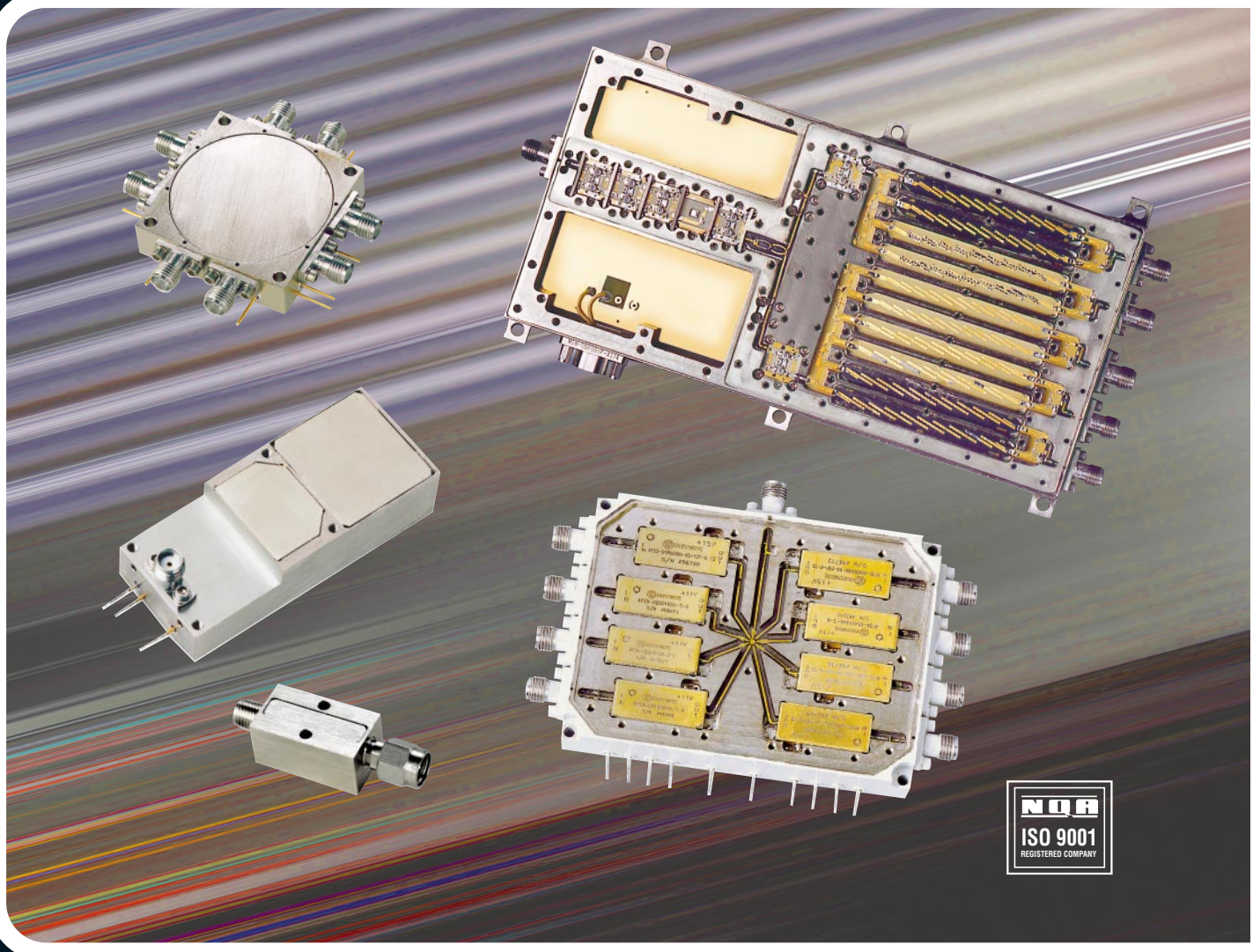
MICROWAVE ASSEMBLIES, SYSTEMS AND TECHNOLOGIES



- PIN Switches
- Broadband Power Dividers
- 3 dB Hybrids
- Analog PIN Attenuators
- Phase Shifters
- Modulators
- Couplers
- Limiters
- Custom Integrated Assemblies

MITEQ

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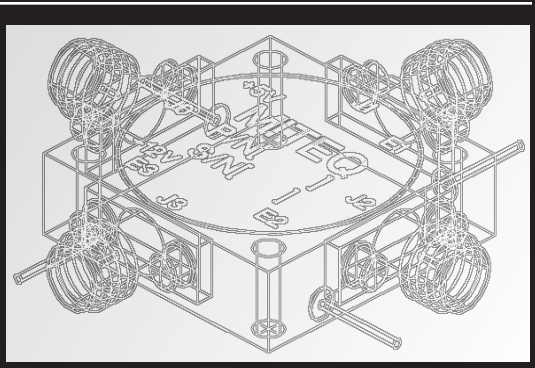
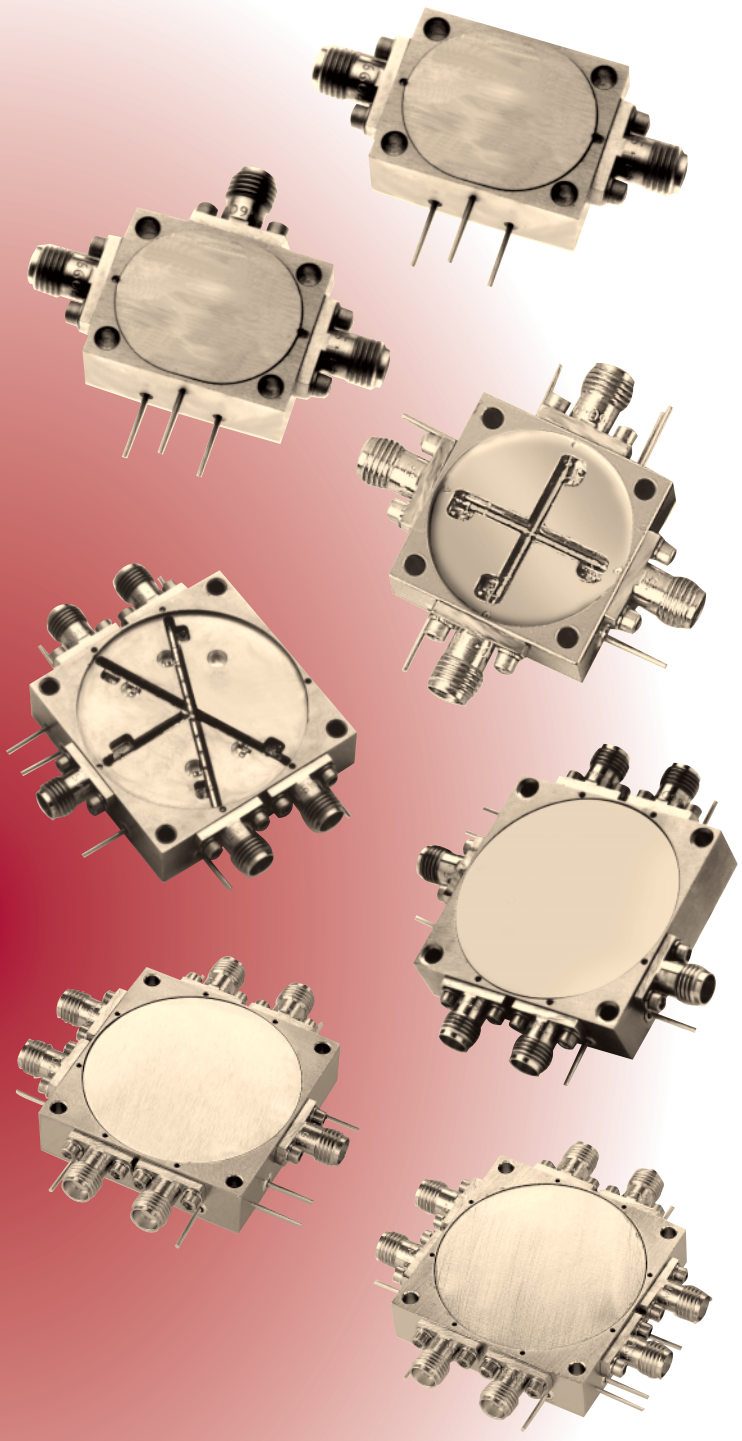
SINGLE-POLE SWITCHES



MITEQ offers a broad line of switches covering multioctave bands from 0.2 to 18 GHz. Single-pole, single-throw through single-pole, seven-throw switches are available as standard products. We can, on special request, provide switches up to single-pole, twelve-throw and can array switches to form switch matrices to handle signal routing in complex systems.

Custom switches up to 40 GHz are also available. Our switches can be screened to the salient characteristics of MIL-STD-883 and we offer a variety of connector options including GPO and SMA. Custom high-power switches capable of switching up to 10 watts are also available.

Our standard products achieve switching times as low as two nanoseconds for those applications requiring the ultimate in switching speed. We are able to accommodate special video leakage needs by incorporating video filters and pulse-shaping networks as needed.



GENERAL SPECIFICATIONS

Power handling (full performance)	20 dBm
Power handling (no damage)	30 dBm
Video leakage for “F” model (RMS power)	< -50 dBm (> 2 GHz) typical
Third order input intercept point	35 dBm typical

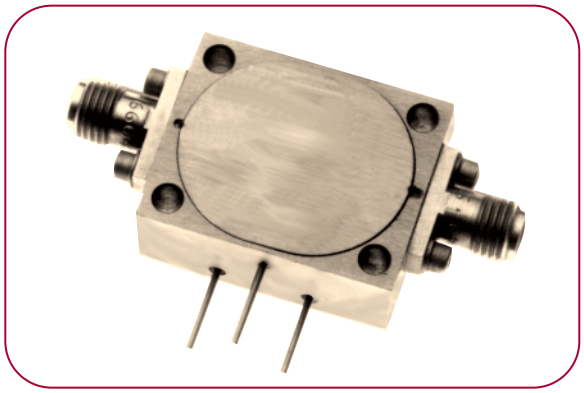
ENVIRONMENTAL CONDITIONS

Operating temperature	0 to 70°C
Storage temperature	-30 to +85°C
Humidity	95% noncondensing
Vibration	12 Gs RMS, 20–2000 Hz per MIL-STD-810B, Method 514, Procedure 5

SINGLE-POLE SINGLE-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- 2 ns models



Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	DC Power Consumption Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S103A	1.5	50	1.6:1	Ref	35	35	SPST	1-5	–
	S103B	1.7	70	1.6:1	Ref	35	35	SPST	1-5	–
	N103A	1.6	55	1.6:1	Abs	35	35	SPST	1-5	–
	N103B	1.8	75	1.6:1	Abs	35	35	SPST	1-5	–
0.5–2	S113A	1.3	60	1.6:1	Ref	35	35	SPST	1-6	–
	S113B	1.5	80	1.6:1	Ref	35	35	SPST	1-6	–
	N113A	1.5	55	1.6:1	Abs	35	35	SPST	1-5	–
	N113B	1.7	75	1.6:1	Abs	35	35	SPST	1-5	–
2–8	S136A	1.8	60	1.7:1	Ref	35	35	SPST	1-6	–
	S136B	2	80	1.7:1	Ref	35	35	SPST	1-6	–
	N136A	2	55	1.7:1	Abs	35	35	SPST	1-5	–
	N136B	2.2	70	1.7:1	Abs	35	35	SPST	1-5	–
4–12	S147A	2	70	1.7:1	Ref	35	35	SPST	1-6	–
	S147B	2.2	90	1.7:1	Ref	35	35	SPST	1-6	–
	N147A	2.3	50	1.7:1	Abs	35	35	SPST	1-5	–
	N147B	2.6	65	1.7:1	Abs	35	35	SPST	1-5	–
2–18	S138A	2.6	60	2:1	Ref	35	35	SPST	1-6	–
	S138B	3	80	2:1	Ref	35	35	SPST	1-6	–
	N138A	2.6	45	2:1	Abs	35	35	SPST	1-5	–
	N138B	3	60	2:1	Abs	35	35	SPST	1-5	–
1–18	S128A	2.7	50	2:1	Ref	35	35	SPST	1-5	–
	S128B	3	70	2:1	Ref	35	35	SPST	1-5	–
	N128A	2.8	45	2:1	Abs	35	35	SPST	1-5	–
	N128B	3.2	60	2:1	Abs	35	35	SPST	1-5	–

Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Examples of custom models previously shipped are shown below. Consult factory for options.

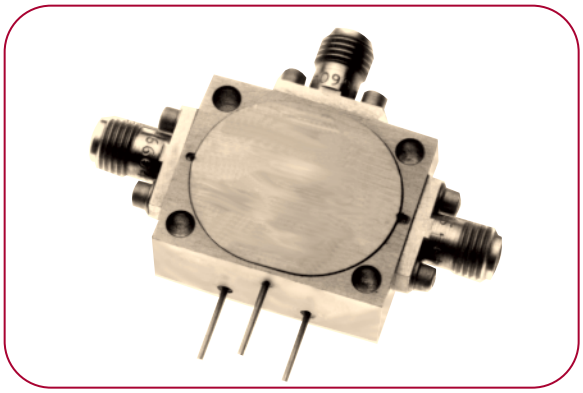
OPTIMIZED PERFORMANCE MODELS									
0.21–0.23	124794	1.8	80	1.6:1	Abs	35	35	SPST	5V,-12V.
0.5–2	126152	1.1	60	1.6:1	Abs	70	70	Contact factory	5V,-15V. 40ns switch speed
3–3.4	124516	1	60	1.5:1	Abs	–	–	SPST	5V,-5V. 6ns rise/fall time
5–5.6	125473	1.3	60	1.5:1	Abs	–	–	SPST	5V,-5V. 6ns rise/fall time
3–9	123296	1.7	60	1.7:1	Ref	–	–	SPST	5V,-15V. 30ns switch speed
9.5–10.5	127922	2.5	70	1.7:1	Abs	35	35	SPST	5V,-15V. 5ns rise/fall time
2–18	124796	3.2	80	2:1	Ref	–	–	SPST	5, -15V. 2ns rise/fall time
2–18	123297	2.8	70	1.8:1	Ref	50	50	Contact factory	±15V. 4ns rise/fall time
2–18	122791	3	80	1.8:1	Ref	50	50	Contact factory	5V,-12V. 3ns rise/fall time
2–18	123797	2.8	70	1.8:1	Ref	50	50	Contact factory	5V,-15V. 4ns rise/fall time

*For reflective models, VSWR is not specified in the "OFF" state.
For absorptive models, VSWR in the "OFF" state is defined for port J2 only.

SINGLE-POLE DOUBLE-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- Amplitude and phase tracking



Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S203A	1.2	50	1.6:1	Ref	60	60	SP2T	1-5	–
	S203B	1.5	70	1.6:1	Ref	60	60	SP2T	1-5	–
	N203A	1.7	55	1.6:1	Abs	60	60	SP2T	1-5	–
	N203B	2	75	1.6:1	Abs	60	60	SP2T	1-5	–
0.5–2	S213A	1	60	1.6:1	Ref	60	60	SP2T	1-5	–
	S213B	1.3	80	1.6:1	Ref	60	60	SP2T	1-5	–
	N213A	1.5	55	1.6:1	Abs	60	60	SP2T	1-5	–
	N213B	1.8	75	1.6:1	Abs	60	60	SP2T	1-5	–
2–8	S236A	1.6	60	1.7:1	Ref	60	60	SP2T	1-5	–
	S236B	1.8	80	1.7:1	Ref	60	60	SP2T	1-5	–
	N236A	1.8	55	1.7:1	Abs	60	60	SP2T	1-5	–
	N236B	2	70	1.7:1	Abs	60	60	SP2T	1-5	–
4–12	S247A	2	70	1.7:1	Ref	60	60	SP2T	1-5	–
	S247B	2.2	90	1.7:1	Ref	60	60	SP2T	1-5	–
	N247A	2	50	1.7:1	Abs	60	60	SP2T	1-5	–
	N247B	2.2	65	1.7:1	Abs	60	60	SP2T	1-5	–
2–18	S238A	2.5	60	2:1	Ref	60	60	SP2T	1-5	–
	S238B	2.8	80	2:1	Ref	60	60	SP2T	1-5	–
	N238A	2.6	45	2:1	Abs	60	60	SP2T	1-5	–
	N238B	3	60	2:1	Abs	60	60	SP2T	1-5	–
1–18	S228A	2.6	55	2:1	Ref	60	60	SP2T	1-5	–
	S228B	3	70	2:1	Ref	60	60	SP2T	1-5	–
	N228A	2.8	45	2:1	Abs	60	60	SP2T	1-5	–
	N228B	3.2	60	2:1	Abs	60	60	SP2T	1-5	–

Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Examples of custom models previously shipped are shown below. Consult factory for options.

OPTIMIZED PERFORMANCE MODELS										
0.5–2	124513	1.4	70	1.5:1	Ref	–	–	SP2T	50ns switch speed	
0.5–2	126157	1.5	70	1.6:1	Abs	95	95	Contact factory	5V,-12V. 50ns switch speed	
1–2	126158	1.5	70	1.5:1	Ref	90	90	Contact factory	5V,-12V. Single TTL line	
1.2–1.6	122797	2.2	75	1.6:1	Abs	60	60	SP2T	5V,-15V. 50ns switch speed	
0.8–4	126150	1.5	70	1.7:1	Ref	60	60	SP2T	5V,-12V	
8–10	122499	2	60	1.6:1	Ref	–	–	SP2T	5V,-12V. 50ns switch speed	
9–11	126154	2.5	40	1.5:1	Ref	25	–	Contact factory	Single 5V supply	
15–17	125963	3	45	2:1	Ref	60	60	SP2T	5V,-12V. 50ns switch speed	
2–18	124080	2.7	65	2:1	Ref	60	60	SP2T	5V,-12V. 50ns switch speed	
2–18	124784	3	65	2:1	Abs	60	60	SP2T	5V,-12V. Single TTL line	
2–18	127070	2.5	70	1.7:1	Abs	60	60	SP2T	5V,-15V	
23.5–24.5	120612	3	35	2:1	Ref	–	–	SP2T	5V,-12V. 7ns rise/fall time	

*For reflective models, VSWR is not specified in the "OFF" state.
For absorptive models, VSWR in the "OFF" state is defined for port J2 only.

SINGLE-POLE THREE-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- Amplitude and phase tracking
- Binary decoded logic

Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S303A	1.3	50	1.6:1	Ref	85	85	SP3T	1-5	–
	S303B	1.6	70	1.6:1	Ref	85	85	SP3T	1-5	–
	N303A	1.7	55	1.6:1	Abs	85	85	SP3T	1-5	–
	N303B	2	75	1.6:1	Abs	85	85	SP3T	1-5	–
0.5–2	S313A	1.2	60	1.6:1	Ref	85	85	SP3T	1-5	–
	S313B	1.5	80	1.6:1	Ref	85	85	SP3T	1-5	–
	N313A	1.6	55	1.6:1	Abs	85	85	SP3T	1-5	–
	N313B	1.9	75	1.6:1	Abs	85	85	SP3T	1-5	–
2–8	S336A	1.7	60	1.7:1	Ref	85	85	SP3T	1-5	–
	S336B	1.9	80	1.7:1	Ref	85	85	SP3T	1-5	–
	N336A	1.9	55	1.7:1	Abs	85	85	SP3T	1-5	–
	N336B	2.1	70	1.7:1	Abs	85	85	SP3T	1-5	–
4–12	S347A	2.2	70	1.7:1	Ref	85	85	SP3T	1-5	–
	S347B	2.4	90	1.7:1	Ref	85	85	SP3T	1-5	–
	N347A	2.2	50	1.7:1	Abs	85	85	SP3T	1-5	–
	N347B	2.5	65	1.7:1	Abs	85	85	SP3T	1-5	–
2–18	S338A	2.7	60	2:1	Ref	85	85	SP3T	1-5	–
	S338B	3	80	2:1	Ref	85	85	SP3T	1-5	–
	N338A	2.8	45	2:1	Abs	85	85	SP3T	1-5	–
	N338B	3.2	60	2:1	Abs	85	85	SP3T	1-5	–
1–18	S328A	2.8	55	2:1	Ref	85	85	SP3T	1-5	–
	S328B	3.1	70	2:1	Ref	85	85	SP3T	1-5	–
	N328A	2.9	45	2:1	Abs	85	85	SP3T	1-5	–
	N328B	3.4	60	2:1	Abs	85	85	SP3T	1-5	–

Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Examples of custom models previously shipped are shown below. Consult factory for options.

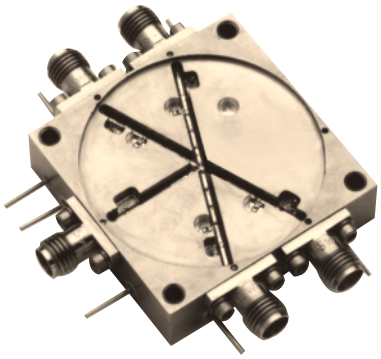
OPTIMIZED PERFORMANCE MODELS									
4.8–7.6	126145	3	60	1.5:1	Ref	–	–	SP3T	Single 5V supply
5.8–14.5	126144	3	60	1.6:1	Ref	–	–	Contact factory	Single 5V supply
2–12	120608	2.2	70	1.7:1	Ref	85	85	SP3T	5V,-12V
2–18	124081	2.7	70	2:1	Ref	–	–	SP3T	5V,-12V. 50ns switch speed

*For reflective models, VSWR is not specified in the "OFF" state.
For absorptive models, VSWR in the "OFF" state is defined for port J2 only.

SINGLE-POLE FOUR-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- Amplitude and phase tracking
- Binary decoded logic



Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	DC Power Consumption Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S403A	1.4	50	1.7:1	Ref	110	110	SP4T	1-5	–
	S403B	1.7	60	1.7:1	Ref	110	110	SP4T	1-5	–
	N403A	1.8	55	1.7:1	Abs	110	110	SP4T	1-5	–
	N403B	2.1	65	1.7:1	Abs	110	110	SP4T	1-5	–
0.5–2	S413A	1.3	55	1.7:1	Ref	110	110	SP4T	1-5	–
	S413B	1.6	65	1.7:1	Ref	110	110	SP4T	1-5	–
	N413A	1.7	55	1.7:1	Abs	110	110	SP4T	1-5	–
	N413B	2	65	1.7:1	Abs	110	110	SP4T	1-5	–
2–8	S436A	1.8	55	1.8:1	Ref	110	110	SP4T	1-5	–
	S436B	2	65	1.8:1	Ref	110	110	SP4T	1-5	–
	N436A	2	55	1.8:1	Abs	110	110	SP4T	1-5	–
	N436B	2.3	65	1.8:1	Abs	110	110	SP4T	1-5	–
4–12	S447A	2.4	55	1.8:1	Ref	110	110	SP4T	1-5	–
	S447B	2.6	65	1.8:1	Ref	110	110	SP4T	1-5	–
	N447A	2.4	50	1.8:1	Abs	110	110	SP4T	1-5	–
	N447B	2.7	65	1.8:1	Abs	110	110	SP4T	1-5	–
2–18	S438A	2.8	50	2:1	Ref	110	110	SP4T	1-5	–
	S438B	3.1	60	2:1	Ref	110	110	SP4T	1-5	–
	N438A	3	45	2:1	Abs	110	110	SP4T	1-5	–
	N438B	3.4	60	2:1	Abs	110	110	SP4T	1-5	–
1–18	S428A	3	50	2:1	Ref	110	110	SP4T	1-5	–
	S428B	3.3	60	2:1	Ref	110	110	SP4T	1-5	–
	N428A	3.2	45	2:1	Abs	110	110	SP4T	1-5	–
	N428B	3.6	60	2:1	Abs	110	110	SP4T	1-5	–

Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Examples of custom models previously shipped are shown below. Consult factory for options.

