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MODULATOR PRODUCTS

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- QPSK & QAM Modulators
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- Phase Shifters

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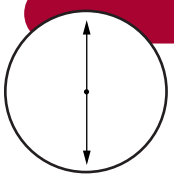
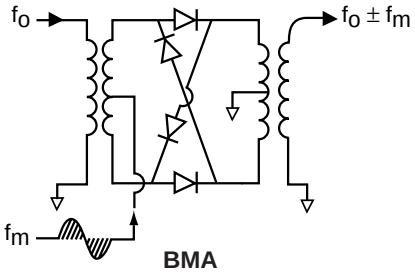
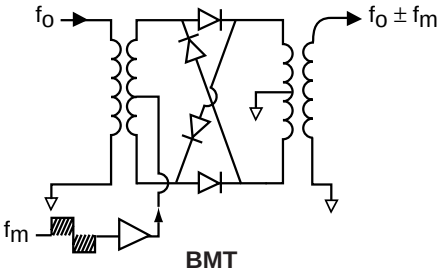
BIPHASE MODULATORS AND UPCONVERTERS



BPSK



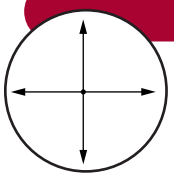
BMA
Linear Biphase



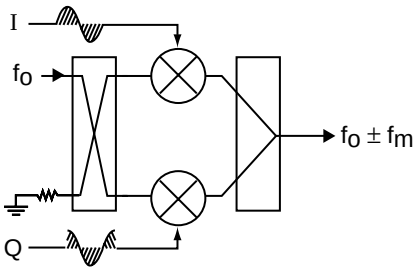
BMT
Digital Biphase

MODEL NUMBER	FREQUENCY RANGE RF (GHz)	FREQUENCY RANGE IF (GHz)	CARRIER DRIVEN (LINEAR IF MODULATION) (NOTE 1) CARRIER REJECTION (dBc)	CARRIER DRIVEN (LINEAR IF MODULATION) (NOTE 1) SIDEBAND HARMONICS (dBc)	MODULATION DRIVEN (LINEAR RF BPSK) (NOTE 2) PHASE/AMP ERROR (Max.) (±deg./±dB)	MODULATION DRIVEN (LINEAR RF BPSK) (NOTE 2) STATIC LOSS/P 1 dB (dB, Max.) / (dBm)	CARRIER REJECTION (dBc, Typ.)	OUTLINES	NOTES
ANALOG OR DIGITALLY CONTROLLED INPUTS									
BMT65175HC10	0.65 – 1.75	TTL	NA	NA	3 / 0.3	5 / +15	30	11	PIN diodes
BMA0502LA2	0.5 – 2	DC – 0.5	35	30	3 / 0.3	5 / +5	30	30	Hermetic
BMA0104LW2	1 – 4	DC – 1	30	35	3 / 0.3	4 / +5	35	33	Hermetic
BMA0208LW2	2 – 8	DC – 2	25	30	5 / 0.5	4 / +5	35	33	Low 1/f Schottky
BMA0218LA1	2 – 18	DC – 0.5	15	20	10 / 0.75	5 / +5	20	1	Low 1/f Schottky
BMT0218HC10	2 – 18	TTL	N/A	N/A	10 / 0.75	4 / +20	25	11	PIN diodes
BMT0218HR5	2 – 18	TTL	N/A	N/A	10 / 0.75	5 / +16	25	29	RHG equivalent
BMA0618LA1	6 – 18	DC – 0.5	20	25	10 / 0.75	5 / +5	20	1	Low 1/f Schottky