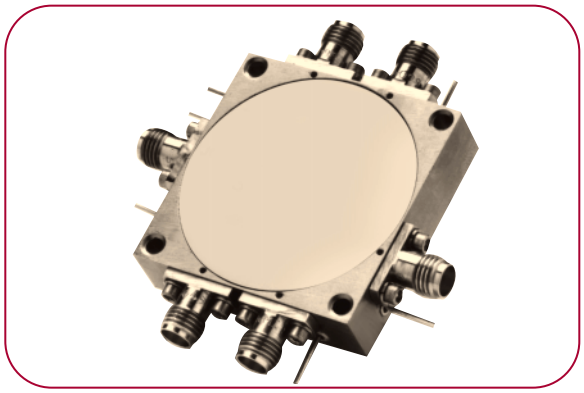
OPTIMIZED PERFORMANCE MODELS									
0.5–4	125482	1.6	65	2:1	Ref	110	110	SP4T	5V, -15V
5–6	127935	2.2	60	1.7:1	Abs	35	–	Contact factory	Single 5V supply
5–6	126940	1.4	55	1.5:1	Abs	110	110	SP4T	5V,-15V
9–11	127087	2.6	70	1.5:1	Abs	35	–	Contact factory	Single 5V supply
3.4–12.8	126142	3	60	1.5:1	Ref	–	–	Contact factory	Single 5V supply

*For reflective models, VSWR is not specified in the "OFF" state.
For absorptive models, VSWR in the "OFF" state is defined for port J2 only.

SINGLE-POLE FIVE-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- Amplitude and phase tracking
- Binary decoded logic



Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S503A	1.5	50	1.7:1	Ref	135	135	SP5T	1-5	–
	S503B	1.8	60	1.7:1	Ref	135	135	SP5T	1-5	–
	N503A	1.9	55	1.7:1	Abs	135	135	SP5T	1-5	–
	N503B	2.2	65	1.7:1	Abs	135	135	SP5T	1-5	–
0.5–2	S513A	1.4	55	1.7:1	Ref	135	135	SP5T	1-5	–
	S513B	1.7	65	1.7:1	Ref	135	135	SP5T	1-5	–
	N513A	1.8	55	1.7:1	Abs	135	135	SP5T	1-5	–
	N513B	2.1	65	1.7:1	Abs	135	135	SP5T	1-5	–
2–8	S536A	1.9	55	1.8:1	Ref	135	135	SP5T	1-5	–
	S536B	2.1	65	1.8:1	Ref	135	135	SP5T	1-5	–
	N536A	2.1	55	1.8:1	Abs	135	135	SP5T	1-5	–
	N536B	2.4	65	1.8:1	Abs	135	135	SP5T	1-5	–
4–12	S547A	2.6	55	1.8:1	Ref	135	135	SP5T	1-5	–
	S547B	2.8	65	1.8:1	Ref	135	135	SP5T	1-5	–
	N547A	2.6	50	1.8:1	Abs	135	135	SP5T	1-5	–
	N547B	2.9	65	1.8:1	Abs	135	135	SP5T	1-5	–
2–18	S538A	3	50	2:1	Ref	135	135	SP5T	1-5	–
	S538B	3.3	60	2:1	Ref	135	135	SP5T	1-5	–
	N538A	3.2	45	2:1	Abs	135	135	SP5T	1-5	–
	N538B	3.6	60	2:1	Abs	135	135	SP5T	1-5	–
1–18	S528A	3.2	50	2:1	Ref	135	135	SP5T	1-5	–
	S528B	3.5	60	2:1	Ref	135	135	SP5T	1-5	–
	N528A	3.4	45	2:1	Abs	135	135	SP5T	1-5	–
	N528B	3.8	60	2:1	Abs	135	135	SP5T	1-5	–

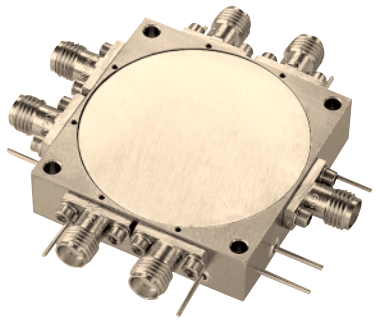
Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Consult factory for options.

*For reflective models, VSWR is not specified in the "OFF" state.
For absorptive models, VSWR in the "OFF" state is defined for port J2 only.

SINGLE-POLE SIX-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- Amplitude and phase tracking
- Binary decoded logic



Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S603A	1.6	50	1.7:1	Ref	160	160	SP6T	1-5	–
	S603B	1.9	60	1.7:1	Ref	160	160	SP6T	1-5	–
	N603A	2	55	1.7:1	Abs	160	160	SP6T	1-5	–
	N603B	2.3	65	1.7:1	Abs	160	160	SP6T	1-5	–
0.5–2	S613A	1.5	55	1.7:1	Ref	160	160	SP6T	1-5	–
	S613B	1.8	65	1.7:1	Ref	160	160	SP6T	1-5	–
	N613A	1.9	55	1.7:1	Abs	160	160	SP6T	1-5	–
	N613B	2.2	65	1.7:1	Abs	160	160	SP6T	1-5	–
2–8	S636A	2	55	1.8:1	Ref	160	160	SP6T	1-5	–
	S636B	2.2	65	1.8:1	Ref	160	160	SP6T	1-5	–
	N636A	2.2	55	1.8:1	Abs	160	160	SP6T	1-5	–
	N636B	2.5	65	1.8:1	Abs	160	160	SP6T	1-5	–
4–12	S647A	2.7	55	1.8:1	Ref	160	160	SP6T	1-5	–
	S647B	2.9	65	1.8:1	Ref	160	160	SP6T	1-5	–
	N647A	2.8	50	1.8:1	Abs	160	160	SP6T	1-5	–
	N647B	3.1	65	1.8:1	Abs	160	160	SP6T	1-5	–
2–18	S638A	3.2	50	2:1	Ref	160	160	SP6T	1-5	–
	S638B	3.5	60	2:1	Ref	160	160	SP6T	1-5	–
	N638A	3.4	45	2:1	Abs	160	160	SP6T	1-5	–
	N638B	3.8	60	2:1	Abs	160	160	SP6T	1-5	–
1–18	S628A	3.4	50	2:1	Ref	160	160	SP6T	1-5	–
	S628B	3.7	60	2:1	Ref	160	160	SP6T	1-5	–
	N628A	3.6	45	2:1	Abs	160	160	SP6T	1-5	–
	N628B	4	60	2:1	Abs	160	160	SP6T	1-5	–

Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Examples of custom models previously shipped are shown below. Consult factory for options.

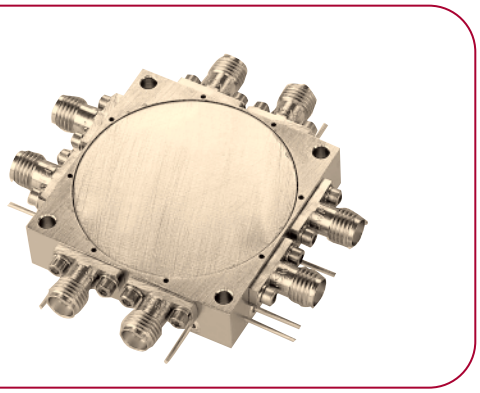
OPTIMIZED PERFORMANCE MODELS										
0.6–2.5	122516	2.5	65	1.7:1	Abs	160	160	SP6T	5V,-5V	
9–11	126153	2.5	40	1.5:1	Ref	25	–	Contact factory	Single 5V supply	

*For reflective models, VSWR is not specified in the "OFF" state.
For absorptive models, VSWR in the "OFF" state is defined for port J2 only.

SINGLE-POLE SEVEN-THROW SWITCHES

FEATURES

- Multioctave bands 0.2 to 18 GHz
- Current and TTL control
- Low loss
- High isolation
- Medium and high speed models
- Drop-in models
- Amplitude and phase tracking
- Binary decoded logic



Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	*VSWR (Max.)	Type (Reflective/ Absorptive)	DC Power Consumption Pos. Supply (mA, Max.)	Neg. Supply (mA, Min.)	Outline	Ordering Options	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS										
0.2–2	S703A	1.7	50	1.7:1	Ref	185	185	SP7T	1-5	–
	S703B	2	60	1.7:1	Ref	185	185	SP7T	1-5	–
	N703A	2.1	55	1.7:1	Abs	185	185	SP7T	1-5	–
	N703B	2.4	65	1.7:1	Abs	185	185	SP7T	1-5	–
0.5–2	S713A	1.6	55	1.7:1	Ref	185	185	SP7T	1-5	–
	S713B	1.9	65	1.7:1	Ref	185	185	SP7T	1-5	–
	N713A	2	55	1.7:1	Abs	185	185	SP7T	1-5	–
	N713B	2.3	65	1.7:1	Abs	185	185	SP7T	1-5	–
2–8	S736A	2.1	55	1.8:1	Ref	185	185	SP7T	1-5	–
	S736B	2.3	65	1.8:1	Ref	185	185	SP7T	1-5	–
	N736A	2.3	55	1.8:1	Abs	185	185	SP7T	1-5	–
	N736B	2.6	65	1.8:1	Abs	185	185	SP7T	1-5	–
4–12	S747A	2.9	55	1.8:1	Ref	185	185	SP7T	1-5	–
	S747B	3.1	65	1.8:1	Ref	185	185	SP7T	1-5	–
	N747A	3	50	1.8:1	Abs	185	185	SP7T	1-5	–
	N747B	3.2	65	1.8:1	Abs	185	185	SP7T	1-5	–
2–18	S738A	3.4	50	2:1	Ref	185	185	SP7T	1-5	–
	S738B	3.7	60	2:1	Ref	185	185	SP7T	1-5	–
	N738A	3.6	45	2:1	Abs	185	185	SP7T	1-5	–
	N738B	4	60	2:1	Abs	185	185	SP7T	1-5	–
1–18	S728A	3.6	50	2:1	Ref	185	185	SP7T	1-5	–
	S728B	3.9	60	2:1	Ref	185	185	SP7T	1-5	–
	N728A	3.8	45	2:1	Abs	185	185	SP7T	1-5	–
	N728B	4.2	60	2:1	Abs	185	185	SP7T	1-5	–

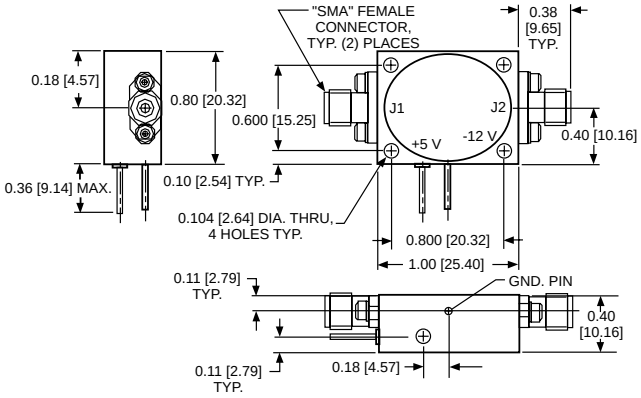
Electrical performance of multioctave models can be optimized over narrower bandwidths, or for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation, flat amplitude response, amplitude tracking. Mechanical/Control options include: Custom packaging, single supply operation, fast switching time, single TTL control line. Examples of custom models previously shipped are shown below. Consult factory for options.

OPTIMIZED PERFORMANCE MODELS										
1–1.5	127069	1.5	60	1.6:1	Abs	–	–	SP7T	2-3	15V, -15V 1ns switch speed

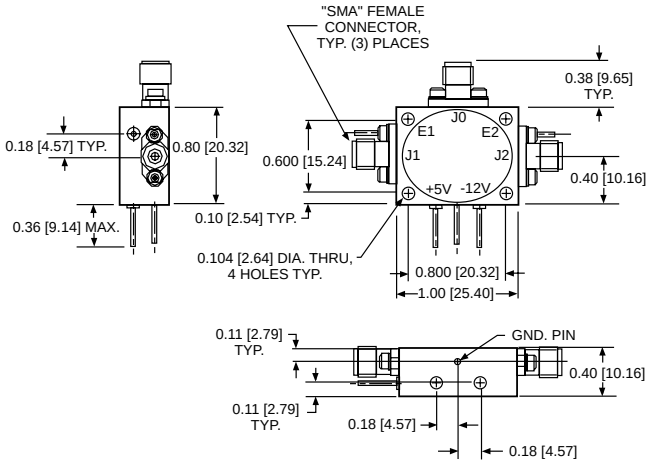
*For reflective models, VSWR is not specified in the “OFF” state.
For absorptive models, VSWR in the “OFF” state is defined for port J2 only.

SWITCH OUTLINE DRAWINGS

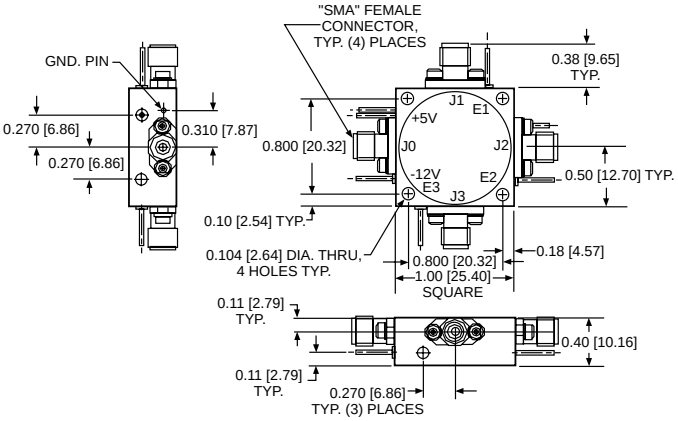
SPST



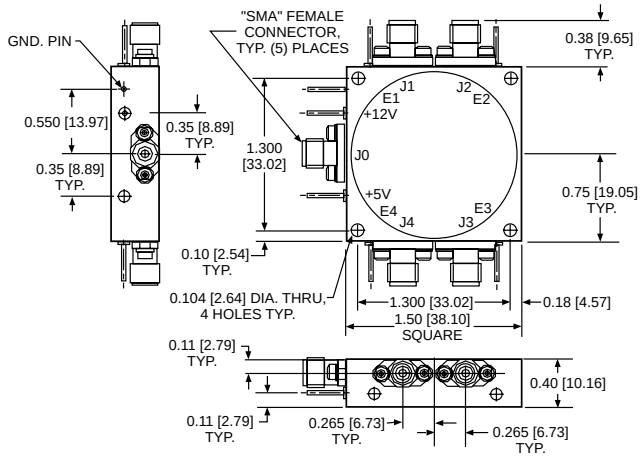
SP2T



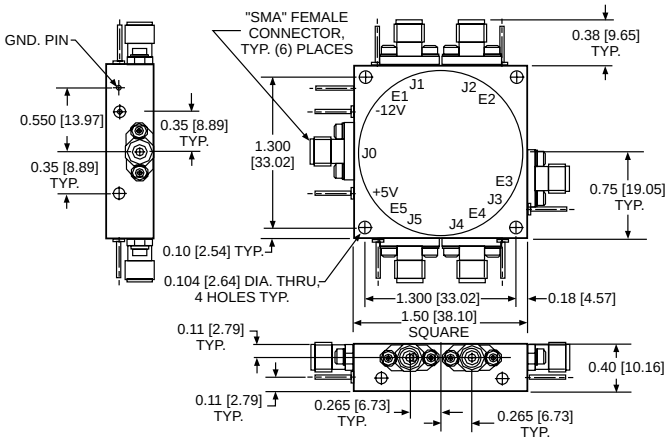
SP3T



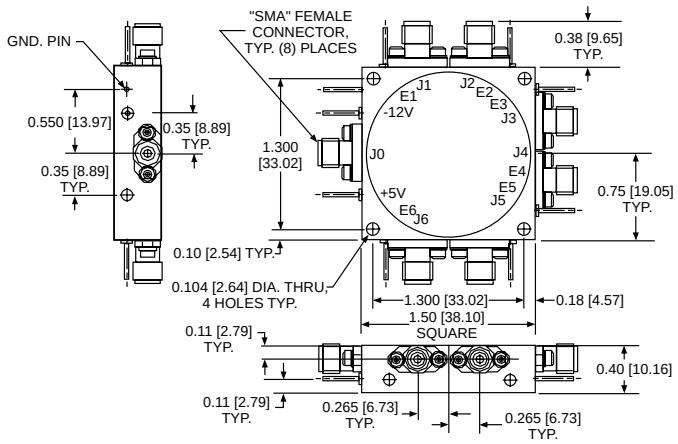
SP4T



SP5T



SP6T

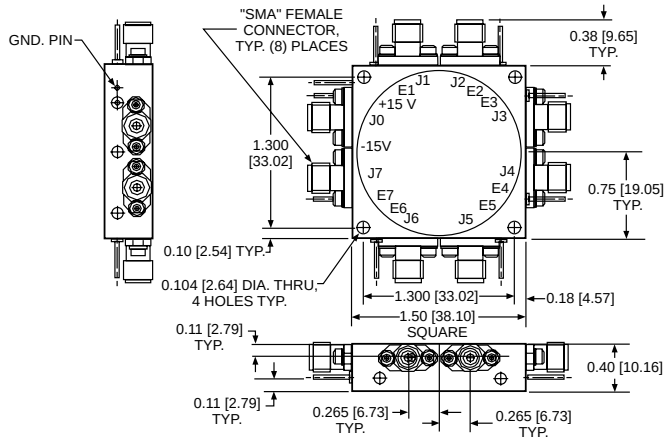


GENERAL NOTES:

1. Dimensions shown in brackets [ ] are in millimeters.
2. Unless specified, all connectors are type SMA female field replaceable. SMA male also available, see ordering options.
3. Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

SWITCH OUTLINE DRAWINGS (CONT.)

SP7T



GENERAL NOTES:

1. Dimensions shown in brackets [ ] are in millimeters.
2. Unless specified, all connectors are type SMA female field replaceable. SMA male also available, see ordering options.
3. Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

ORDERING INFORMATION

To order a standard switch with specific parameters please include the following:

S236B — *D* — *F* — *O*

Model Number
Specify from tables on previous pages.

Impedance Control Option
Current control, each throw:
-2V @ 15 mA typ. (insertion loss)
2V @ 20 mA typ. (isolation) . . . . . **Blank**
TTL driver, inverting logic
"O" = Isolation, "I" = Insertion loss . . . . . **D**
TTL driver, noninverting logic
"I" = Isolation, "O" = Insertion loss . . . . . **N**

Rise/Fall Time, ns
Medium: 300ns maximum . . . . . **M**
Fast: 20 ns, SP2T – SP7T . . . . . **F**
Ultrafast: 3 ns maximum
Available in models S113, S136, S147 and S138 only . . . . . **U**

Power Supply
5V, -12V **0**
5V, -5V **1**
5V, -15V **2**

The above illustrated switch Part Number *S236B-D-F-O* is based on the following parameters:
2–8 GHz Single-Pole Double-Throw Switch
Isolation . . . . . 80 dB
"OFF" state . . . . . Reflective
Impedance control . . . . . TTL, inverting logic
Rise/fall time . . . . . 20 ns maximum
Power supply . . . . . 5V, -12V

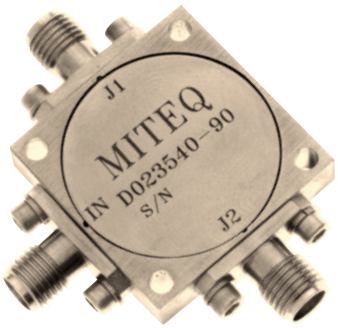
ORDERING INFORMATION FOR RF CONNECTORS

Unless otherwise specified on the purchase order, units will be shipped with field replaceable SMA female connectors on the input and outputs. If male connectors are desired on any ports, specify on the purchase order.

3 dB HYBRIDS

FEATURES

- 0°, 90° and 180° split
- Up to 40 GHz
- Compact package
- Low loss
- Tight amplitude and phase balance



MITEQ offers a variety of 3 dB hybrids including in-phase, quadrature, and 180 degree split types. Custom designs covering multioctave bands up to 40 GHz are also available. We offer MIL-STD-883 screening of our couplers and can accommodate special connector requirements.

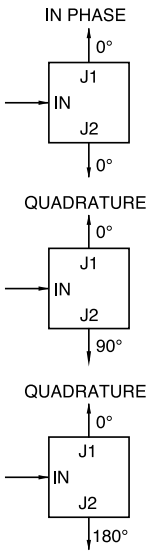
Frequency Range (GHz)	Model Number	Nominal Split (dB)	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	Amplitude Balance (±dB, Max.)	Phase Balance (±Deg., Max.)	VSWR	RF Connectors	Outline
0° HYBRIDS									
35 – 40	D023540-0	3.01	1.5	18	0.5	5	1.7:1	K connectors, field replaceable	See below
QUADRATURE 90° HYBRIDS									
35 – 40	D023540-90	3.01	1.5	18	0.5	5	1.7:1	K connectors, field replaceable	See below
180° HYBRIDS									
19 – 21	141295	3.01	1	20	0.25	5	1.5:1	K connectors, field replaceable	See below

Additional frequency ranges are available for all hybrids. Consult factory for options.

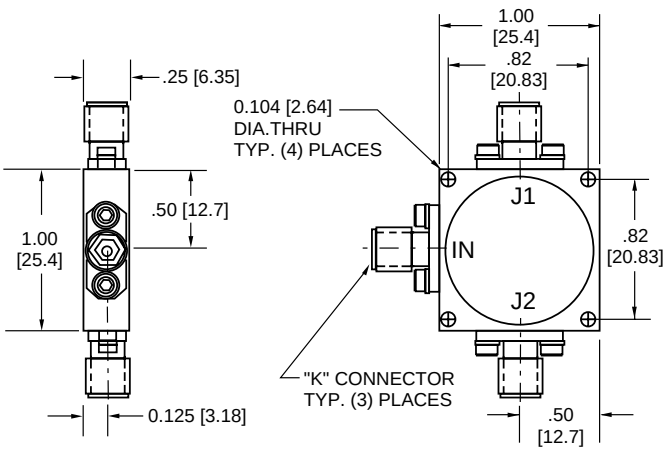
ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING

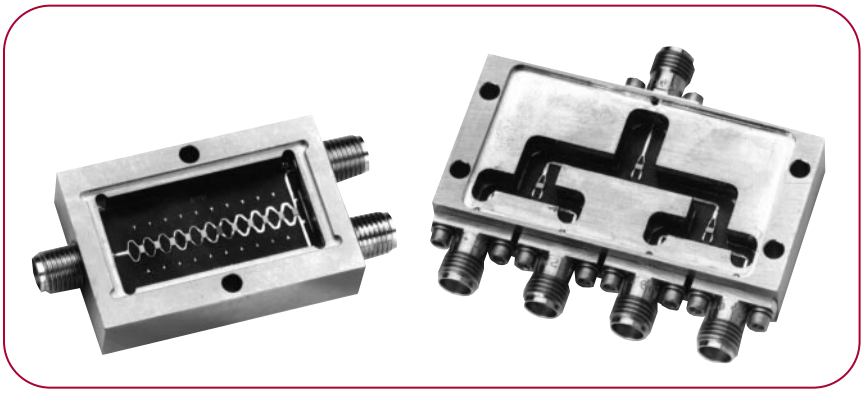


GENERAL NOTES:
1. Dimensions shown in brackets [ ] are in millimeters.
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

BROADBAND POWER DIVIDERS

FEATURES

- Multioctave bands
- Microstrip construction
- Low loss
- High isolation
- Small size



MITEQ offers a broad range of Wilkinson-type power dividers covering multioctave bands from 2 to 18 GHz, and custom power dividers up to 40 GHz are also available. Power dividers up to 16-way are available as standard products. These products feature excellent amplitude, phase balance and lowest possible loss. We can provide these components as drop-in functions for those applications that require higher levels of integration. We offer MIL-STD-883 screening and custom connector options.

Divide By	Model Number	Frequency Range (GHz)	Insertion Loss (dB, Max.)	Isolation (dB, Min.)	Amplitude Balance (±dB, Max.)	Phase Balance (±Deg., Max.)	VSWR In (Max.)	VSWR Out (Max.)	Outline
STANDARD, MULTIOCTAVE BAND MODELS									
2	D0238	2–18	1.2	20	0.25	4	1.45:1	1.35:1	2
	D0239	2–26.5	2.5	20	0.5	5	1.6:1	1.5:1	2
	D0237	2–12.4	0.6	20	0.3	3	1.4:1	1.35:1	3
	D0236	2–8	0.4	20	0.2	2	1.4:1	1.3:1	3
	D0258	5–18	0.6	20	0.2	3	1.4:1	1.4:1	3
	D0249	4–26.5	1.2	18	0.4	4	1.6:1	1.6:1	3
	D0279	12–26.5	1	18	0.2	3	1.6:1	1.6:1	3
	D2089	18–40	1	17	0.5	5	1.8:1	1.7:1	3
4	D0438	2–18	2.5	20	0.4	5	1.6:1	1.4:1	4
	D0437	2–12.4	1.7	20	0.35	4	1.5:1	1.4:1	4
	D0436	2–8	0.9	20	0.35	4	1.5:1	1.25:1	4
	D0458	5–18	1.5	20	0.35	5	1.6:1	1.4:1	5
	D0449	4–26.5	2.5	16	0.5	6	1.7:1	1.6:1	5
	D0479	12–26.5	1.8	16	0.5	6	1.75:1	1.6:1	5
	D0489	18–40	2.5	17	0.5	5	1.8:1	1.7:1	5
8	D0837	2–12.4	2.8	20	0.4	5	1.6:1	1.4:1	6
	D0836	2–8	1.5	20	0.4	5	1.6:1	1.25:1	6
	D0858	5–18	2	20	0.5	7	1.7:1	1.4:1	7
	D0849	4–26.5	3.7	16	0.6	7	1.8:1	1.6:1	7
	D0879	12–26.5	2.4	16	0.5	7	1.8:1	1.6:1	8
	D0889	18–40	3.5	17	0.5	5	1.8:1	1.7:1	8
16	D1636	2–8	2.2	20	0.5	5	1.7:1	1.25:1	9
	D1658	5–18	3.5	20	0.5	7	1.8:1	1.5:1	10

Electrical performance of multioctave models can be optimized over narrower bandwidths for a particular parameter. Electrical options include: Lower insertion loss, lower VSWR, higher isolation. Custom packaging also available. Examples of custom models previously shipped are shown below. Consult factory for options.

OPTIMIZED PERFORMANCE MODELS									
2	119732	2.8–3.2	0.5	20	0.2	3	1.4:1	1.4:1	Contact factory
	127071	15.7–16.2	0.5	20	0.2	10	1.5:1	1.5:1	Contact factory
4	123287	8–14	1.2	20	0.25	3	1.4:1	1.4:1	Contact factory
	125965	8–12.4	1.1	20	0.35	4	1.5:1	1.5:1	Contact factory
8	126459	0.95–1.45	0.8	20	0.5	6	1.45:1	1.45:1	Contact factory

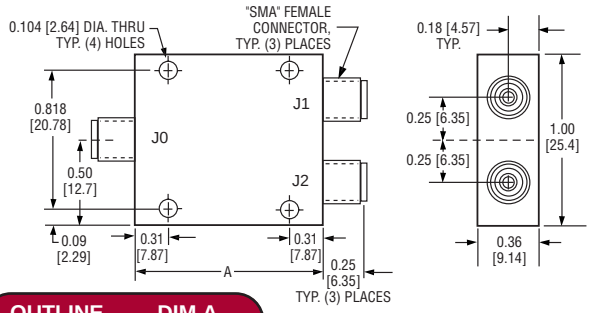
Power handling in a splitter application: 30 W CW @ load VSWR < 1.2:1, 10 W CW @ load VSWR < 2:1.

ENVIRONMENTAL CONDITIONS

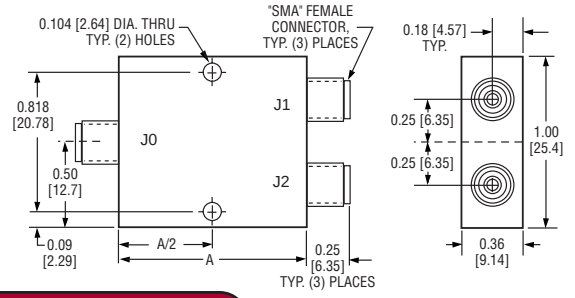
Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C
Power handling . . . . . P_{in} maximum equals 20 W into 1.2:1 load, all ports.

BROADBAND POWER DIVIDER OUTLINE DRAWINGS

1, 2 and 3

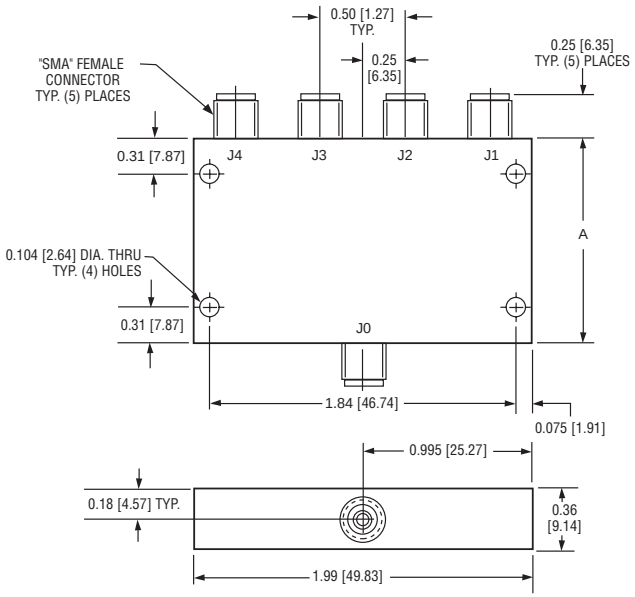


OUTLINE	DIM A
1	3.5 [88.90]



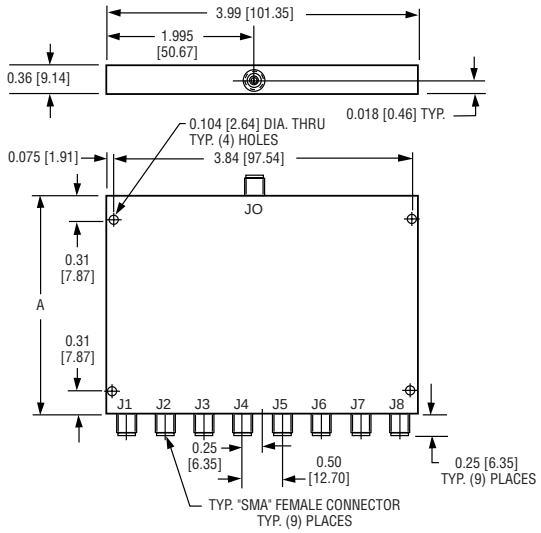
OUTLINE	DIM A
2	1.5 [38.10]
3	1.02 [25.91]

4 and 5



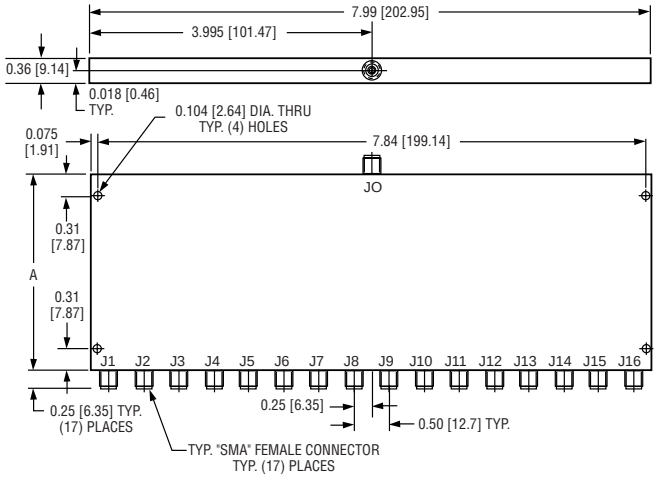
OUTLINE	DIM A
4	2.5 [63.50]
5	1.4 [35.56]

6, 7 and 8



OUTLINE	DIM A
6	3.5 [88.90]
7	2.2 [55.88]
8	1.75 [44.45]

9 and 10



OUTLINE	DIM A
9	5.5 [139.70]
10	2.9 [73.66]

GENERAL NOTES:

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2. Unless specified, all connectors are type SMA female field replaceable.
3. Tolerance as follows:
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   .xxx = ±0.005 [.xxx = ±0.13]

ANALOG PIN ATTENUATORS

FEATURES

- Attenuation range of up to 60 dB
- Up to octave bandwidths
- Analog control voltage
- Lowest insertion loss

Analog PIN attenuators optimized for the communication bands are available from MITEQ. Attenuation ranges up to 60 dB can be obtained with our standard products. We also offer as custom products 5-bit digital attenuators with an LSB of 1 dB and maximum attenuation of 30 dB. This design is ideal in IF applications up to 3 GHz. Custom PIN attenuators that cover octave bands are available. We also offer MESFET-based attenuators covering 0.2 to 40 GHz in multioctave bands. These products offer very broad bandwidths and fast response time.

Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	*VSWR In/Out (Max.)	**Amplitude Response (dB)	Atten. Range Options (dB, Min.)	***Control Options (VDC)	Outline	Additional Features
STANDARD, MULTIOCTAVE BAND MODELS								
0.95–1.45	MPAT-095145-	1.1	1.5:1	See notes	10–60	0–20	1	–
0.95–1.75	MPAT-095175-	1.1	1.5:1	See notes	10–60	0–20	1	–
1.5–1.8	MPAT-150180-	1.1	1.5:1	See notes	10–60	0–20	2	–
2.1–2.7	MPAT-210270-	1.5	1.5:1	See notes	10–60	0–20	2	–
3.4–4.2	MPAT-340420-	2.2	1.5:1	See notes	10–60	0–20	2	–
3.62–4.205	MPAT-362420-	2.2	1.5:1	See notes	10–60	0–20	2	–
4.5–4.8	MPAT-450480-	2.2	1.5:1	See notes	10–60	0–20	2	–
5.845–6.43	MPAT-584643-	2.2	1.5:1	See notes	10–60	0–20	2	–
6.4–7.2	MPAT-640720-	2.2	1.5:1	See notes	10–60	0–20	2	–
7.25–7.75	MPAT-725775-	2.2	1.5:1	See notes	10–60	0–20	2	–
7.9–8.4	MPAT-790840-	2.2	1.5:1	See notes	10–60	0–20	2	–
10.95–11.7	MPAT-109117-	2.2	1.5:1	See notes	10–60	0–20	4	–
10.95–12.2	MPAT-109122-	2.2	1.5:1	See notes	10–60	0–20	4	–
10.7–11.7	MPAT-107117-	2.2	1.5:1	See notes	10–60	0–20	4	–
10.7–12.5	MPAT-107125-	2.2	1.5:1	See notes	10–60	0–20	4	–
10.95–12.75	MPAT-109128-	2.2	1.5:1	See notes	10–60	0–20	4	–
11.7–12.2	MPAT-117122-	2.2	1.5:1	See notes	10–60	0–20	4	–
11.7–12.75	MPAT-117128-	2.2	1.5:1	See notes	10–60	0–20	4	–
12.2–12.75	MPAT-122128-	2.2	1.5:1	See notes	10–60	0–20	4	–
12.75–13.25	MPAT-128133-	2.5	1.5:1	See notes	10–60	0–20	4	–
13.75–14.5	MPAT-138145-	2.5	1.5:1	See notes	10–60	0–20	4	–
14–14.5	MPAT-140145-	2.5	1.5:1	See notes	10–60	0–20	4	–
14–14.8	MPAT-140148-	2.7	1.5:1	See notes	10–60	0–20	4	–
17.3–17.8	MPAT-173178-	2.7	1.5:1	See notes	10–60	0–20	5	–
17.3–18.1	MPAT-173181-	3	1.5:1	See notes	10–60	0–20	5	–
17.7–20.2	MPAT-177202-	3	1.5:1	See notes	10–60	0–20	5	–
18.8–19.6	MPAT-188196-	3	1.5:1	See notes	10–60	0–20	5	–

* VSWR is guaranteed over full attenuation range.
** Amplitude response: ±0.2 dB p-p over any 40 MHz window, 1 dB p-p over full band from 0–30 dB attenuation.
*** Insertion loss occurs at 0 V control.
Custom models featuring broader bandwidths, and/or optimized specifications are also available. Consult factory for options.

ANALOG PIN ATTENUATORS (CONT.)

Frequency Range (GHz)	Model Number	Insertion Loss (dB, Max.)	*VSWR In/Out (Max.)	**Amplitude Response (dB)	Atten. Range Options (dB, Min.)	***Control Options (VDC)	Outline	Additional Features
VOLTAGE CONTROLLED								
1.275–1.48	MPAT-127148-	2.5	1.5:1	See notes	30	0–20	4	–
1.654–1.746	MPAT-165175-	1.1	1.5:1	0.25 in band	20	0–20	2	–
2–2.2	MPAT-124068-	1.7	1.5:1	0.3 in band	37	0–6	2	Input P1 dB = 20 dBm High power: 20 W peak, operating. 40 W peak, survival.
3.1–3.5	124082	2.2	1.3:1	0.25 in band	15	0–5	–	
3.8–4.1	126149	1.3	1.5:1	1 max. at 20–60 dB atten.	10–60	0–5	2	–
7.5–8.5	125964	1.8	1.5:1	0.25 in band	10	0–10	5	–
8–12	124792	2.2	1.8:1		60	–	4	Attenuation flatness: ±1.6 dB maximum 150 ns switch speed maximum
CURRENT-CONTROLLED ANALOG PIN ATTENUATORS								
4–8	123293	2	1.7:1	0.3 at 10 dB 1.5 at 40 dB 1.6 at 60 dB	10–60	–	2	50 ns switch speed maximum
8–12	124782	2.2	1.7:1	0.5 at 10 dB 1.5 at 40 dB 1.6 at 60 dB	10–60	–	4	– – –

* VSWR is guaranteed over full attenuation range.
** Amplitude response: ±0.2 dB p-p over any 40 MHz window, 1 dB p-p over full band from 0–30 dB attenuation.
*** Insertion loss occurs at 0 V control.

ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

ORDERING INFORMATION

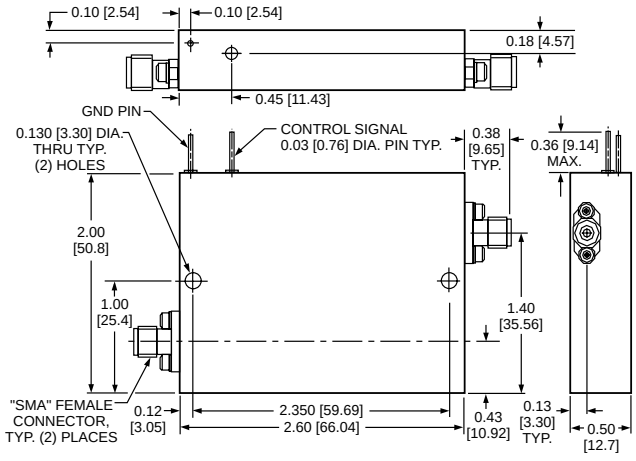
MPAT- Model number - Desired attenuation (10–60 dB) - Desired control voltage (0–20 V)
Example: To specify a 10.7–12.75 GHz, 40 dB attenuator with a control voltage of 15 volts, the following ordering information would be used: MPAT-107117-40-15.

ORDERING INFORMATION FOR RF CONNECTORS

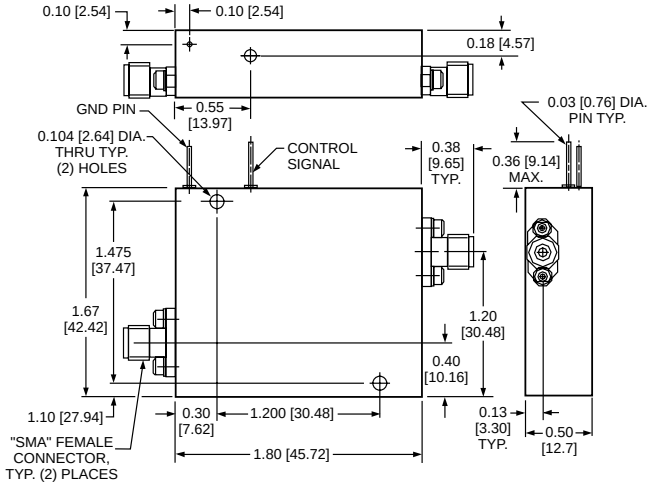
Unless otherwise specified all units will be shipped with field replaceable SMA female connectors on the input and outputs. If male connectors are desired on any ports, please specify on the purchase order.

ANALOG PIN ATTENUATORS OUTLINE DRAWINGS

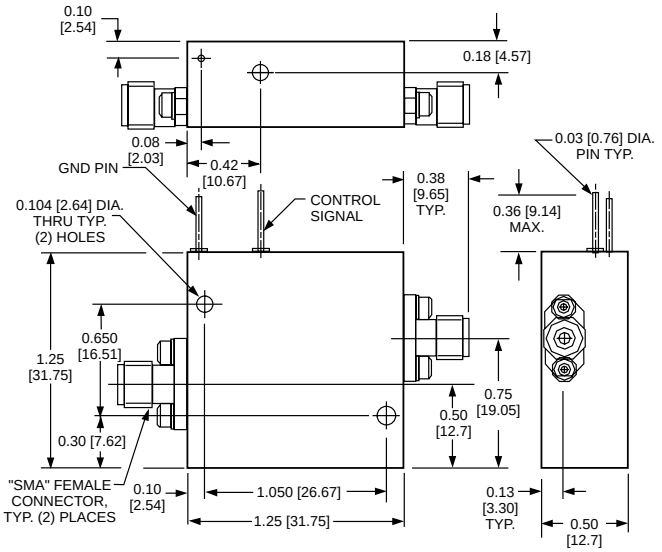
1



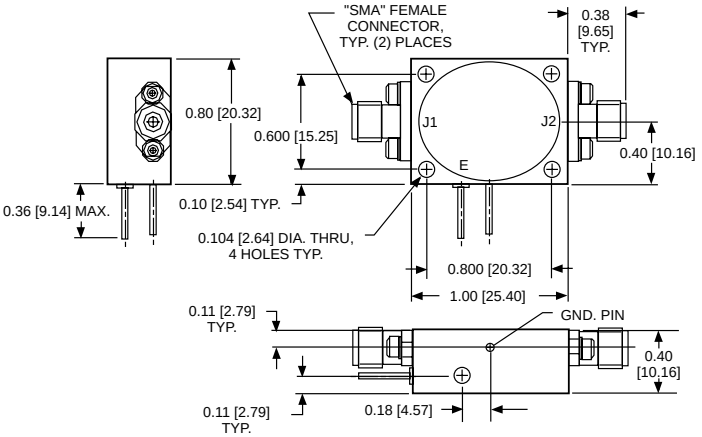
2



4



5



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   .xxx = ±0.005 [.xxx = ±0.13]

PHASE SHIFTERS

MITEQ offers a 6-BIT to 18 GHz digital phase shifter operating as high as 18 GHz for EW applications. This product offers exceptional power handling capability in excess of 25 dBm and switching speed of 20 ns maximum. This device is ideally suited for phased array applications and interferometric receivers. We also offer a number of narrowband analog phase shifters that utilize switched line and reflection phase shifter topologies.

3 BIT, 9–10 GHz DIGITAL PHASE SHIFTER

SPECIFICATIONS - MODEL 126138

Phase states	0° (Ref.), 90°, 180°, 270°
Frequency range	9–10 GHz
Insertion loss	7 dB maximum
VSWR	1.7:1 maximum
Switching speed	20 ns maximum
Phase accuracy	±5° maximum
Amplitude balance	±0.5 dB maximum
Control	TTL, 2 lines
Logic truth table	E1 E2 Phase 0 0 0° 0 1 90° 1 0 180° 1 1 270°
DC power	±5 V @ 50 mA maximum
Outline drawing	1

6 BIT, 6–18 GHz DIGITAL PHASE SHIFTER

SPECIFICATIONS - MODEL PS-0618-360-5-5.6

RF frequency range	6–18 GHz
Insertion loss	9 dB typical, 12 dB maximum
Input/output VSWR	1.6:1 maximum
Maximum phase shift	360°
Phase shift step size	5.6° minimum
Phase error	3° typical, 6° maximum over RF band
Input third order intercept	40 dBm typical, 35 dBm minimum
Switching speed	20 ns maximum
DC control voltages	0 V and -5.5 V
Number of control lines	9
DC control connector	ITT cannon MDM 9 pin
RF connectors	SMA female
Outline drawing	2

4 BIT, 2.9–3.1 GHz DIGITAL PHASE SHIFTER

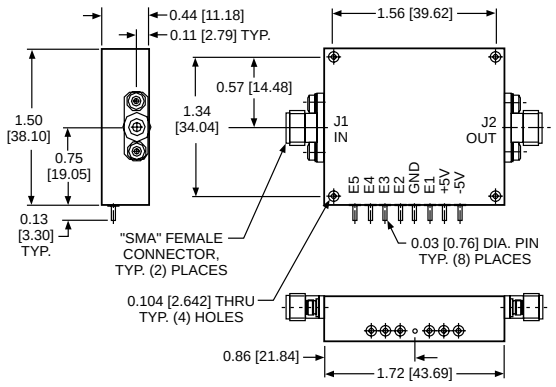
SPECIFICATIONS - MODEL 124787

Phase states	4 0° (Ref.), 22.5°, 45°, 90°, 180°
Frequency range	2.9–3.1 GHz
Insertion loss	3 dB maximum
VSWR	1.5:1 maximum
Switching speed	25 ns maximum
Phase accuracy	1° maximum
Amplitude accuracy	0.25 dB maximum
Control	TTL, “0” = Path on
Outline drawing	1

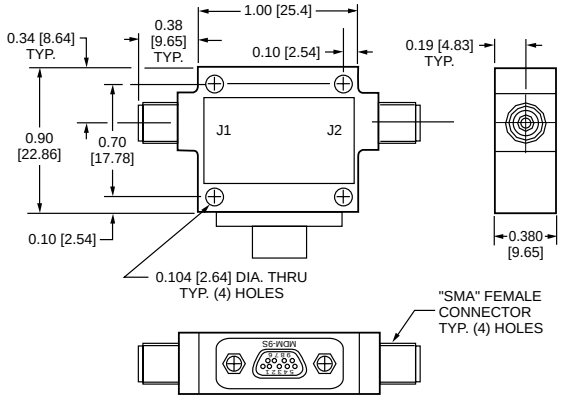
ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

OUTLINE 1



OUTLINE 2



GENERAL NOTES:

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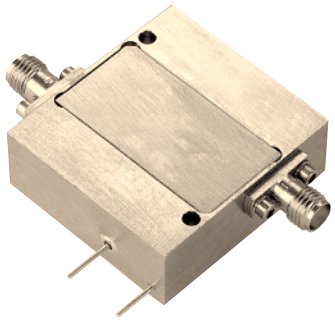
MODULATORS

MITEQ supports the wireless markets with BPSK and QPSK modulators that can handle data rates as high as 200 Mb/s. We can offer spectral shaping filters to control spectral content and thereby achieve optimal spectrum utilization. RRC and Butterworth baseband shaping filters can be provided. Our modulators feature very good linearity to minimize spectral regrowth after shaping is performed. BIT error rates within 1 dB of theoretical can be achieved.

Modulators supporting carrier frequencies up to 18 GHz and data rates as high as 200 Mb/s are available. Our communications expertise is available to support you in achieving the optimum solution to your system problem.