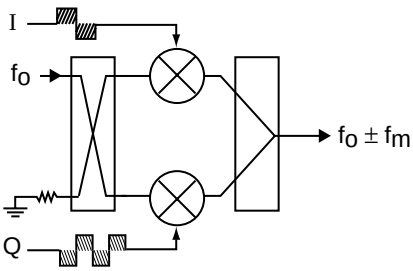
QPSK AND QAM MODULATORS



QPSK



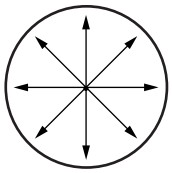
SDM, SMC, SME
Linear, I/Q



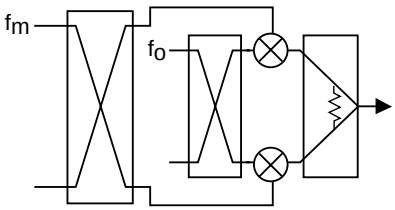
SMT
Digital, Linear RF

MODEL NUMBER	FREQUENCY RANGE RF (GHz)	FREQUENCY RANGE IF (GHz)	CARRIER DRIVEN (LINEAR IF QAM) (NOTE 1) CARRIER REJECTION (dBc)	CARRIER DRIVEN (LINEAR IF QAM) (NOTE 1) SIDEBAND HARMONICS (dBc)	MODULATION DRIVEN (LINEAR RF QPSK) (NOTE 2) PHASE/AMP ERROR (Max.) (±deg./±dB)	MODULATION DRIVEN (LINEAR RF QPSK) (NOTE 2) STATIC LOSS/P 1 dB (dB, Max.) / (dBm)	CARRIER REJECTION (dBc, Typ.)	OUTLINES	NOTES
LINEAR I/Q OR RF INPUTS									
SDM0502LC1Q	0.5 –2	DC – 0.5	25	23	7 / 0.75	7 / +3	33	8	
SMT0502LC1	0.5 – 2	TTL	N/A	N/A	10 / 1.5	7 / +3	35	10	
SM2737LI6Q	2.7 – 3.7	DC – 0.5	30	25	5 / 0.5	7 / +3	35	25	8
SDM0104LC1Q	1 – 4	DC – 0.5	30	23	7 / 0.75	7 / +5	34	8	
SDM0307LI1Q	3.4 – 6.4	DC – 0.3	30	25	5 / 0.5	7 / +6	35	21	8
SMC0208LI1Q	1.5 – 6.5	DC – 0.5	30	25	7 / 0.75	10 / +16	35	21	8
SDM0607LI3Q	6 – 7	DC – 0.5	30	25	5 / 0.5	7 / +5	35	24	8
SDM6474LQ	6.4 – 7.4	DC – 0.1	30	25	N/A	N/A	35	26	
SME0208LI1Q	2 – 8	DC – 0.5	20	30	7.5 / 0.75	10 / +6	25	21	8
SDM0708LI3Q	7.2 – 8.4	DC – 0.3	30	25	5 / 0.5	8 / +5	35	24	8
SML0711LM8Q	7 – 11	DC – 0.5	50	24	N/A	N/A	N/A	27	LO = 1/2 RF
SDM1015LI3Q	10 – 15	DC – 1	30	25	7 / 0.75	9 / +8	33	24	8
SMT0218LC1	2 – 18	TTL	N/A	N/A	15 / 1.5	9 / +3	20	20	
SMC0618LI1Q	6 –18	DC – 0.5	30	25	12 / 1.25	9 / +16	33	21	8
SME0618LI1Q	6 –18	DC – 0.03	20	30	10 / 1.0	10 / +16	30	21	8