FEATURES

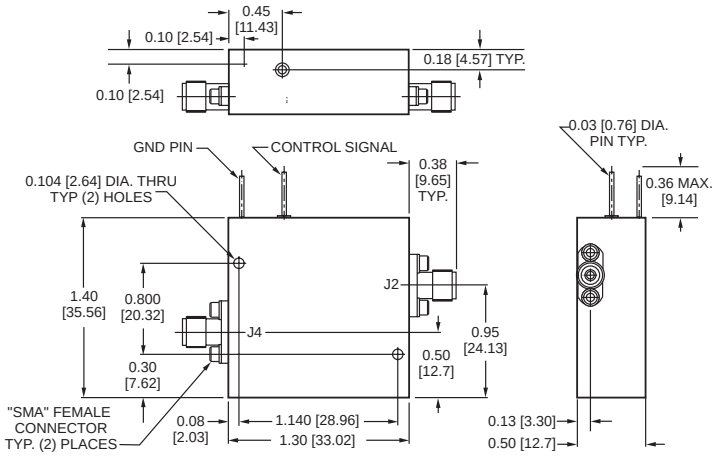
- **Voltage controlled**



SPECIFICATIONS - MODEL 124785

RF frequency range	13.5–14.5 GHz
Insertion loss	3 dB maximum
Input/output VSWR	1.7:1 maximum
On/off ratio	60 dB minimum
Switching speed	150 ns maximum
DC control voltages	0 V = Off 5 V = On

OUTLINE DRAWING



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   .xxx = ±0.005 [.xxx = ±0.13]

BPSK MODULATOR

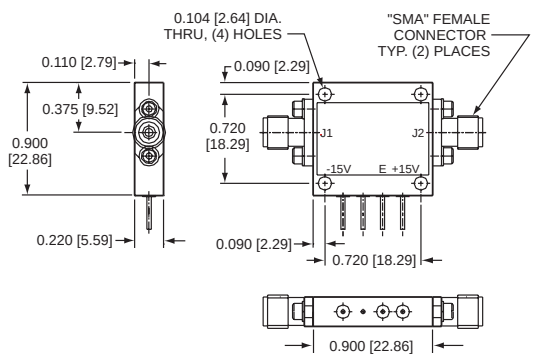
SPECIFICATIONS - MODEL 1921649

RF frequency range	10–10.3 GHz
Insertion loss	3 dB maximum
Input/output VSWR	1.8:1 maximum
Amplitude balance	0.5 dB maximum
Phase balance	10° maximum
Switching speed	15 ns maximum
Driver delay	40 ns maximum
Power handling	15 dBm CW maximum
Control	TTL
Modulation rate	DC–25 MHz
Carrier suppression	15 dB minimum
DC power	15 V @ 200 mA maximum -15 V @ 100 mA maximum

ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C

Storage temperature . . . . . -30 to +85°C



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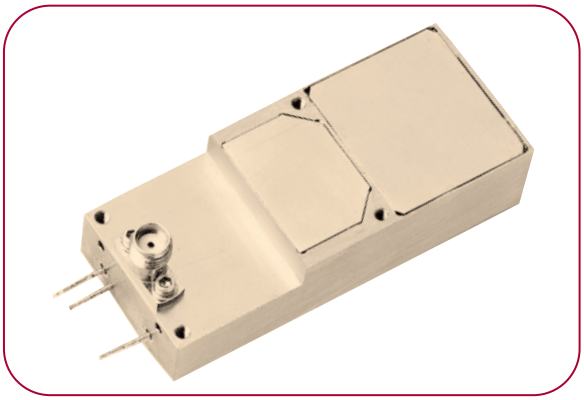
BPSK MODULATORS

FEATURES

- Less than 1.4 cubic inches
- Biphase modulation to 50 MHz
- Ruggedized for military applications
- Integral dielectric resonator oscillator
- Other frequencies available



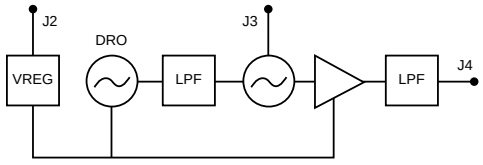
SPECIFICATIONS

PARAMETERS	Model 121733	Model 124083
RF carrier frequency (fixed)	3.8–4.5 GHz	7.6–9 GHz
Frequency stability	±2.5 MHz	±2.5 MHz
Phase noise	< -95 dBc @ 10 kHz	< -75 dBc @ 10 kHz
Transmit power	> 150 mW	> 120 mW
Carrier harmonics	-20 dBc maximum	-20 dBc maximum
Pushing	500 kHz maximum, over supply voltage	500 kHz maximum, over supply voltage
Pulling	500 kHz maximum, over specified load mismatch	500 kHz maximum, over specified load mismatch
Load mismatch	No degradation for load of 3:1 maximum at any phase	No degradation for load of 3:1 maximum at any phase
Settling time after power up	10 ms maximum	10 ms maximum
Output power (into 50 Ω)	22 dBm minimum	21 dBm minimum
Supply voltage	6.5–9.5 V	6.5–9.5 V
DC current	500 mA maximum	500 mA maximum
Modulation type	BPSK	BPSK
Amplitude imbalance	±0.5 dB maximum	±0.5 dB maximum
Phase imbalance	±5° maximum	±5° maximum
Carrier suppression	20 dB minimum	25 dB minimum
Modulation signal current	±8–±20 mA	±8–±20 mA
Modulation signal (1 dB bandwidth)	DC–50 MHz	DC–50 MHz
Modulation input impedance	50 Ω in series with diodes, 20 pF maximum to ground	50 Ω in series with diodes, 20 pF maximum to ground
Continuous operation	At 25°C, without heatsink	At 25°C, without heatsink
Connector J4 SMA removable		0.015 dia. pin, 50 Ω
Connectors J2, J3 and GND		Solder pins

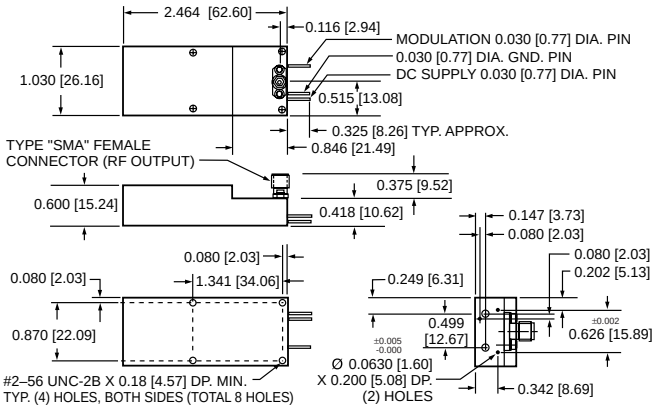
ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



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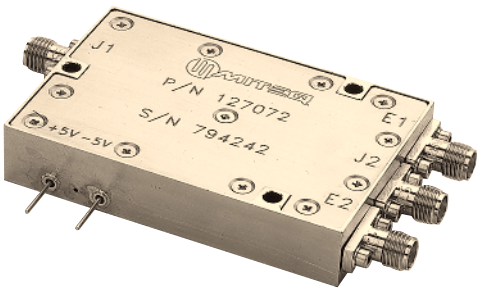
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

QPSK MODULATORS

FEATURES

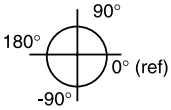
- **Switching speed ..... 150 ns maximum**
- **Phase accuracy ..... ±5° maximum**
- **Amplitude balance ..... ±0.75 dB maximum**



SPECIFICATIONS

PARAMETERS	Model 127072	Model 131008
Function	Phase shifter, 2-BIT (QPSK)	Phase shifter, (QPSK)
Frequency range	2.2–2.3 GHz	13.3–14.1 GHz
Phase states	0°, 90°, 180°, 270°	0°, 90°, 180°, 270°
Insertion loss	8 dB maximum	8 dB maximum
VSWR		
J1, RF input	2:1 maximum	2:1 maximum
J2, RF output	3:1 maximum	3:1 maximum
Control	TTL, 2 lines (E1, E2)	TTL, 2 lines (E1, E2)
Switching speed	150 ns maximum	150 ns maximum
Phase accuracy	±5° maximum	±5° maximum
Amplitude balance	±0.75 dB maximum	±0.75 dB maximum
DC power	±5 V @ 75 mA maximum each	±5 V @ 75 mA maximum each

Control logic

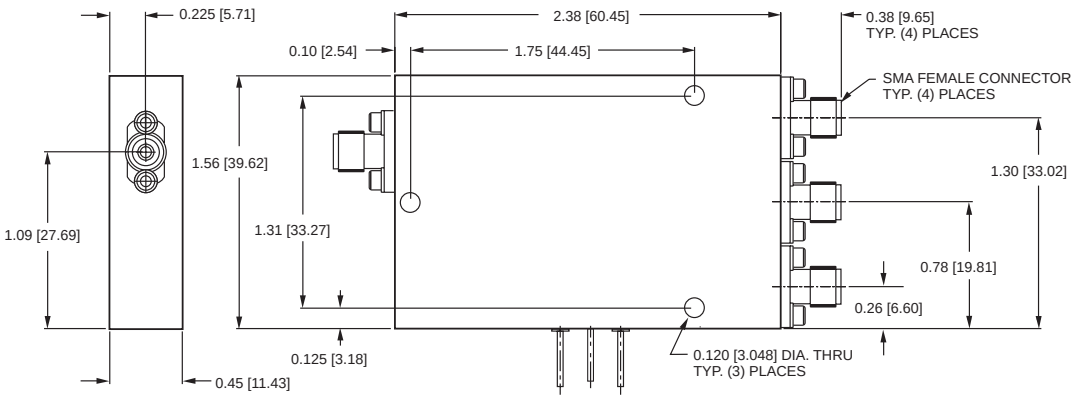


E1	E2	State
0	0	0°
0	1	90°
1	0	-90°
1	1	180°

ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

OUTLINE DRAWING



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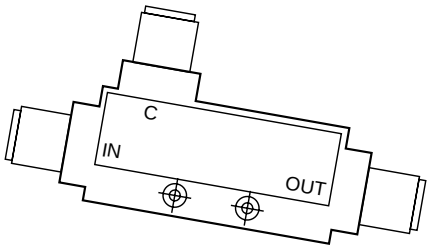
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

COUPLERS

FEATURES

- **High directivity through phase velocity compensation**
- **Stripline and microstrip couplers available**
- **Lowest insertion loss**



MITEQ offers a variety of single and multisection microstrip and stripline couplers featuring a wide range of coupling values and bandwidths. MITEQ can offer microstrip couplers that incorporate compensation to enhance directivity by as much as 15 dB.

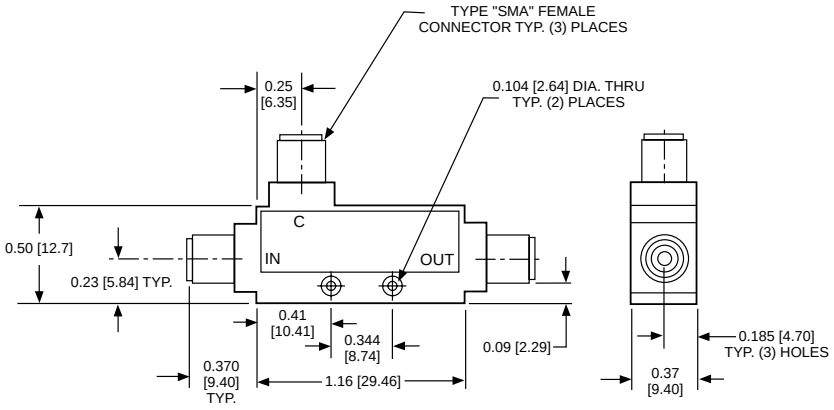
Model Number	Frequency Range (GHz)	Coupling (dB)	Insertion Loss (dB, Max.)	VSWR In (Max.)	VSWR Out (Max.)	VSWR Coupled (Max.)	Outline
NARROWBAND COUPLERS							
125471	6.3–6.9	20	1.3	1.6:1	1.6:1	1.8:1	See below
131009-70058	15.4–19.8	Out 1 = 20 Out 2 = 6	3	1.6:1	1.6:1	2:1	Contact factory
124788-19.328	19.3–19.5	20	1.3	1.8:1	1.8:1	1.9:1	See below
124788-29.1	29–29.2	20	1.3	1.8:1	1.8:1	1.9:1	See below
125955	30	20	1.5	1.8:1	1.8:1	2:1	See below

Additional frequency ranges and coupling values are available. Consult factory for options.

ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C
Power handling . . . . . P_{in} maximum equals 20 W into 1.2:1 load, all ports.

OUTLINE DRAWING



GENERAL NOTES:

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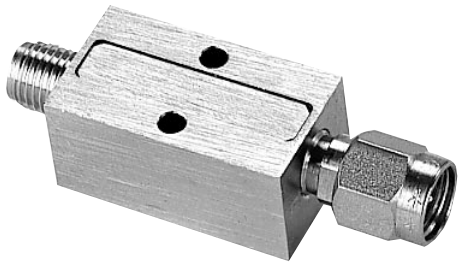
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

FEATURES

- **Optimized for lowest spike and flat leakage**
- **Designs suitable for sensitive PHEMT front ends**
- **Lowest insertion loss**
- **Power handling up to 60 dBm**



MITEQ has extensive experience in the design and development of limiters for receiver protection. We specialize in developing limiters for critical radar receiver applications and EW applications. Designs based on PIN diodes, Schottky diodes, and combinations of the two semiconductor technologies are also available. In applications that require extremely fast response time MITEQ can offer a customized solution that meets your needs. We can provide limiters that safely handle pulsed power levels up to 60 dBm. These designs feature PIN diodes with plated heatsink that are eutectically-attached to a carrier for best possible thermal transfer. We offer limiters that feature Schottky diode arrays for the ultimate in insertion loss, flat output leakage and minimal spike leakage.

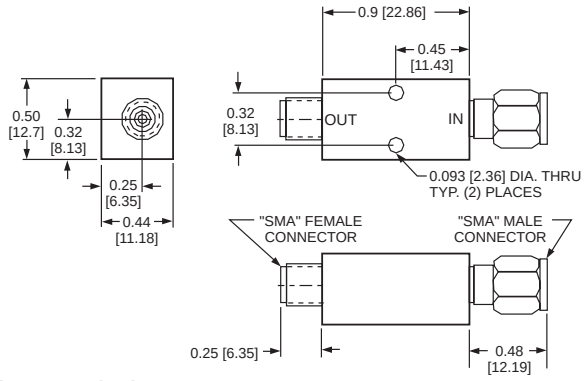
Model Number	Frequency Range (GHz)	Insertion Loss (dB, Max.)	VSWR In/Out (Max.)	RF Power (Max.)	Flat Leakage (dBm)	Spike Leakage (erg)	IP_3 (dBm, Min.)	Linearity	Recovery Time (ns, Max.)	Outline
126159	0.5–1	0.7	1.3:1	1W CW. 400W peak, 1µs 0.1% DC	20	0.2	25	-50–0 dBm, w/in 0.1 dB	500	A
126160	1–2	0.7	1.3:1	1W CW, 400W peak, 1µs 0.1% DC	20	0.2	25	-50–0 dBm, w/in 0.1 dB	500	A
126156	0.5–2	1.5	1.5:1	100W peak, 10 µs pulse	15	0.2				B
129186	2.7–2.9	0.8	1.5:1	1W CW, 52 dBm peak, 80 µs pulse, rate: 1.4 ms	20	0.2			100	A

Additional bandwidths from 2–18 GHz are available. Consult factory for options.

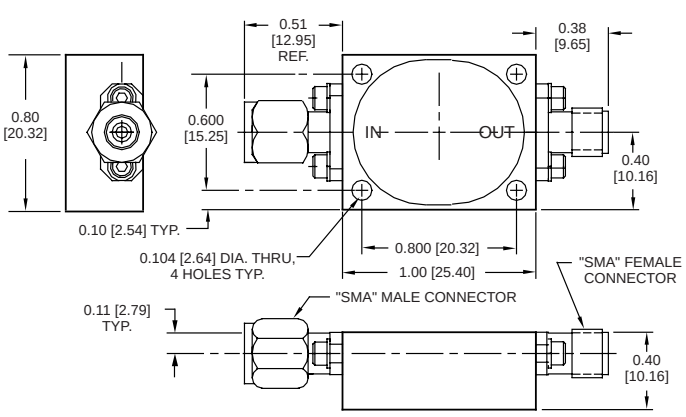
ENVIRONMENTAL CONDITIONS

Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

OUTLINE A

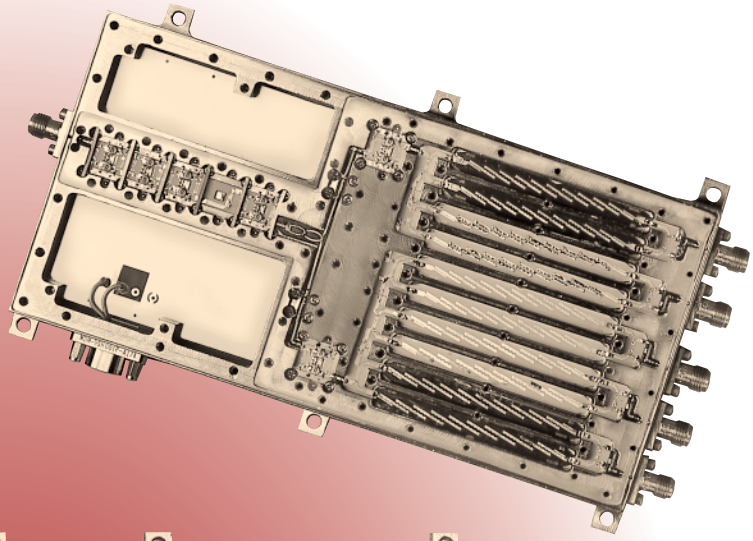


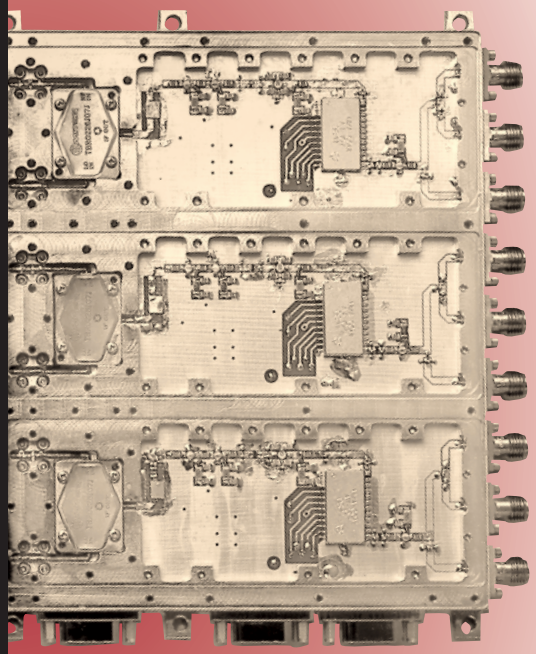
OUTLINE B

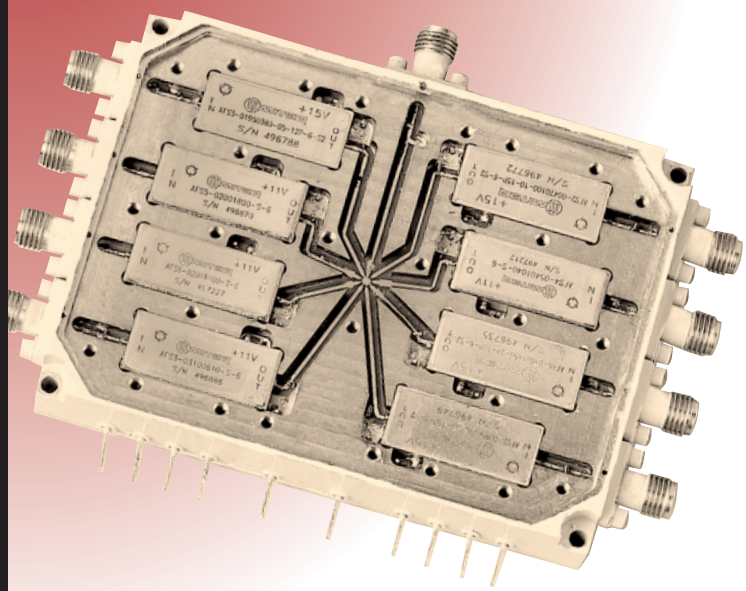


GENERAL NOTES:
1. Dimensions shown in brackets [ ] are in millimeters.
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

CUSTOM INTEGRATED ASSEMBLIES







MITEQ offers hundreds of man-years of experience in the design and development of the most demanding custom integrated assemblies. We can offer superior sub-system solutions because we have complete capabilities in all of the components that go into the most advanced systems. The breadth of experience includes low noise signal sources, low- and medium-power amplifiers, mixers, switches, high-performance filters and filter banks, mixers, etc. All of this capability under one roof ensures the highest standard in system performance because we understand our components.

We can offer highly integrated solutions to your system problems and routinely offer densely packed slices containing as many as 50 microwave functions in a small volume.

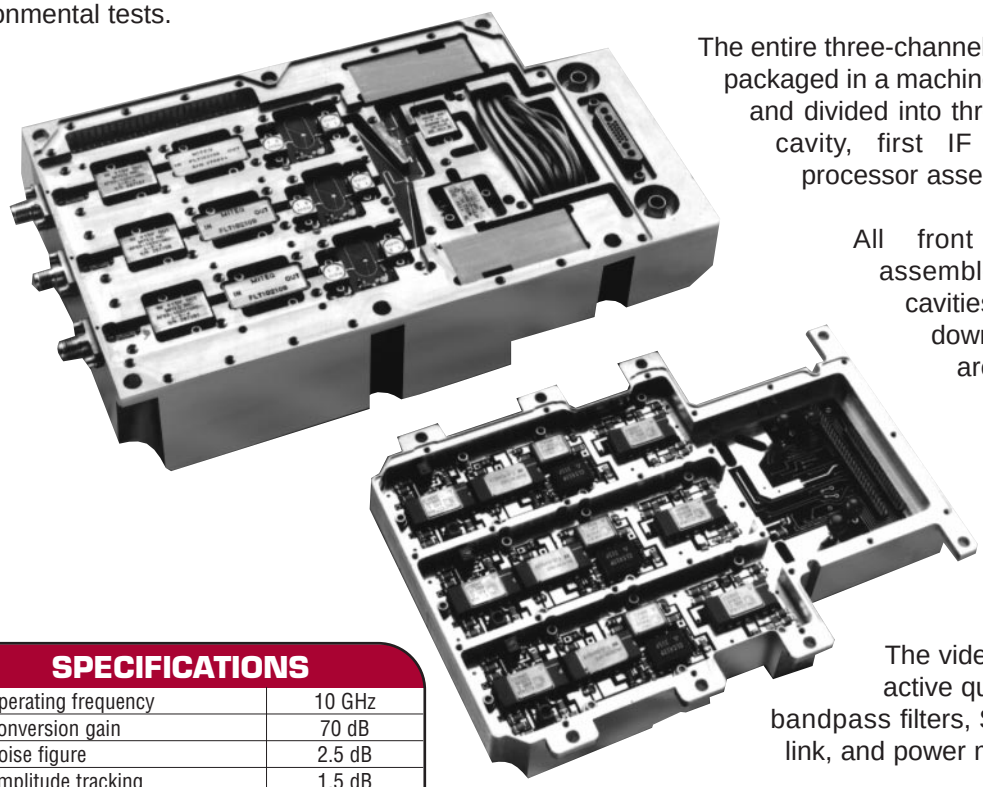
We have extensive experience in developing custom assemblies for space and we currently support JPL on their EOS-MLS and MIRO programs, and we support a number of classified space programs.

The following pages provide a limited sampling of our capabilities. We welcome your inquiries.

THREE-CHANNEL RECEIVER ASSEMBLY

MITEQ's low-noise monopulse receiver development has drawn on the entire company's capabilities to provide a very small, lightweight assembly for missile applications that has passed stringent electrical and environmental tests.

The video output of the IRM is passed to an extremely compact video processor. Control of all of the receiver functions, such as gain control, BIT, calibration, LO selection, etc., is implemented via serial link.



The entire three-channel receiver assembly is packaged in a machined aluminum housing and divided into three levels: microwave cavity, first IF cavity, and video processor assembly.

All front end circuitry is assembled in microwave cavities. Outputs of the first down conversion stages are routed via glass to metal feedthroughs to the first IF cavity located directly underneath.

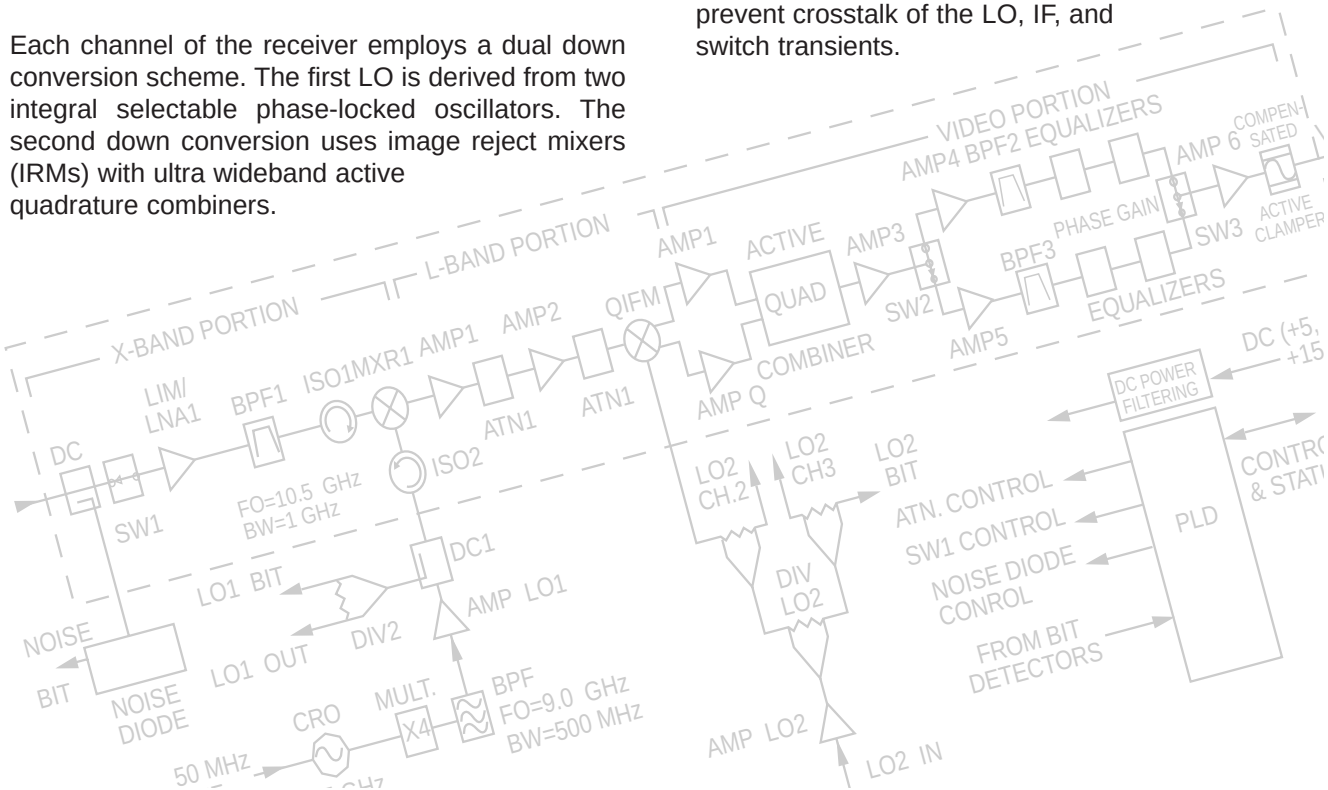
SPECIFICATIONS

Operating frequency	10 GHz
Conversion gain	70 dB
Noise figure	2.5 dB
Amplitude tracking	1.5 dB
Phase tracking	20°
Channel-to-channel isolation	40 dB

The video processor contains active quadrature combiners, bandpass filters, SP2T switches, serial link, and power management circuitry.

At each level, the assembly is channelized to meet the required channel-to-channel isolation and prevent crosstalk of the LO, IF, and switch transients.

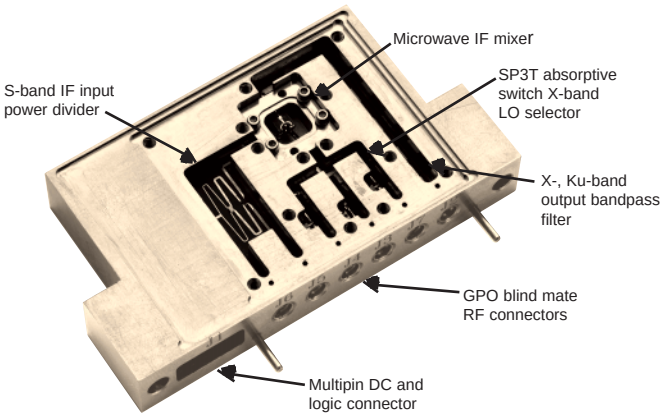
Each channel of the receiver employs a dual down conversion scheme. The first LO is derived from two integral selectable phase-locked oscillators. The second down conversion uses image reject mixers (IRMs) with ultra wideband active quadrature combiners.



CONVERTER ASSEMBLIES

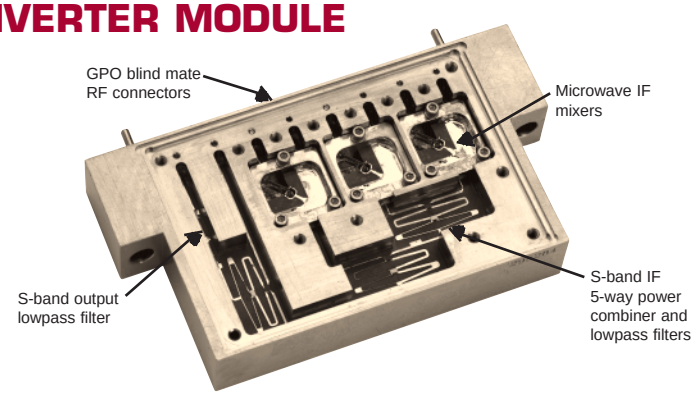
S-BAND TO X-, Ku-BAND UPCONVERTER MODULE

SPECIFICATIONS	
IF input frequency	2–4 GHz
LO input frequency	10, 12 and 14 GHz
RF output frequency	X-band, Ku-band
Conversion loss	15 dB
Band selection switching speed	15 ns
Band selection isolation	60 dB
LO-to-IF leakage	30 dB
VSWR (all ports)	2.5:1



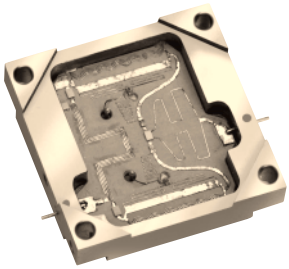
X-, Ku-BAND TO S-BAND DOWNCONVERTER MODULE

SPECIFICATIONS	
RF input frequency	X-band, Ku-band
LO input frequency	10, 12 and 14 GHz
IF output frequency	2–4 GHz
Conversion loss	20 dB
LO-to-RF isolation	25 dB
LO-to-IF isolation	45 dB
RF-to-IF isolation	25 dB
VSWR (all ports)	2.5:1



QUADRATURE IF MIXER

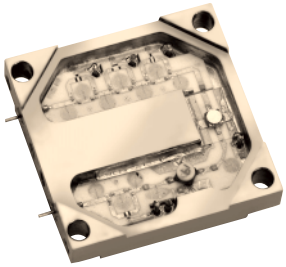
SPECIFICATIONS	
RF, LO frequency range	1.25–1.55 GHz
IF frequency range	DC–100 MHz
Conversion loss	10 dB maximum
LO-to-RF isolation	22 dB minimum
LO-to-IF isolation	25 dB minimum
Amplitude unbalance	±0.5 dB maximum
Phase deviation from 90°	±3° maximum
VSWR RF	3:1 maximum
VSWR LO	2:1 maximum
LO drive level	7–10 dBm
Amplitude tracking, set of 3	±1.0 dB maximum
Phase tracking, set of 3	±5° maximum



AGC MODULE

SPECIFICATIONS	
Function	Coarse AGC, 4 bit
Frequency range	1.25–1.55 GHz
Gain	32 dB nominal
Noise figure	9 dB maximum
Output power (1 dB comp.)	8 dBm minimum
Attenuation range	32 dB nominal
Number of bits	4
Bit sizes	4, 8, 16, and 8 dB
Attenuation accuracy	±1 dB maximum
Phase change vs. attenuation	±10° maximum
Attenuation control	15 mA = ref.,-15 mA= attenuation
DC power supply	5 V @ 65 mA typical
Amplitude tracking, set of 3	±0.5 dB maximum
Phase tracking, set of 3	±5° maximum

Miniature modular subassemblies operating in the 1.25 to 1.55 GHz frequency range were developed for airborne radar applications. Each of the specified units, the Quadrature IF Mixer and the AGC Module, measure only 1.0 x 1.0 x 0.22 inches. These modules were produced in sets of three amplitude and phase matched units and operate over the temperature range of -35 to +85°C.

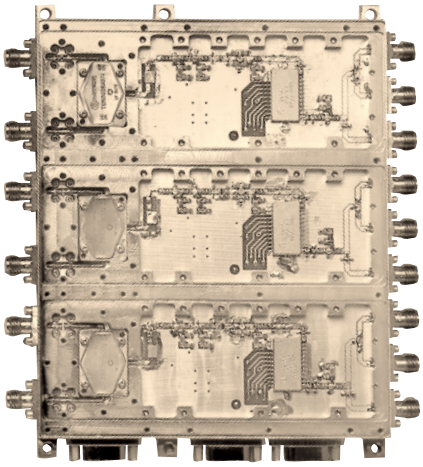


3–21 GHz THREE-CHANNEL DOWNCONVERTER

MODEL: 136460

FEATURES

- **High reliability, spaceborne application**
- **Broadband RF/LO coverage..... 3–21 GHz**
- **Broadband IF operation..... 250–1550 MHz**
- **LO power range..... 10–16 dBm**
- **Conversion gain ..... 25 dB nominal**
- **LO/RF isolation..... 30 dB typ., 20 dB minimum**
- **LO/IF isolation ..... 40 dB typ., 30 dB minimum**
- **Digital gain control..... 0–31.5 dB, 0.5 dB steps**
- **Low power ..... 165 mA (5 V), 2 mA (-5 V) typ. per channel**
- **Lightweight ..... 400 grams typical**



MITEQ's model 136460 broadband three-channel downconverter functions as the second IF down conversion stage of a low earth orbit-based millimeter-wave radiometer. Coupled with one of five MITEQ frequency multiplexers as an input stage, the system provides maximally flat frequency response over the bands of interest, high linearity of output power to input power, and high isolation between the frequency bands of interest as well as from other undesirable signals. In addition, this high reliability, spaceborne integrated assembly is optimized for small size, low power consumption, lightweight, and excellent thermal stability of operation.

ELECTRICAL SPECIFICATIONS

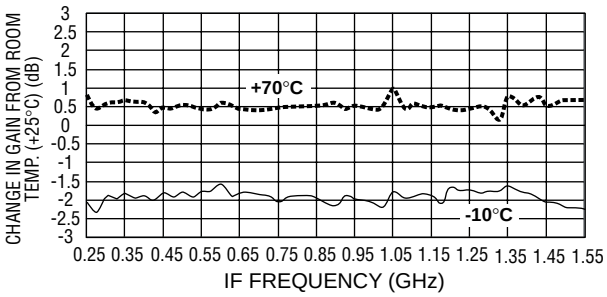
RF INPUT PARAMETERS	CONDITION	UNITS	MIN.	TYP.	MAX.
Frequency range		GHz	3.2		21.2
IF/RF VSWR		Ratio		1.5:1	
LO frequency range		GHz	4.8		19.5
LO power		dBm	10		16
LO VSWR		Ratio		2.5:1	
IF OUTPUT PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Number of IF outputs	Per channel			2	
Operating range		MHz	250		1550
RF-to-IF gain	At maximum gain	dB		25	
Digital attenuator control step size	6-BIT control	dB		0.5	
Digital attenuator		dB	0		31.5
Output power (1 dB compression)		dBm	-1	0	
Calibration port coupling value		dB		16	
Coupling flatness	250–1550 MHz	dB		±1	
VSWR	250–1550 MHz	Ratio			1.5:1
OTHER PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
LO-to-RF isolation		dB	20	30	
LO-to-IF isolation		dB	30	40	
Connectors, RF, IF, LO				SMA	
Connectors, DC, control	1 per channel			15-pin, micro D	
Supply voltage		Volts		±5	
DC power consumption for each downconverter	At 5 V per channel At -5 V per channel	mA mA		165 2	
Weight		Grams		400	

ENVIRONMENTAL CONDITIONS

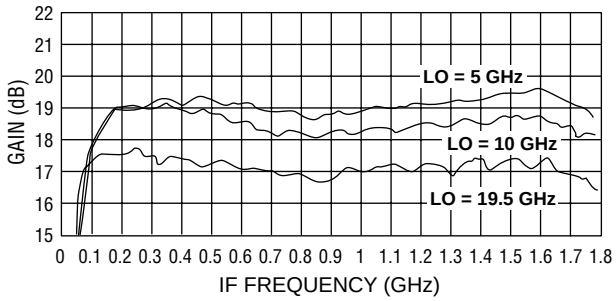
Operating temperature . . . . . 10 to 60°C
Storage temperature . . . . . -25 to +60°C
Vibration . . . . . 6.5 Gs RMS, 20–2000 Hz
Radiation . . . . . 30 krads, total DOSP

MODEL 136460 TYPICAL DATA

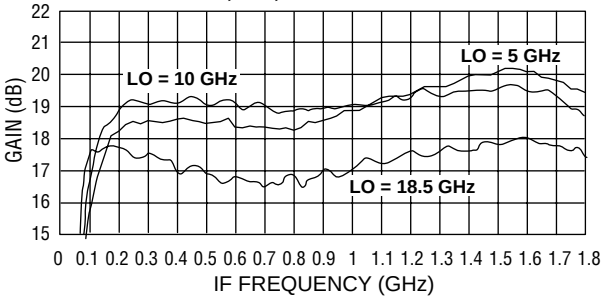
GAIN VARIATION VS. TEMPERATURE (-10 TO +70°C). LO=10 GHz, USB



IF RESPONSE, USB, ATTEN. SETTING = 7 dB

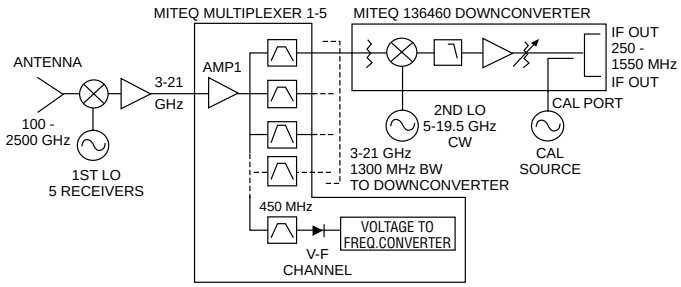


IF RESPONSE, LSB, ATTEN. SETTING = 7 dB

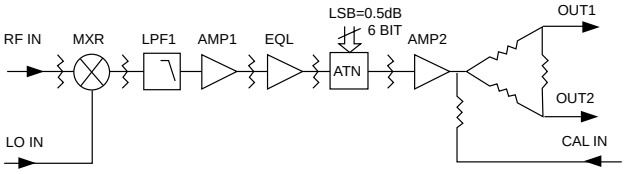


FUNCTIONAL BLOCK DIAGRAMS

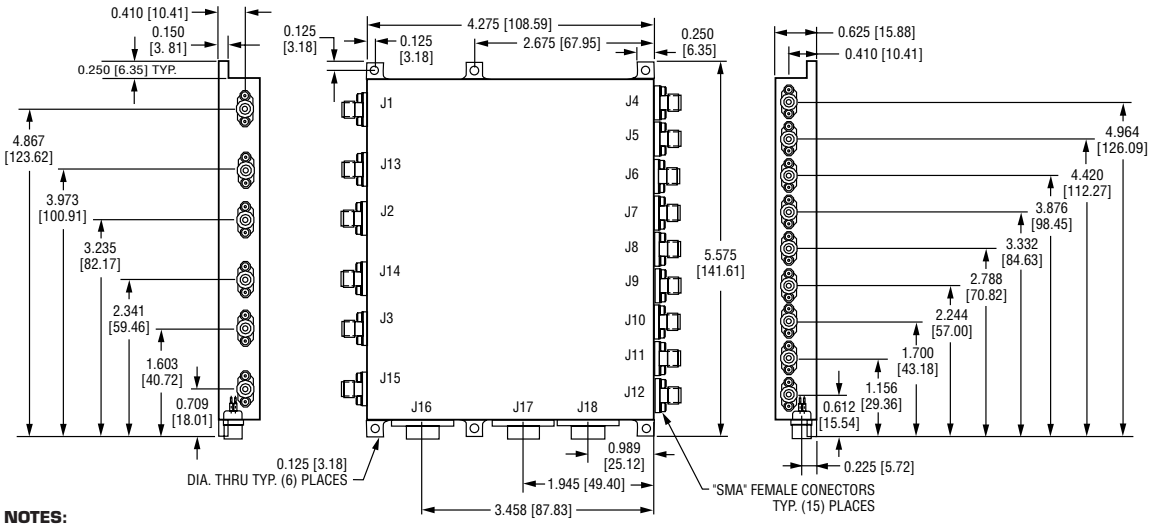
GENERIC SYSTEM



MODEL 136460



OUTLINE DRAWING



GENERAL NOTES:

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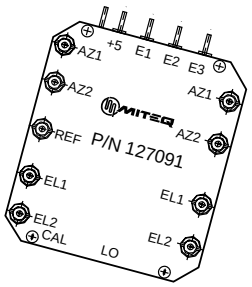
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

MINIATURE DOWNCONVERTER

MODEL: 127091

FEATURES

- **Single and multi-channel radar receiver front ends**
- **Single and multi-channel frequency converters**
- **Switch filters**
- **Switch amplifiers**
- **Frequency multiplexers**
- **Transmit/receive modules**



SPECIFICATIONS

PARAMETERS	LIMITS	CONDITIONS
Input frequency range	6–18 GHz	AZ1, AZ2, EL1, EL2, REF, CAL,
Input signal power	10 dBm maximum	
EMI input	2 W CW maximum	
LO frequency range	5.4–18.6 GHz	
LO power	20 dBm, ±2 dBm	
LO leakage at the outputs	-47 dBm MHz	LO to AZ1 and 2 Out LO to EL1 and 2 Out
Output frequency range	DC–600 MHz	
Gain	-15 dB typical, -16 dB maximum -17 dB typical, -18 dB maximum -21.5 dB typical, -23 dB maximum	AZ to AZ Out, EL to EL Out REF to AZ Out and EL Out CAL to AZ Out and EL Out
Isolation	-50 dB -45 dB	AZ to EL AZ1 to AZ2, EL1 to EL2
Amplitude unbalance	1.4 dB maximum	Note 1
Phase unbalance	Δ + 8° maximum	Note 1
Phase unbalance	10° maximum	REF to AZ1, AZ2 or EL1, EL2
Switching speed	2 µs maximum	All switches
DC power	5 V @ 175 mA maximum	5 V regulated supply
Control	TTL	E1 and E2

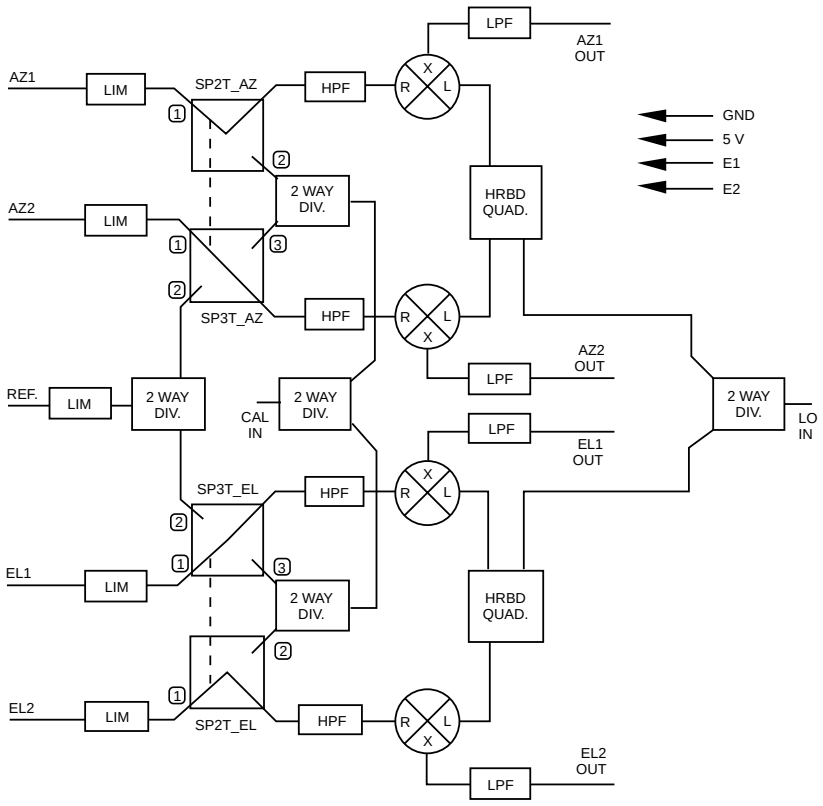
Note 1:
Amplitude and gain unbalance is defined as a change in the channel-to-channel output amplitude or phase with reference to the respective phase and amplitude outputs of the assembly. When the switch is in the CAL vs. the direct AZ and EL antenna positions over the operating environment (i.e., residual amplitude and phase changes that cannot be calibrated out by reference to the CAL signal), phases may vary by a Δ which corresponds to a fixed line length difference.