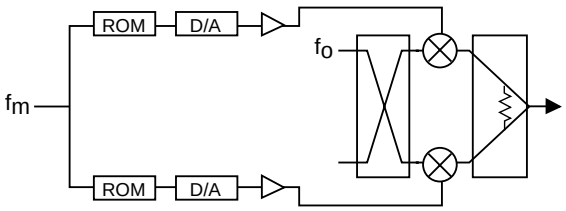
SSB UPCONVERTERS AND VECTOR MODULATORS/PHASE SHIFTERS



MPSK



SDM, SML-A...D
Single-Sideband Upconverter
LO and 1/2 LO



SMC, SME...AVC/DIQ
Analog/Digital, Phase/Amp Control

MODEL NUMBER	FREQUENCY RANGE RF IN AND OUT (GHz)	IF (GHz) (Note 3)	CARRIER DRIVEN (LINEAR IF QAM) (NOTE 1) CARRIER REJECTION (dBc)	CARRIER DRIVEN (LINEAR IF QAM) (NOTE 1) SIDEBAND REJECTION (dBc)	MODULATION DRIVEN (LINEAR RF PM) (NOTE 2) CARRIER REJECTION (dBc)	MODULATION DRIVEN (LINEAR RF PM) (NOTE 2) SIDEBAND REJECTION (Typ./Min.)	CONVERSION LOSS (Typ./Max.)	OUTLINES	NOTES
SSB UPCONVERTERS WITH INTERNAL IF HYBRIDS									
SDM0501LC1	0.5 – 1	DC – 0.5	25	18	33	25 / 15	8 / 10	8	
SDM0502LC1	0.5 – 2	DC – 0.5	25	18	33	25 / 15	8 / 10	8	
SDM0102LC1	1 – 2	DC – 0.5	25	20	35	25 / 15	8 / 10	8	
SDM0104LC1	1 – 4	DC – 0.5	30	20	34	25 / 15	8 / 10	8	
SME0104LI1	1 – 4	DC – 0.5	30	30	35	35 / 27	10 / 12	22	8
SDM0204LC1	2 – 4	DC – 0.5	30	20	35	20 / 18	8 / 10	8	
SM0208LC2	2 – 8	DC – 0.5	20	20	25	20 / 18	9 / 11	13	
SME0208LI1	2 – 8	DC – 0.5	20	30	25	35 / 27	11 / 13	22	8
SMC0208LI1	2 – 8	DC – 0.5	30	25	35	25 / 23	7 / 10	21	
SM0408LC2	4 – 8	DC – 0.5	25	24	30	24 / 20	6 / 9	13	
SM0812LC2	8 – 12	DC – 0.5	25	23	30	23 / 20	6 / 9	13	
SM0218LC1	2 – 18	DC – 0.5	12	18	25	18 / 15	9.5 / 11	9	
SM0618LC2	6 – 18	DC – 0.5	12	18	25	20 / 18	8 / 9	13	
SME0618HI1	6 – 18	DC – 0.5	N/A	N/A	25	28 / 25	10 / 13	22	PIN diodes, 8
SME0618LI1	6 – 18	DC – 0.5	20	28	25	28 / 25	10 / 13	22	Schottky diodes, 8
SML0618LC2	6 – 18	DC – 1	40	23	N/A	N/A	N/A	13	LO = 1/2 RF
SM1218LC2	12 – 18	DC – 1	15	15	20	23 / 20	7 / 9	13	
SM0226LC1	2 – 26	DC – 0.5	15	15	20	18 /15	12 / 15	9	
ANALOG OR DIGITALLY CONTROLLED VECTOR MODULATORS/PHASE SHIFTERS									
SME0618LI1AVC	6 – 18	DC – .01	N/A	N/A	30	30 / 25	12 / 15	*	Analog phase/vector
SME0618LI1DIQ	6 – 18	TTL	N/A	N/A	30	30 / 25	10 / 13	*	Digital phase/vector

* Contact factory for outline drawings.

GENERAL

All modulators and SSB upconverters require that at least one of the input frequency bands (carrier or modulation) has sufficient power to turn on the semiconductors used in the various designs (i.e., Schottky diodes or PIN diodes). All modulators yield a frequency spectrum that utilizes both sidebands on either side of the output suppressed carrier. SSB upconverters employ an internal IF 90 degree hybrid to yield only 1 RF sideband output. This is offset above or below the input LO by the IF frequency (test data is recorded for the upper sideband only). Schottky diode (standard) modulators have the greatest speed and bandwidths, but yield RF output powers of typically less than 0 dBm. PIN diode (optional) designs can only be driven at modulation rates of less than 30 MHz, but will yield output RF powers exceeding +5 dBm. PIN or Schottky modulators that vary only the RF carrier phase, in many discrete steps or continuously, are referred to as phase shifters or frequency translators respectively. When output RF amplitude and phase control is required, the device is usually called a vector modulator. For the latter device, phase accuracy is usually specified over a given amplitude range (in dB). All MITEQ modulators can be driven in the carrier or modulation modes as explained below, but test data is only recorded in the modulation driven mode.

SECTION 3 NOTES

Note 1: Carrier driven: LO = +13 dBm, I/Q = 0 dBm. Used when any amplitude variation or pulse shape of the modulation must be accurately transferred to the RF output envelope. A communication example would be directly modulating a microwave carrier with Gaussian shaped I/Q digital pulses to minimize the channel bandwidth required.

Note 2: Modulation driven: RF = 0 dBm, I/Q = +10 dBm or ±10 mA or TTL. Used when RF input has wide dynamic range, such as for military and commercial Doppler frequency shift generation or corrections. If desired, the harmonic distortion of the relatively fixed and higher level I/Q drive third order harmonics can be linearized by "resistance/diode" or digital "ROM" wave shaping techniques. The latter is often used in vector modulator applications, such as in the model SME0618LI1DIQ design.

Note 3: To specify the IF frequency for SSB upconverter usage, select from the following standard options and add to end of model number or contact MITEQ:
Suffix A: 20–40 MHz, Suffix B: 40–80 MHz, Suffix C: 100–200 MHz, Suffix D: 500–1000 MHz, Suffix Q: I/Q inputs

Note 4: Conversion loss (CL) is relative to lowest power input (f_o, f_m). All other outputs (including f_o, are relative to the desired upper ($f_o + f_m$) output.

Note 5: Standard units with IF hybrids are aligned for upper sideband operation. For lower sideband or selectable sideband, contact MITEQ.

Note 6: Last two characters in model number indicate standard outline number, see outline section.

Note 7: Question and answer modulator application notes available, contact factory.

Note 8: Hermetically sealed housing.