ENVIRONMENTAL CONDITIONS

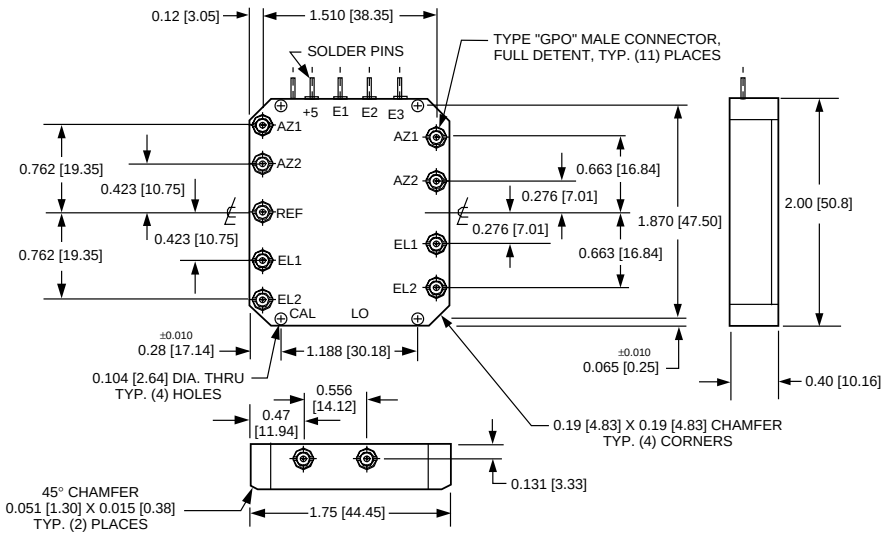
Weight . . . . . 30 grams
Operating/storage temperature . . . . . -54 to +71°C

MODEL 127091 TYPICAL DATA

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



GENERAL NOTES:

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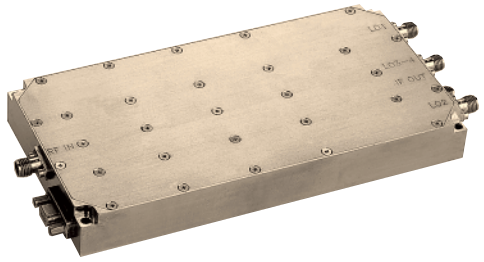
TRI-BAND DOWNCONVERTER

MODEL: 131724

FEATURES

- Three bands of operation covering S-, C- and X-bands
- Image rejection greater than 80 dB
- 2 GHz IF frequency
- LO leakage less than -80 dBm



SPECIFICATIONS

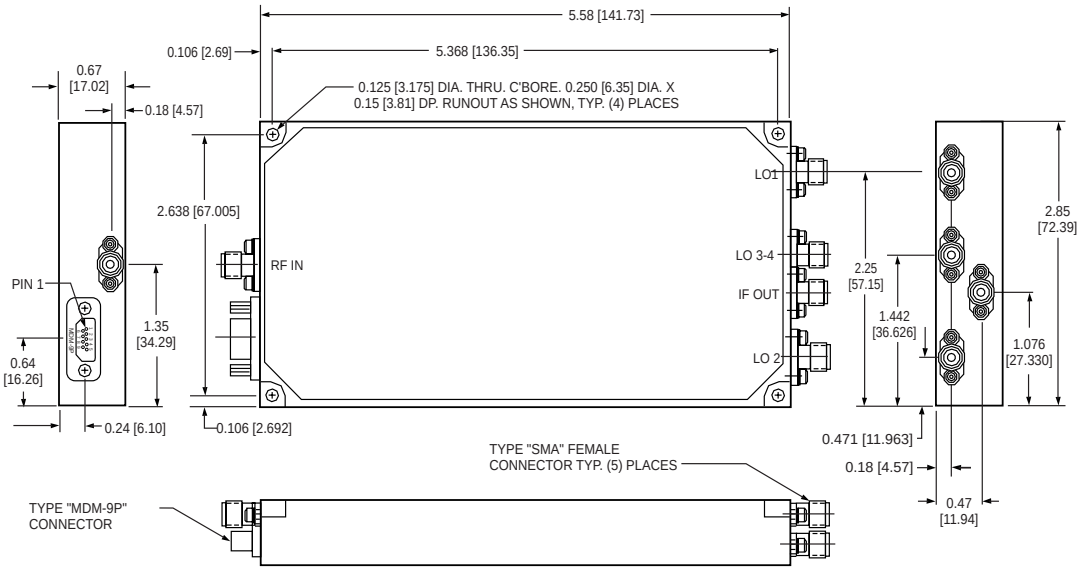
PARAMETERS	LIMITS	CONDITIONS
RF input frequency range Band 1 Band 2 Band 3a Band 3b	 3.62–4.2 GHz 7.25–7.75 GHz 10.95–11.9 GHz 11.7–12.75 GHz	
RF input power	-18 dBm nominal	
IF output frequency	2 GHz	
LO power LO = 5.62–6.2 GHz LO = 9.25–12.75 GHz	 15 dBm 10–11 dBm	
Conversion loss	16 dB maximum	
Gain flatness	0.2 dB for any 40 MHz segment, 1 dB over any frequency band	Over 0 to 50°C
Gain variation between any 2 bands	1 dB maximum	
Group delay (any 40 MHz band) Linear Parabolic Ripple	 .01 ns/MHz maximum .005 ns/MHz, 2 maximum 0.5 ns p-p	Over 0 to 50°C
Input/output VSWR	1.5:1 maximum	
Output power(1 dB compression)	-8 dBm minimum	
Spurious	Signal related -65 dBc maximum	Signal level -18 dBm
DC voltage supply	5 V	
Connectors, RF, IF, LO	SMA female	
Connector, DC	Multipin MDM-9P (ITT)	
Frequency rejections Band 1: a) Image = 7.62–8.2 GHz b) LO = 5.62–6.2 GHz	 > 80 dBc < -80 dBm input, < -90 dBm output	
Band 2: a) Image = 11.25–11.75 GHz b) LO = 9.25–9.75 GHz	> 80 dBc < -80 dBm input, < -90 dBm output	
Band 3: a) Image = 14.95–16.75 GHz b) LO = 12.95–14.75 GHz	> 80 dBc < -80 dBm input, < -90 dBm output	
Control	Open Ckt = OFF, GND = Band select	

ENVIRONMENTAL CONDITIONS

Weight . . . . . 100 grams
Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

MODEL 131724 TYPICAL DATA

OUTLINE DRAWING



GENERAL NOTES:
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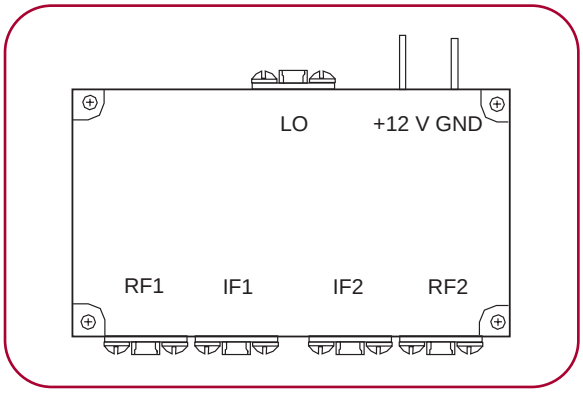
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

TWO CHANNEL, SINGLE LO INPUT DOWNCONVERTER ASSEMBLY

MODEL: 127089

FEATURES

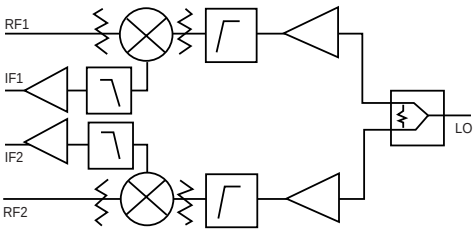
- **Single LO port, dual RF/IF ports**
- **RF input frequency ..... 1.95–5.2 GHz**
- **Conversion loss ..... 5 dB nominal**



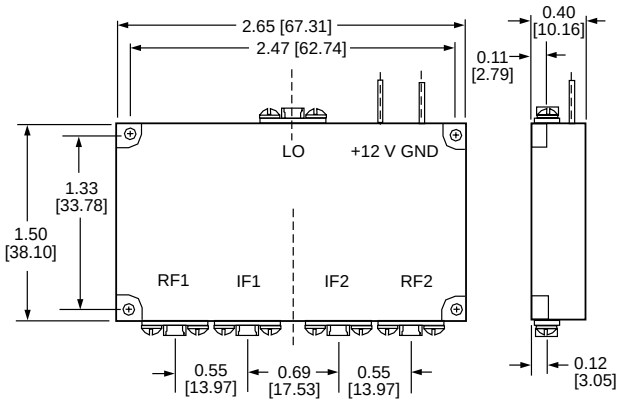
SPECIFICATIONS

PARAMETERS	LIMITS
RF input frequency range	1.95–5.2 GHz
RF input power	-65 to -2 dBm
LO input frequency	2.7–4.45 GHz
LO input power	0 dBm ±2 dBm
IF output frequency	750 MHz ±50 MHz
RF-to-IF gain	-5 dB ±2 dB
SSB Noise Figure	15 dB maximum @ 25°C
IP_3 out	17.5 dBm minimum @ 25°C
Single-tone mixer products	-25 dBc maximum, 0 to ±1 MHz from carrier, RF input -65 to -2 dBm -30 dBc maximum, ±1 MHz from carrier and above, RF input -20 to -2 dBm -45 dBc maximum, ±1 MHz from carrier and above, RF input -65 to -20 dBm
IF output leakage	-80 dBm maximum, 750 MHz ±50 MHz, RF - Off
LO-to-RF leakage	-10 dBm maximum
LO-to-IF leakage	-60 dBm maximum
Isolation	50 dB minimum, RF1 to IF2, RF2 to IF1
VSWR RF1 and RF2	1.7:1 maximum
VSWR LO	2:1 maximum
VSWR IF1 and IF2	1.8:1 maximum
DC power	12 V @ 375 mA maximum

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



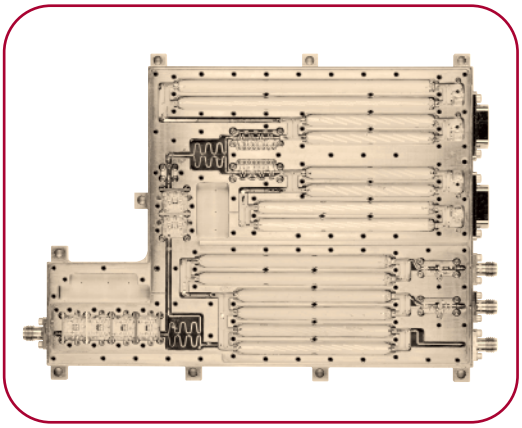
GENERAL NOTES:
1. Dimensions shown in brackets [ ] are in millimeters.
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

2.8–9.9 GHz FREQUENCY MULTIPLEXER

MODEL: 136466

FEATURES

- High reliability, spaceborne application
- Broadband RF coverage..... 2.8–9.9 GHz
- RF gain ..... 23 dB nominal
- Channel-to-channel isolation.. 45 dB minimum
- Input/output VSWR..... 1.5:1 typ., 1.8:1 maximum
- Noise figure ..... 3.5 dB typ., 4.5 dB maximum
- Low power ..... 325 mA (5 V) typical
- Lightweight ..... 520 grams typical



MITEQ's model 136466 broadband-three output frequency multiplexer precedes the second IF down conversion stage in a low earth orbit-based millimeter-wave radiometer. In combination with the MITEQ second IF downconverter, the system provides maximally flat frequency response over the bands of interest, high linearity of output power to input power, and high isolation between the frequency bands of interest as well as from other undesirable signals. In addition, this high reliability, spaceborne integrated assembly is optimized for small size, low power consumption, lightweight, and excellent thermal stability of operation.

ELECTRICAL SPECIFICATIONS

RF INPUT PARAMETERS	CONDITION	UNITS	MIN.	TYP.	MAX.
Frequency range		GHz	2.8		9.9
VSWR		Ratio		1.5:1	1.8:1
RF OUTPUT PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Number of RF output channels				3	
Channel 2 dB bandwidth		MHz	1300		
Channel 20 dB rejection bandwidth		MHz			2300
Channel center frequencies		GHz		3.9449, 5.7085, 9.1168	
Nominal gain		dB		23	
Output power (1 dB compression)		dBm	-8	-5	
Noise figure		dB		3.5	4.5
Isolation between output channels		dB	45		
VSWR	Over 1300 MHz passband	Ratio		1.5:1	1.8:1
VOLTAGE TO FREQUENCY OUTPUT PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Number of output channels				4	
Channel 3 dB bandwidth		MHz	450		
Channel 30 dB rejection bandwidth		MHz			1000
Channel center frequencies		GHz		3.06, 4.76, 7.26, 7.86	
Output full scale frequency		kHz		90	
OTHER PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Digital gain control	4 BIT Binary, TTL; BIT 5 = OFF state	dB	0		7.5
Gain control step size		dB		0.5	
Connectors, RF				SMA	
Connectors, DC control, voltage-frequency outputs				21-pin, micro D	
Supply voltage		Volts		±5	
DC power consumption for each downconverter	At 5 V Supply At -5 V Supply	mA mA		325 2.5	
Weight		Grams		520	

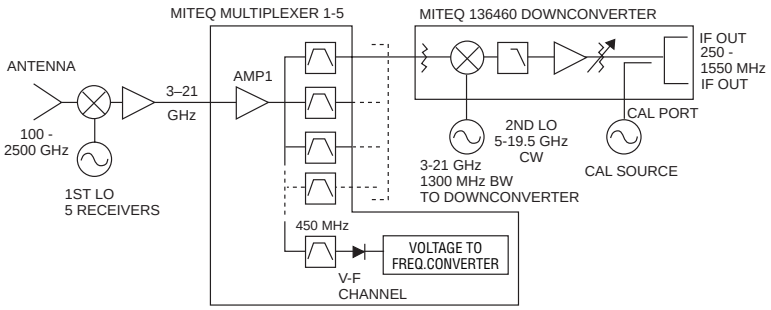
2.8–9.9 GHz FREQUENCY MULTIPLEXER (CONT.)

ENVIRONMENTAL CONDITIONS

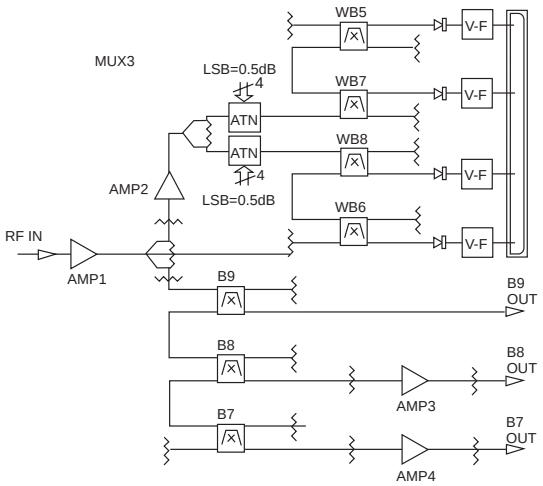
Operating temperature . . . . . 10 to 60°C
Storage temperature . . . . . -25 to +60°C
Vibration . . . . . 6.5 Gs RMS, 20–2000 Hz
Radiation . . . . . 30 krads, total DOSP

FUNCTIONAL BLOCK DIAGRAMS

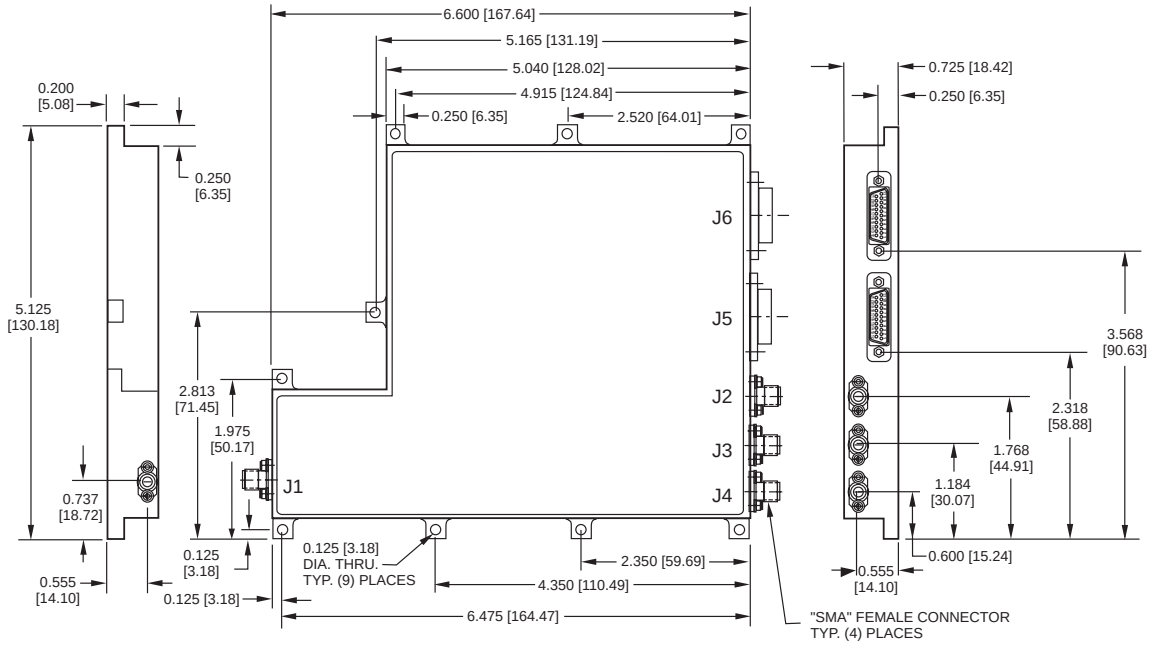
GENERIC SYSTEM



MODEL 136466



OUTLINE DRAWING



GENERAL NOTES:

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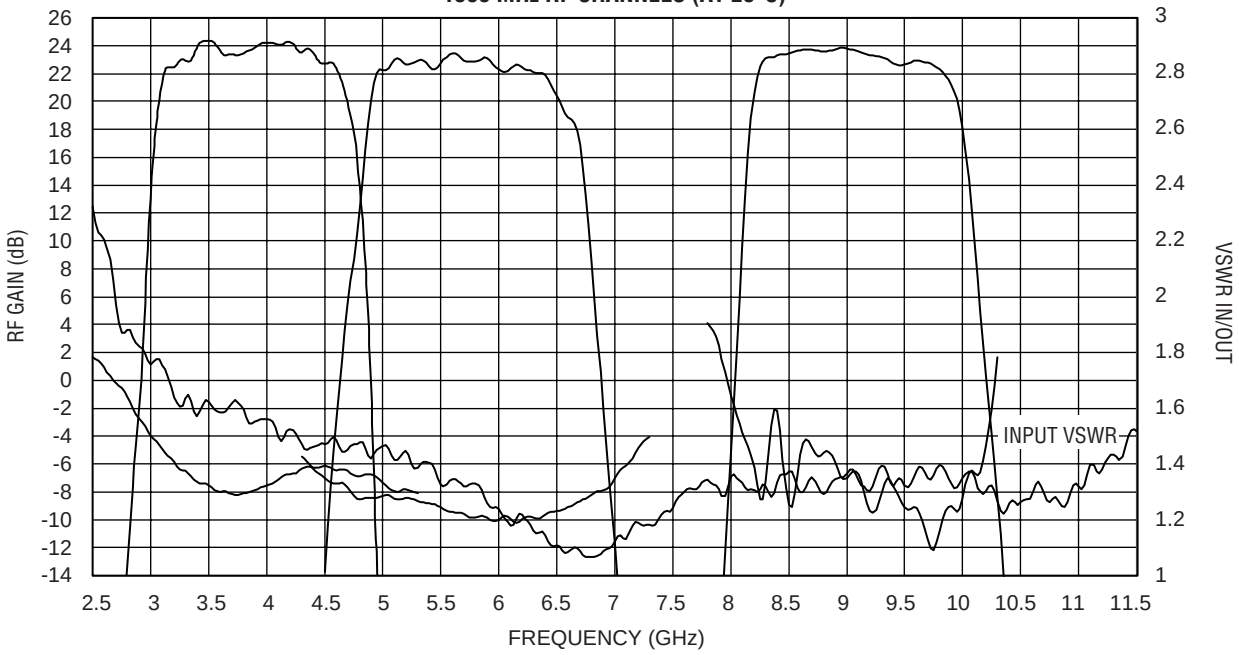
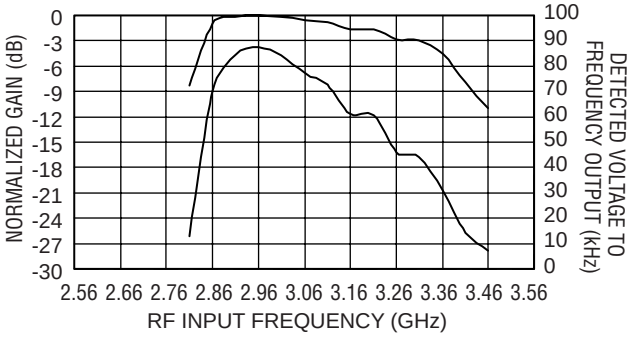
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

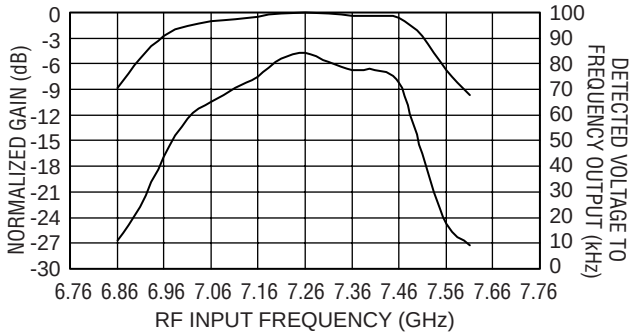
MODEL 136466 TYPICAL DATA

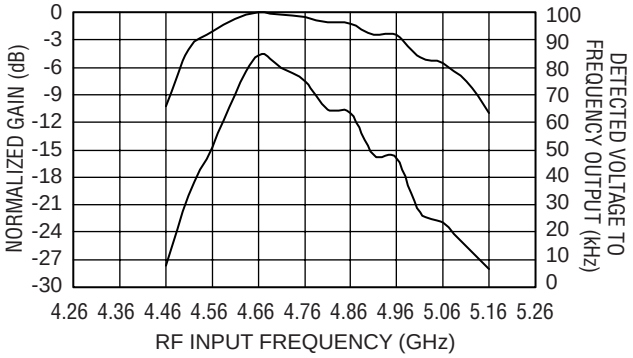
1300 MHz RF CHANNELS (AT 25°C)

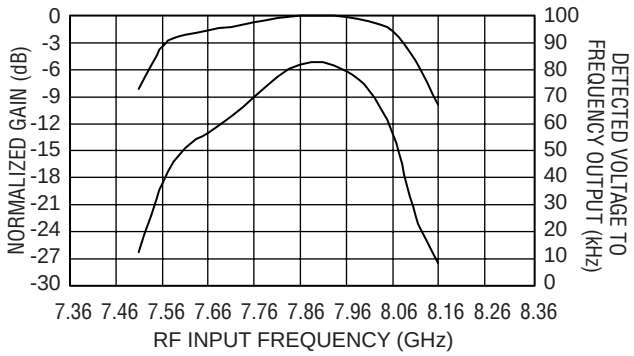


450 MHz DETECTED VOLTAGE TO FREQUENCY OUTPUTS (AT 25°C).







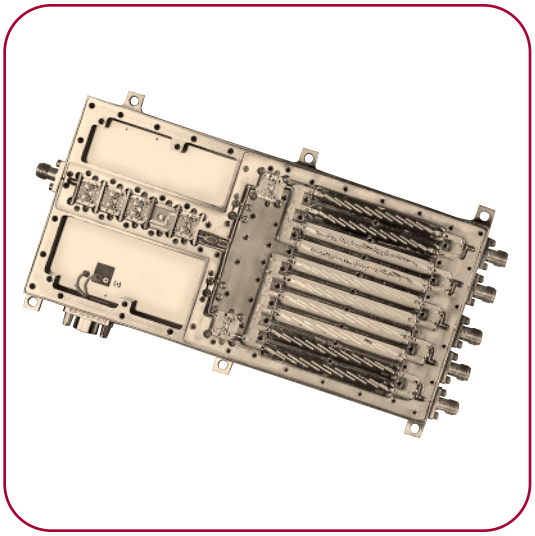


7.9–14.9 GHz FREQUENCY MULTIPLEXER

MODEL: 136468

FEATURES

- **High reliability, spaceborne application**
- **RF coverage..... 7.9–14.9 GHz**
- **Gain ..... 23 dB nominal**
- **Channel-to-channel isolation.. 45 dB minimum**
- **Input/output VSWR..... 1.5:1 maximum**
- **Noise figure ..... 3.5 dB typical, 4.5 dB maximum**
- **Low power ..... 130 mA (5 V) typical**
- **Lightweight ..... 320 grams typical**



MITEQ's model 136468 five-output frequency multiplexer precedes the second IF down conversion stage in a low earth orbit-based millimeter-wave radiometer. In combination with second IF downconverter, the system provides maximally flat frequency response over the bands of interest, high linearity of output power to input power, and high isolation between the frequency bands of interest as well as from other undesirable signals. In addition, this high reliability, spaceborne integrated assembly is optimized for small size, low power consumption, lightweight, and excellent thermal stability of operation.

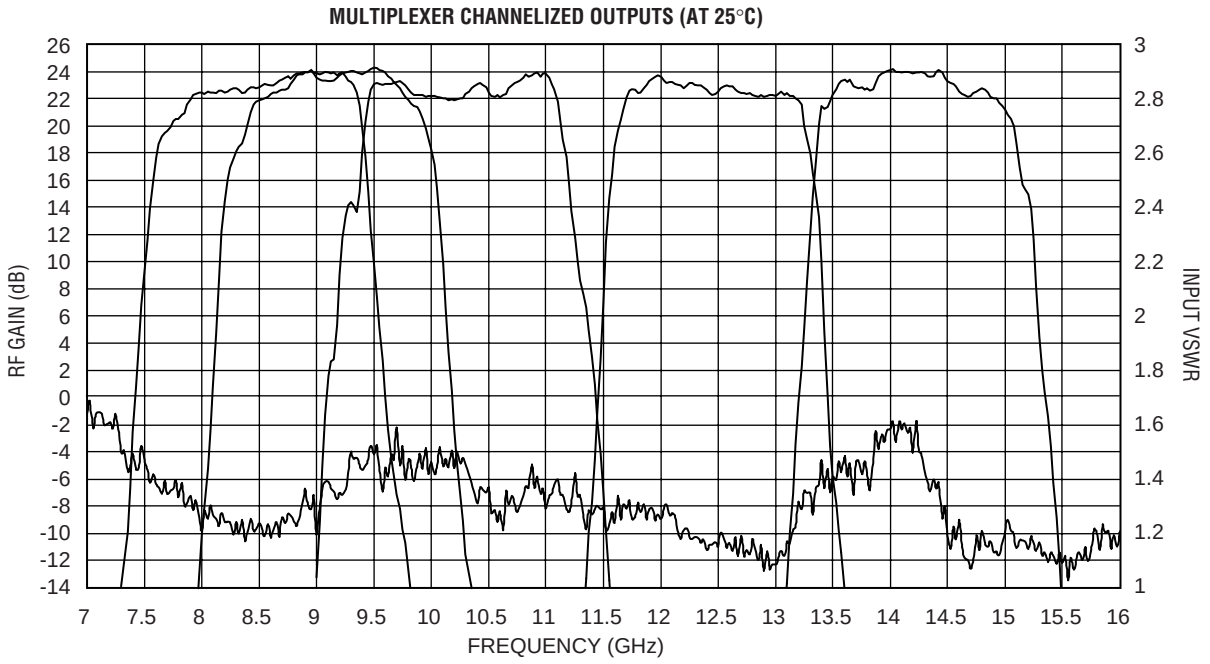
ELECTRICAL SPECIFICATIONS

RF INPUT PARAMETERS	CONDITION	UNITS	MIN.	TYP.	MAX.
Frequency range		GHz	7.9		14.9
VSWR		Ratio			1.5:1
RF OUTPUT PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Number of RF output channels				5	
Channel 2 dB bandwidth		MHz	1300		
Channel 20 dB rejection band		MHz			2300
Channel center frequencies		GHz		8.5858, 9.0798, 10.3013, 12.4566, 14.2367	
Nominal gain		dB		23	
Output power (1 dB compression)		dBm	-5	-3	
Noise figure		dB		3.5	4.5
Isolation between output channels		dB	45		
VSWR	Over 1300 MHz passband	Ratio			1.5:1
Connectors, RF				SMA	
OTHER PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Connector, DC				9-pin, micro D	
Supply voltage		Volts		5	
DC power consumption	At 5 V supply	mA		130	
Weight		Grams		320	

ENVIRONMENTAL CONDITIONS

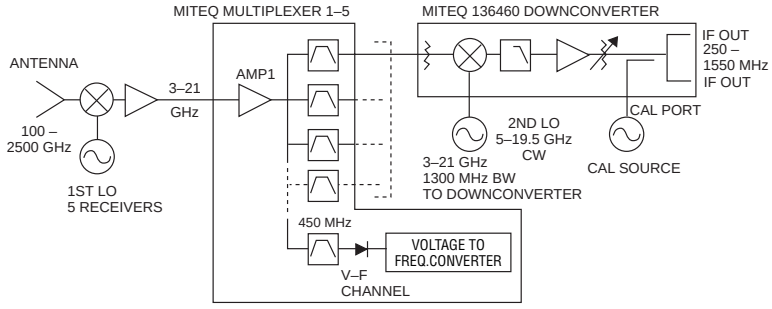
Operating temperature . . . . . 10 to 60°C
Storage temperature . . . . . -25 to +60°C
Vibration . . . . . 6.5 Gs RMS, 20–2000 Hz
Radiation . . . . . 30 krads, total DOSP

MODEL 136468 TYPICAL DATA

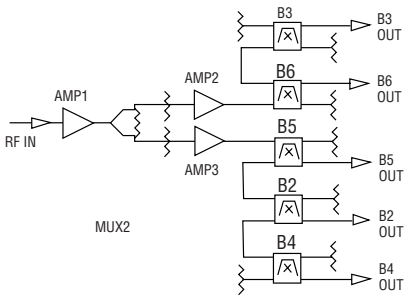


FUNCTIONAL BLOCK DIAGRAMS

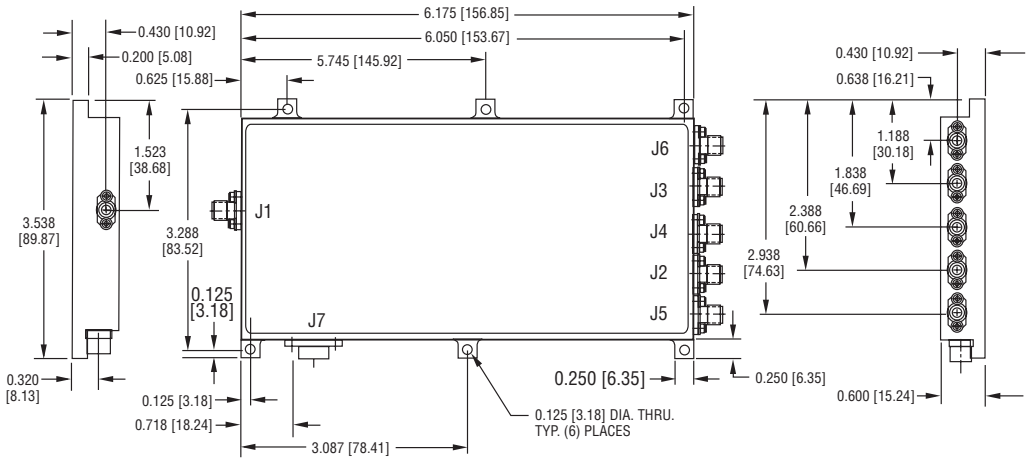
GENERIC SYSTEM



MODEL 136468



OUTLINE DRAWING



GENERAL NOTES:

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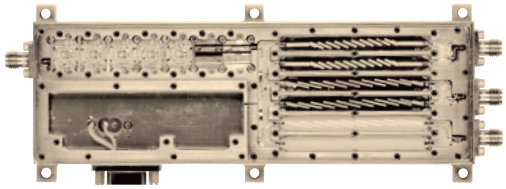
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

7.6–21.2 GHz FREQUENCY MULTIPLEXER

MODEL: 136462

FEATURES

- **High reliability, spaceborne application**
- **Broadband RF coverage..... 7.6–21.2 GHz**
- **Gain ..... 23 dB nominal**
- **Channel-to-channel isolation.. 50 dB minimum**
- **Input/output VSWR..... 1.5:1 typ., 1.8:1 maximum**
- **Noise figure ..... 4 dB typ., 6 dB maximum**
- **Low power ..... 130 mA (5 V) typical**
- **Lightweight ..... 210 grams typical**



MITEQ's model 136462 broadband three-output frequency multiplexer precedes the second IF down conversion stage in a low earth orbit-based millimeter-wave radiometer. In combination with second IF downconverter, the system provides maximally flat frequency response over the bands of interest, high linearity of output power to input power, and high isolation between the frequency bands of interest as well as from other undesirable signals. In addition, this high reliability, spaceborne integrated assembly is optimized for small size, low power consumption, lightweight, and excellent thermal stability of operation.

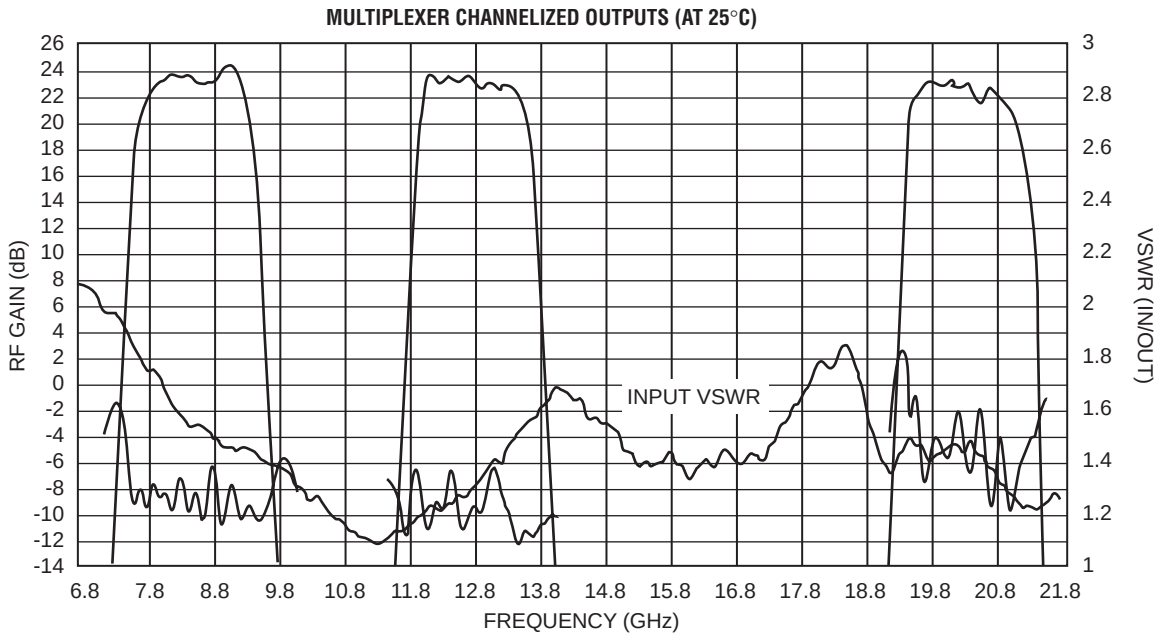
ELECTRICAL SPECIFICATIONS

RF INPUT PARAMETERS	CONDITION	UNITS	MIN.	TYP.	MAX.
Frequency range		GHz	7.6		21.2
VSWR		Ratio			1.8:1
RF OUTPUT PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Number of RF output channels				3	
Channel bandwidth		MHz	1300		
Channel center frequencies		GHz		8.4081 12.7759 20.4012	
Gain flatness	Over 1300 MHz passband	dB		2	
Normal gain		dB		23	
Channel 20 dB rejection bandwidth		MHz			2300
Output power (1 dB compression)		dBm	-8	-5	
Noise figure		dB		4	6
Isolation between output channels		dB	50		
VSWR	Over 1300 MHz passband	Ratio		1.5:1	1.8:1
OTHER PARAMETERS	**CONDITION**	**UNITS**	**MIN.**	**TYP.**	**MAX.**
Connectors, RF				SMA	
Connector, DC				15-pin, micro D	
Supply voltage		Volts		5	
DC power consumption	At 5 V supply	mA		130	
Weight		Grams		210	

ENVIRONMENTAL CONDITIONS

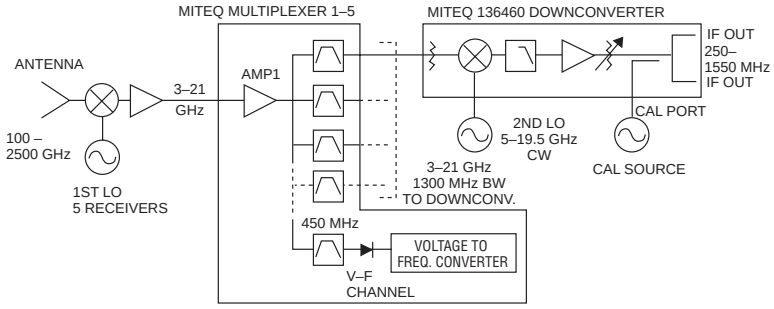
Operating temperature . . . . . 10 to 60°C
Storage temperature . . . . . -25 to +60°C
Vibration . . . . . 6.5 Gs RMS, 20–2000 Hz
Radiation . . . . . 30 krads, total DOSP

MODEL 136462 TYPICAL DATA

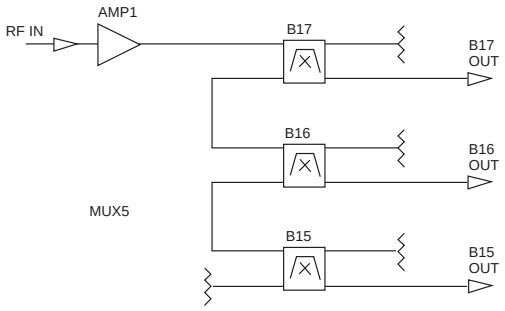


FUNCTIONAL BLOCK DIAGRAMS

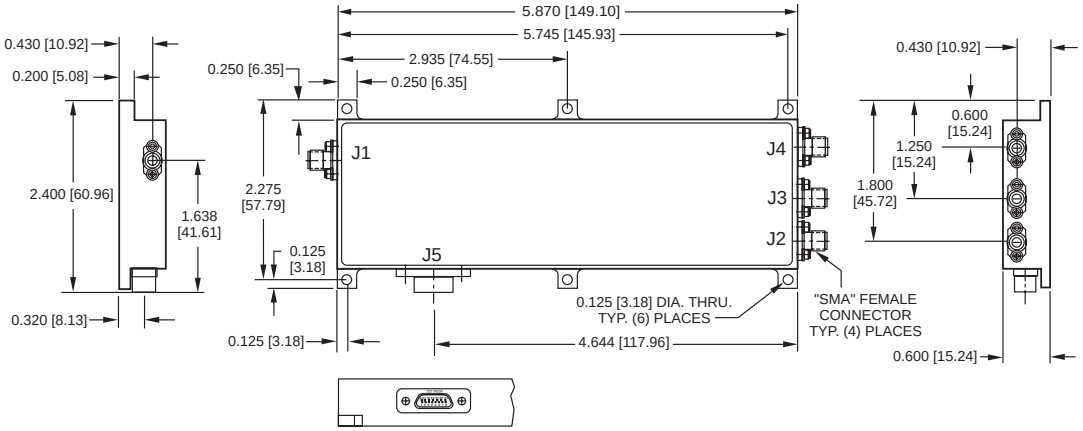
GENERIC SYSTEM



MODEL 136462



OUTLINE DRAWING



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TRANSMIT SWITCHED MULTIPLEXER

MODEL: 127086

FEATURE

- **Three-channel design**
- **Insertion loss.....3 dB maximum**
- **Flatness .....0.5 dB maximum**
- **Isolation .....60 dB minimum**

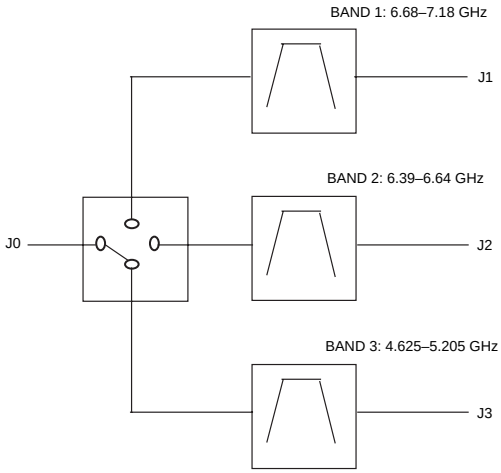
MITEQ'S model 127086 integrated, switched filter assembly features three channelized, printed circuit filter banks, individually selectable by a TTL driven, single-pole, three-throw PIN switch. This arrangement offers very low insertion loss, high isolation and excellent flatness over each passband. MITEQ's Microwave Assemblies, Systems and Technologies Group specializes in the manufacture of integrated switched frequency multiplexers and is able to offer a wide range of frequency ranges and a number of channels.

SPECIFICATIONS

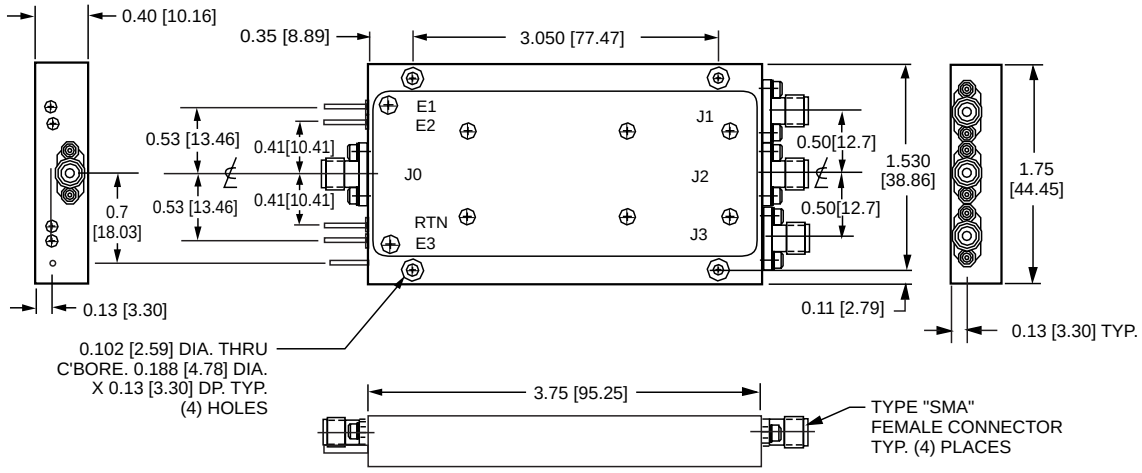
PARAMETERS	LIMITS
Frequency range	
Band 1	6.68–7.18 GHz
Band 2	6.39–6.64 GHz
Band 3	4.625–5.205 GHz
Isolation	60 dB minimum
Insertion loss	3 dB maximum
Flatness	0.5 dB/RF band
VSWR	1.5:1 maximum
Supply voltage	5.2 V
Control	0.C.= Off, GND = On
BPF Band 1	
Frequency	6.68–7.18 GHz
Rejection	> 20 dB at 8.35–8.975 GHz
Insertion loss	1 dB nominal
Flatness	0.7 dB nominal
VSWR	1.5:1 nominal
BPF Band 2	
Frequency	6.39–6.64 GHz
Rejection	> 20 dB at 4.79–4.98 GHz
Insertion loss	1 dB nominal
Flatness	0.7 dB nominal
VSWR	1.5:1 nominal
BPF Band 3	
Frequency	4.625–5.205 GHz
Rejection	> 20 dB at 5.78–6.51 GHz
Insertion loss	2 dB nominal
Flatness	0.7 dB nominal
VSWR	1.5:1 nominal

MODEL 127086 TYPICAL DATA

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



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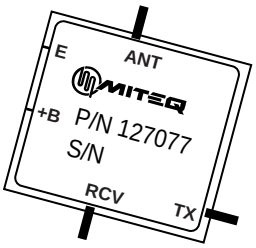
TRANSMIT/RECEIVE SWITCH/AMPLIFIER

MODEL: 127077

FEATURES

- Serves as an amplified duplexer
- Low noise figure
- Tx-Rx isolation greater than 40 dB
- Handles up to 2 watts of transmit power



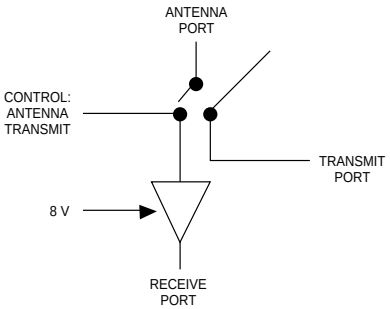
SPECIFICATIONS

PARAMETERS	LIMITS	CONDITIONS
Frequency receive band	2.2–4.2 GHz	
Frequency transmit bands	1.75–1.85 GHz and 5.9–6.4 GHz	
Receive gain	27 dB maximum, 21 dB minimum	Includes gain vs. temperature variations and gain slope
Noise figure	1.7 dB maximum	
Receive P1 dB output	4 dB minimum	
Receive isolation	20 dB minimum	
Transmit to antenna loss	0.7 dB maximum	
Transmit to receive isolation	40 dB minimum	
Transmit input power	33 dBm	
VSWR all RF ports	2:1	Z0 = 50 Ω
Stability	Unconditional	
Switch control	15 mA = Receive mode -15 mA = Transmit mode	
Control and DC connections	Solderable wires	
RF connections	Bondable ribbons	
DC power consumption	8 V @ 120 mA maximum	

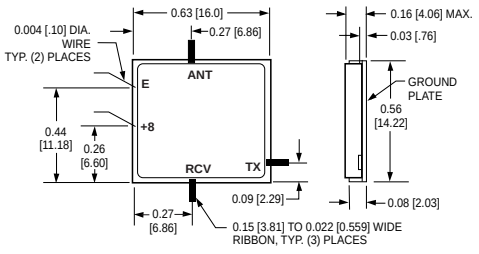
ENVIRONMENTAL CONDITIONS

Weight . . . . . 30 grams
Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



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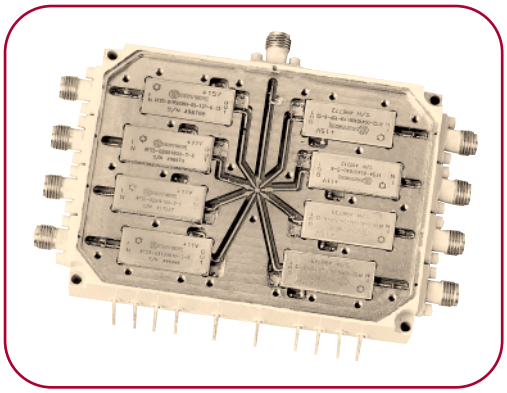
2. Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

AMPLIFIER/SWITCH ASSEMBLY

MODEL: 126140

FEATURES

- Military application
- Broadband RF coverage .... 0.475–18.5 GHz
- RF gain ..... 23 dB nominal
- Channel-to-channel isolation ..... 45 dB minimum
- Input/output VSWR..... 1.5:1 typical, 1.8:1 maximum
- Noise figure ..... 3.5 dB typical, 4.5 dB maximum
- Low power ..... 325 mA (5 V) typical
- Lightweight ..... 520 grams typical



Band	Frequency Range (GHz)	Gain (dB, Min.)	Gain (dB, Max.)	Noise Figure (dB, Max.)	Flatness (±dB)	1 dB Comp. (dB, Min.)	IP_3 (+dB, Min.)	IP_2 (+dB, Min.)	CW RF (+dBm, Max.)	Pulse RF (+dBm, Max.)
1	0.475–1.050	18	22	2	1	11	21	30	32	57
2	0.950–2.100	18	22	2.2	1	11	21	30	32	57
3	1.950–3.800	20	24	2	1.25	8	18	27	32	57
4	3.100–6.100	22	26	2.6	1.25	8	18	27	31	56
5	5.400–10.400	24	30	2.7	1.5	7	16.5	25	31	56
6	9.600–18.500	28	32	4.8	2.25	6	15	23	30	55
7	2.000–18.500	20	26	4.5	2	9	19	22	10	N/A
8	2.000–18.5000	25	32	4.5	2	9	19	22	10	N/A

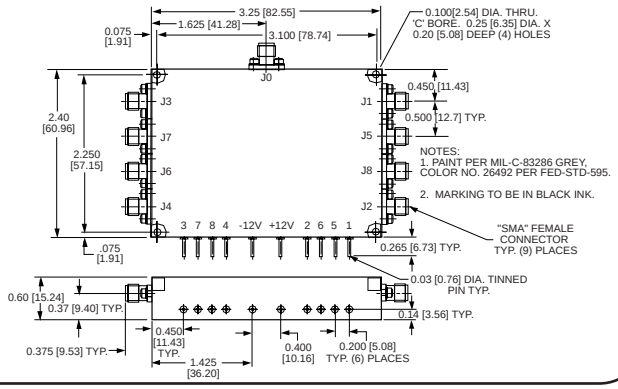
ELECTRICAL SPECIFICATIONS

PARAMETERS	LIMITS	CONDITIONS
VSWR	2.1:1 maximum	
Stability	Unconditional	Source impedance is BPF with passband VSWR < 2:1
On/Off isolation	30 dB minimum	
Switching speed	200 µs maximum	
Video feedthru	-75 dBm maximum from 1 kHz to 4 GHz	PRF = 1 kHz
Control	TTL	
Control logic	"1" = Channel On, "0" = Channel Off	No input = "0"
Blanking	All "0" = Blanking	
DC bias	12 V @ 650 mA maximum, -12 V @ 250 mA maximum	

ENVIRONMENTAL CONDITIONS

Weight . . . . . 200 grams
Operating/storage temperature . . . . . -54 to +71°C
Vibration . . . . . Sinusoidal 5 Gs RMS, 52–500 Hz

OUTLINE DRAWING



GENERAL NOTES:
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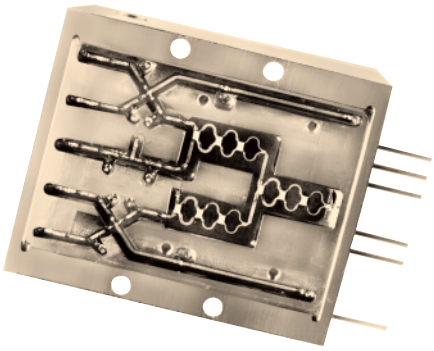
2. Tolerance as follows: .xx = ±0.01 [.xx = ±0.25], .xxx = ±0.005 [.xxx = ±0.13]

MINIATURE CALIBRATION SWITCH

MODEL: 125475

FEATURES

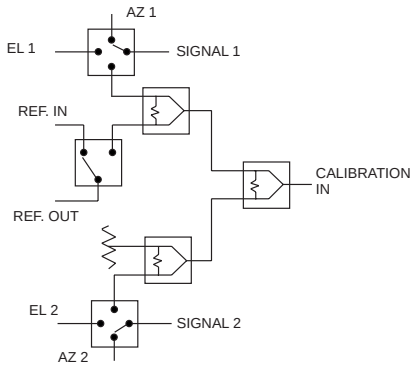
- Compact package
- Tight amplitude and phase tracking
- Fast switching
- Blind mate connectors
- Airborne military applications



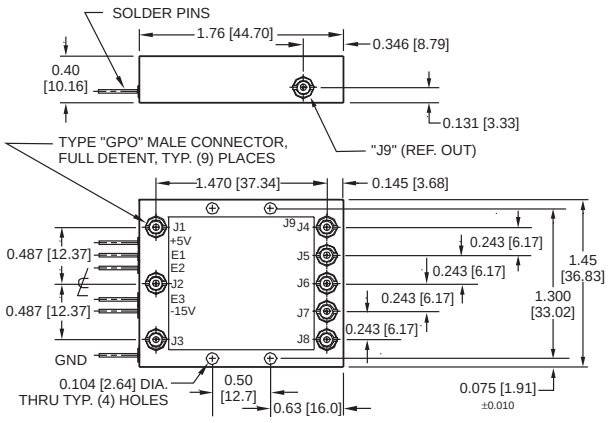
SPECIFICATIONS

PARAMETERS	LIMITS	CONDITIONS	COMMENTS
Frequency range	6–18 GHz		
Insertion loss	3.3 dB maximum 10 dB maximum	AZ/EL→Sig., Ref. In→Ref. Out Cal. In→Sig., Cal. In→Ref. Out	
Amplitude balance	±0.5 dB maximum	AZ/EL→Sig.	
Phase balance	±5° maximum	AZ/EL→Sig.	
Isolation	25 dB minimum 60 dB minimum	Sig.1 Out to Sig. 2 Out any unselected path	Cal. select AZ/EL select
VSWR	2:1 maximum	Selected ports	
Switching speed	50 ns maximum	50% TTL to 10 to 90% RF	
DC power	5 V @ 100 mA maximum, -15 V @ 100 mA maximum		Typical
Control	TTL, 3 lines		
Switch positions	Transmission paths 1. AZ1→Sig. 1, AZ2→Sig. 2, Ref. In→Ref. Out 2. EL1→Sig. 1, EL2→Sig. 2, Ref. In→Ref. Out 3. Cal.→Sig. 1, Cal.→Sig. 2, Cal.→Ref. Out		Path / AZ / EL / CAL Select / Select / Select 1. 0 / 1 / 1 2. 1 / 0 / 1 3. 1 / 1 / 0
RF connectors	Gilbert GPO male		

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



GENERAL NOTES:
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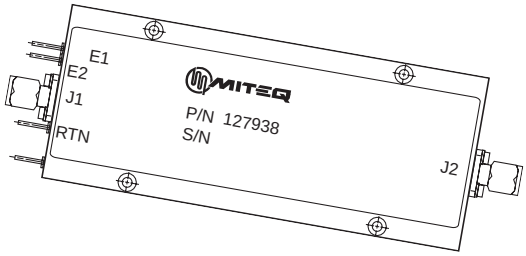
SWITCHABLE FILTER BANK

MODEL: 127938

FEATURES

- **Single input and output**
- **Insertion loss..... 5 dB maximum**
- **Amplitude balance..... 0.5 dB maximum**
- **VSWR ..... 1.5:1 maximum**



MITEQ's model 127938 integrated, two part, switchable filter bank features two channelized, printed circuit filter banks, individually selectable by TTL driven, SP2T PIN switches the input and output. MITEQ's Microwave Assemblies, Systems and Technologies Group specializes in the manufacture of integrated switch filter assemblies and is able to offer a wide range of frequency ranges and a number of channels.

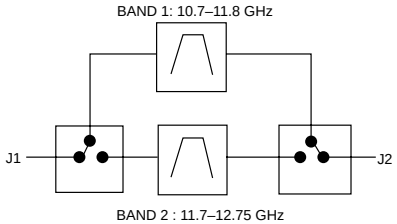
SPECIFICATIONS

PARAMETERS	BAND 1	BAND 2
Passband frequency	10.7–11.8 GHz	11.7–12.75 GHz
Insertion loss	5 dB maximum	5 dB maximum
Insertion loss flatness	0.7 dB maximum, 0.2 dB any 36 MHz band	0.7 dB maximum, 0.2 dB any 36 MHz band
Difference in band level	0.5 dB maximum	0.5 dB maximum
VSWR	1.5:1 maximum	1.5:1 maximum
Group delay (any 40 MHz band) Linear Ripple	 0.01 ns/MHz maximum 0.5 ns p-p maximum	 0.01 ns/MHz maximum 0.5 ns p-p maximum
Rejection	14.88–15.98 GHz > 80 dB 12.79–13.89 GHz > 50 dB	15.88–16.91 GHz > 80 dB 13.79–14.84 GHz > 50 dB
Switch positions	Select E1 = 0 V	Select E2 = 0 V
Return voltage	5 V	5 V

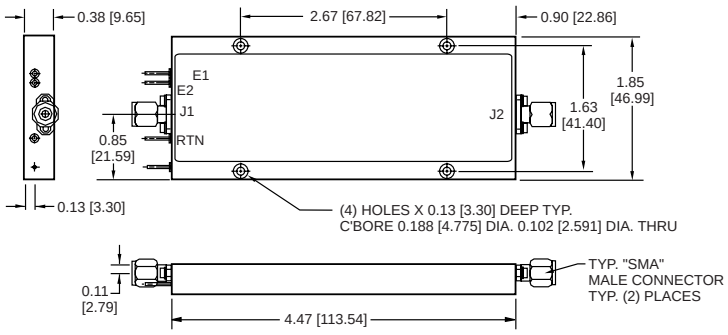
ENVIRONMENTAL CONDITIONS

Weight . . . . . 30 grams
Operating temperature . . . . . 0 to 70°C
Storage temperature . . . . . -30 to +85°C

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



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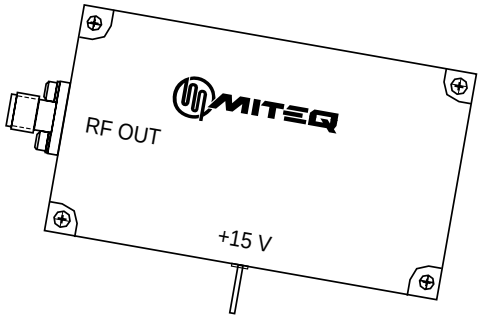
14.5 GHz OSCILLATOR

MODEL: 127090

FEATURES

- **Output power..... 13–20 dBm**
- **Harmonic levels ..... -20 dBc maximum**
- **Spurious levels ..... -60 dBc maximum**
- **Phase noise (1 Hz BW)..... -105 dBc/Hz, 100 kHz from the carrier**
- **Power consumption..... 4.5 W**

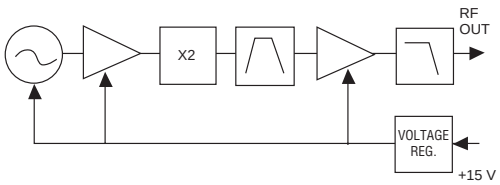


SPECIFICATIONS

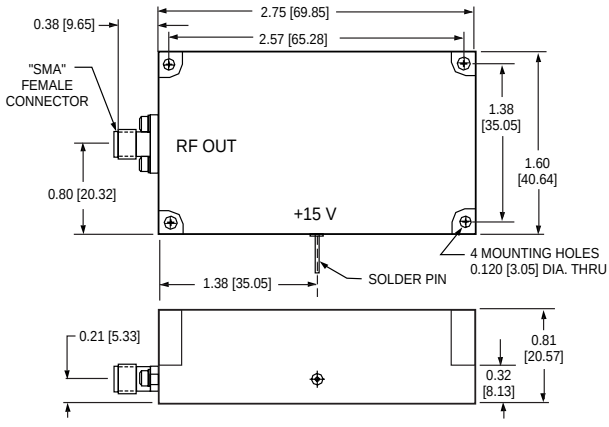
PARAMETERS	LIMITS
Center frequency	14.5 GHz
Output power	13–20 dBm
Power vs. temperature	±1.5 dB maximum
Operating case temperature	-54 to +85°C
Frequency accuracy	0.10% maximum
Temperature stability	±0.05% maximum
Pulling (RL = 12 dB)	±0.02% maximum
Pushing	±0.001% maximum
Harmonics	-20 dBc maximum
Spurious	-60 dBc maximum
SSB phase noise 1Hz BW typical 10 kHz from the carrier 100 kHz from the carrier	 -80 dBc/Hz maximum -105 dBc/Hz maximum
DC voltage	15 ±0.5 V
DC current	300 mA
Survival voltage	20 V maximum
Survival operating temperature	100°C maximum
Storage temperature	-50 to +125°C maximum
Weight	1.75 oz. maximum

Consult factory for additional frequencies that are available.

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



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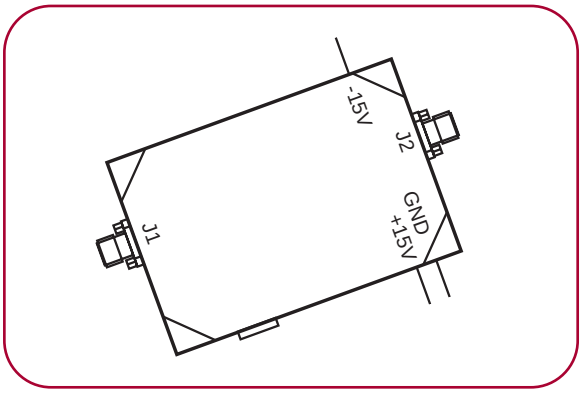
X-BAND LEVELER

MODEL: 124511

FEATURES

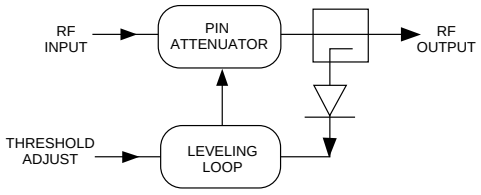
- Used as microwave leveling loop
- Ultra-miniaturized selfcontained AGC feedback loop
- External threshold adjust for setting desired output power
- Output power settability of ±0.2 dB
- -45 to +85°C operation over airborne environments



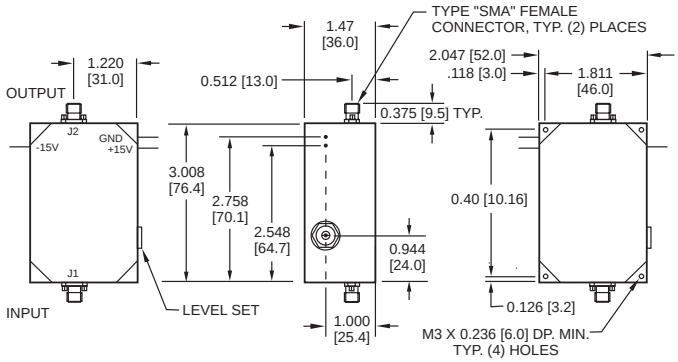
SPECIFICATIONS

PARAMETERS	LIMITS
Frequency range	8.3–10.3 GHz
Insertion loss	2.5 dB maximum
Insertion loss flatness	0.4 dB maximum
VSWR	1.5:1 maximum
Input power	23 dBm maximum
Output level adjust	-4.5 to +16 dBm
Output level flatness	±0.2 dB maximum
Output level vs. temperature	0.5 dB maximum
Response time	Rise/fall time 100 ns, delay 200 ns maximum
Second harmonic	30 dBc maximum @ P_{in} = 20 dBm
Spurious	-60 dBc
DC power	15 V @ 50 mA maximum, -15 V @ 10 mA maximum
Weight	50 grams
Operating temperature	-45 to +85°C
Storage temperature	-55 to +85°C

FUNCTIONAL BLOCK DIAGRAM



OUTLINE DRAWING



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PIN SWITCHES

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

DATE _____

COMPANY _____ ADDRESS _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

For additional technical, price and delivery information, please copy, complete and mail or fax this form to (631) 436-9219, or call John Pierro at (631) 439-9137.

SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
Frequency range (GHz)			
Type (i.e., SP6T)			
Insertion loss (dB, maximum)			
Isolation (dB, minimum)			
VSWR (maximum)			
Type (reflective/absorptive)			
DC power (±V)			
Current consumption (±V, mA)			
Video leakage (dBm)			
Switching speed (ns)			
Connectors			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

_____

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PLEASE SEND ADDITIONAL INFORMATION ON THE FOLLOWING MITEQ PRODUCTS:

- ☐ Amplifiers
- ☐ Mixers
- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

3 dB HYBRIDS

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

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FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
Frequency range (GHz)			
Nominal split (dB)			
Insertion loss (dB, maximum)			
Isolation (dB, minimum)			
Amplitude balance (±dB, maximum)			
Phase balance (±deg., maximum)			
VSWR (maximum)			
Connectors			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

_____

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- ☐ SATCOM Products

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

BROADBAND POWER DIVIDERS

DATE _____

COMPANY _____ **ADDRESS** _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
Frequency range (GHz)			
Divide by			
Insertion loss (dB, maximum)			
Isolation (dB, minimum)			
Amplitude balance (±dB, maximum)			
Phase balance (±deg., maximum)			
Input/output VSWR (maximum)			
Connectors			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

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- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

100 Davids Drive, Hauppauge, NY 11788
TEL.: (631) 436-7400 • FAX: (631) 436-9219/436-7430
www.miteq.com

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

ANALOG PIN ATTENUATORS

DATE_____

COMPANY _____ ADDRESS _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
Frequency range (GHz)			
Insertion loss (dB, maximum)			
Input/output VSWR (maximum)			
Amplitude response (dB, MHz)			
Attenuation range (dB, minimum)			
Control options (VDC)			
Connectors			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

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- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

PHASE SHIFTERS

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

DATE_____

COMPANY _____ ADDRESS _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
RF frequency range (GHz)			
Insertion loss (dB, maximum)			
Input/output VSWR (maximum)			
Phase shift (deg., maximum)			
Phase shift step size (deg.)			
Phase error (deg.)			
Third-order intercept (dBm, minimum)			
Switching speed (ns)			
Control options (VDC)			
Type of control			
Operating temperature			
Quantity			

Special requirements, such as output power variations over temperature and frequency, special testing/screening, or specific operating environment may be listed below:

_____

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PLEASE SEND ADDITIONAL INFORMATION ON THE FOLLOWING MITEQ PRODUCTS:

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- ☐ Mixers
- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

MODULATORS

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

DATE _____

COMPANY _____ ADDRESS _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
RF/LO frequency range (GHz)			
IF frequency range (MHz)			
Conversion loss (dB, maximum)			
Isolation, RF and LO (dB, minimum)			
IF amplitude balance (±dBm, maximum)			
IF phase balance (±deg., maximum)			
RF VSWR (maximum)			
LO/IF VSWR (maximum)			
RF input (P1 dB compression point) (dBm, minimum)			
LO drive level (dBm, minimum)			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

_____

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- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

COUPLERS

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

DATE _____

COMPANY _____ ADDRESS _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
Frequency range (GHz)			
Coupling (dB)			
Insertion loss (dB, maximum)			
Input/output VSWR (maximum)			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

_____

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- ☐ Amplifiers
- ☐ Mixers
- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

TEL: (631) 439-9137
FAX: (631) 436-9219
E-MAIL: jpierro@miteq.com

LIMITERS

DATE _____

COMPANY _____ **ADDRESS** _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

E-MAIL _____

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SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	REQUIREMENT 3
Frequency range (GHz)			
Insertion loss (dB, maximum)			
Input/output VSWR (maximum)			
RF power, pulsed (dBm, minimum)			
RF power, CW (dBm, maximum)			
Flat leakage (dBm, maximum)			
Spike leakage (erg, maximum)			
IP_3 (dBm, minimum)			
Linearity			
Recovery time (ns)			
Operating temperature			
Quantity			

Special requirements, such as special testing/screening, or specific operating environment may be listed below:

_____

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PLEASE SEND ADDITIONAL INFORMATION ON THE FOLLOWING MITEQ PRODUCTS:

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- ☐ Mixers
- ☐ Multipliers
- ☐ Frequency Sources
- ☐ Passive Power Components
- ☐ IF Signal Processing Components
- ☐ Integrated Assemblies
- ☐ SATCOM Products

ORDERING INFORMATION

PRICING AND TERMS

A quotation on any item in the catalog is available by contacting the factory. All quotations, unless otherwise noted, are valid for 60 days from the date of issue, F.O.B. (FCA) Hauppauge, NY 11788. Pricing does not include customer or government source inspection unless otherwise noted. On international orders, an irrevocable letter of credit may be required. MITEQ accepts these credit cards:

QUANTITY DISCOUNTS

A quantity discount is generally available on most catalog items. Due to the wide variety of devices in the catalog, it is not possible to provide a standard discount schedule. When quantities are involved, please contact the factory and the appropriate information will be provided.

SHIPPING INFORMATION

Unless instructed otherwise by the customer, we will ship UPS in the U.S. F.O.B. (FCA) Hauppauge. Air freight will be used as the primary international means of shipment. Please indicate at time of purchase what method of shipment you require.

DRAWINGS AND SPECIFICATIONS

Material presented in this catalog is current at the time of printing. Mechanical and electrical requirements are subject to change. If either of these parameters is critical, please contact the factory to verify that the information is current.

APPLICATION ENGINEERING

We maintain a large support staff of engineers who are experts in specific areas of microwave technology. Each has an engineering background that combines both a formal engineering education with training and experience in product design. As further technical support, we make available the services of our engineering and scientific staff, who may be consulted on more advanced circuit designs or application problems.

RETURNED MATERIAL

When returning material for repair or replacement, please ensure that there is complete information included with the shipment, giving a detailed description of the reason for its return, the date and purchase order on which it was obtained, and the exact address to which the material is to be reshipped. All returns must arrive freight, postage, duties and handling prepaid.

SOURCE INSPECTION

Government/customer source inspection is available on any item upon receipt of the complete written confirmation of purchase order items, including the prime government contract number. Source inspection with respect to some products increases the unit price and extends delivery because of duplicate standard final inspection and testing. It is recommended wherever possible that a Certificate of Compliance be substituted for source inspection to minimize price and delivery delays.

REPAIR COSTS

Warranty repairs will be made at no cost to the customer. Units out of warranty, or those which have been mishandled, will require approval by the customer for the charges involved before the repairs can be accomplished. We will provide an estimate for the cost of the repair, which can be applied to the repair, if approval is granted. For those items that are deemed beyond repair, or where the customer may decide not to repair the unit, a handling charge will be charged.

FEDERAL SUPPLY CODE

Our Federal Supply Code is: 33592

WARRANTY

1. MITEQ, Inc. warrants to the purchaser that each of its products, when shipped will be free from defects in material and workmanship and will perform in full accordance with applicable specifications. The limit of liability under this warranty is at MITEQ, Inc.'s option, to repair or replace any product or part thereof which shall within: (a) three years of delivery for indoor equipment, (b) two years of delivery for outdoor equipment and (c) one year of delivery for integrated assemblies or equipment having RF output powers equal to or greater than +24 dBm, be returned by the purchaser to MITEQ, Inc., at 100 Davids Drive, Hauppauge, New York, 11788, and shall, as determined by examination by MITEQ, Inc., prove defective in material and/or workmanship. Warranty returns must first be authorized in writing by MITEQ, Inc. Disassembly of any MITEQ, Inc. product by anyone other than an authorized representative of MITEQ, Inc. voids this warranty in its entirety. MITEQ, Inc. reserves the right to make changes in any of its products without incurring any obligation to make the same changes on previously delivered products.

2. Components and subsystems having been repaired by MITEQ, Inc. shall be warranted for that repair for ninety (90) days. For products that are still within the original warranty period as described above, the original warranty (if longer) will take precedence. For all SATCOM products, that portion of the system that is repaired, will be warrantied for one year.

3. As a condition to the warranties provided for herein, the Buyer will prepay the shipping charges for all products returned to MITEQ, Inc. for repair and MITEQ, Inc. will pay the return shipping with the exception of rack mountable hardware returned from outside the United States in which case the Buyer will pay the shipping charges.

4. The Buyer will pay the cost of inspecting and testing any goods returned under the warranty or otherwise which are found to meet the applicable specifications or which are not defective or not covered by the warranty.

5. Products sold by MITEQ, Inc. shall not be considered defective or non-conforming to the Buyers' order if they (a) satisfactorily fulfill the performance requirements that were (i) provided by the Buyer to MITEQ, Inc. or (ii) as published in the Sellers' product specification literature, or (b) or in accordance with any written or verbal agreement between the Buyer and MITEQ, Inc., or (c) are in accordance with samples approved by the Buyer. This warranty shall not apply to any products or parts thereof which have been subject to accident, negligence, alteration, abuse or misuse. MITEQ, Inc. makes no warranty whatsoever in respect to accessories or parts not supplied by it.

6. Limitations of Warranty, Damages and Liability

EXCEPT AS EXPRESSLY SET FORTH HEREIN, THERE ARE NO WARRANTIES, CONDITIONS, GUARANTEES OR REPRESENTATIONS AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTIES, CONDITIONS, GUARANTEES OR REPRESENTATIONS, WHETHER EXPRESSED OR IMPLIED, IN LAW OR IN FACT, ORAL OR IN WRITING.

MITEQ, INC.'S AGGREGATE LIABILITY IN DAMAGES OR OTHERWISE SHALL NOT EXCEED THE PAYMENT, IF ANY, RECEIVED BY MITEQ, INC. FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH IS THE SUBJECT OF CLAIM OR DISPUTE. IN NO EVENT SHALL MITEQ, INC. BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, HOWSOEVER CAUSED.

7. All matters regarding this warranty shall be interpreted in accordance with the laws of the State of New York and any controversy that cannot be settled directly shall be settled by arbitration in New York, New York in accordance with the rules then prevailing of the American Arbitration Association, and judgement upon the award rendered may be entered in any court having jurisdiction thereof.

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MITEQ

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