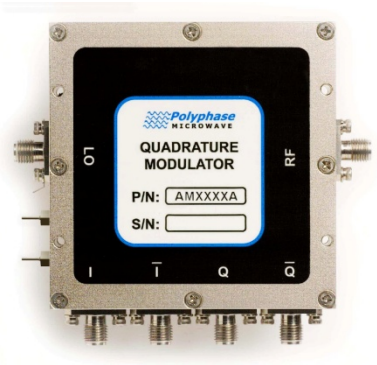
Polyphase MICROWAVE
A Technology Service Corporation Company

AM0350A
QUADRATURE MODULATOR
300 – 5000 MHz

FEATURES

LO/RF Frequency:	300 – 5000 MHz
Input IP3:	+25 dBm
Sideband Suppression:	-40 dBc
LO Leakage:	-35 dBm
LO Power:	+5 dBm
DC Power:	+5 V @ 250 mA, -5 V @ 25 mA

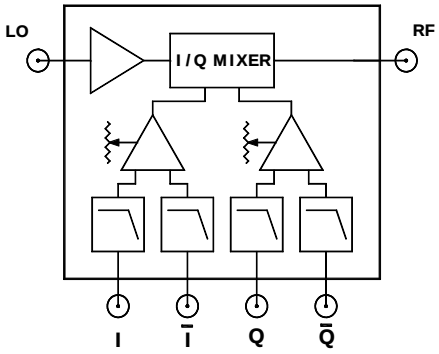


DESCRIPTION

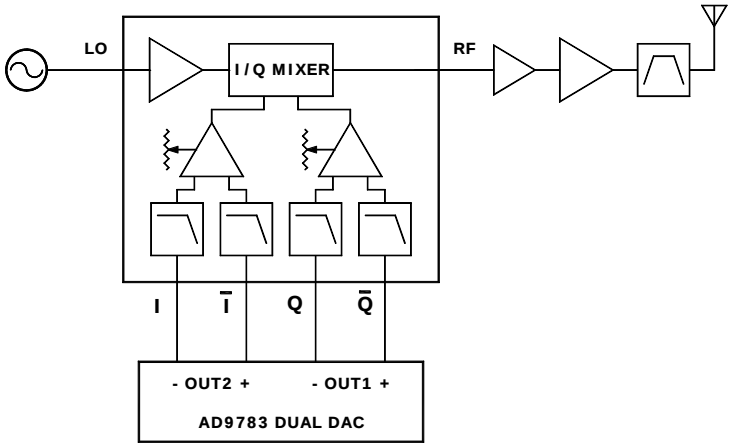
The AM0350A quadrature modulator is ideal for converting baseband I/Q modulation directly to RF. All bandpass RF modulation types are supported including BPSK, QPSK, QAM, OFDM, AM, FM, PM, FMCW, and pulsed Doppler.

In-stock units feature DC-300 MHz I/Q bandwidth. The LO leakage is factory nulled at the center LO frequency. Contact Polyphase Microwave for I/Q lowpass filter options or narrowband frequency optimization.

The AM0350A includes an I/Q mixer, LO amplifier, I/Q lowpass filters, and I/Q differential amplifiers. The AM0350A can be interfaced directly with single-ended or differential I/Q sources including most high-speed DACs. For more information, please refer to the **MODULATOR INTERFACING** section of this datasheet.



TYPICAL APPLICATION: DIRECT CONVERSION TRANSMITTER



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ELECTRICAL SPECIFICATIONS

Test Conditions: +25°C, LO = +5 dBm, I/Q inputs = 0 dBm total @ 100 kHz unless otherwise noted.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
LO/RF Frequency Range		300		5000	MHz
+5V DC Supply Range		+4.9	+5.0	+5.2	V
-5V DC Supply Range		-5.2	-5.0	-4.9	V
+5V DC Supply Current			250		mA
-5V DC Supply Current			30		mA
LO Power		+4	+5	+7	dBm
LO VSWR			1.5:1		Ratio
RF VSWR			2.5:1		Ratio
I/Q Baseband Filter Bandwidth[1]	<1 dB Flatness	DC		300	MHz
I/Q Baseband Filter Stop Band[1]	>25 dB Rejection	450		5000	MHz
I/Q Input Differential Input Impedance			100		Ω
I/Q Input Common-Mode Range	100 Ω Diff. Source	-2.5		+2.5	V
I/Q Input Differential-Mode Range	100 Ω Diff. Source	-1		+1	V
Conversion Loss			3.0	6.0	dB
Input IP3	2-Tone, Δf = 1 MHz		+25		dBm
Output P1dB			+12		dBm
RF Harmonic Spurious	MXRF, M=3, 4, 5		-10		dBc
LO Leakage at RF Port	No RF input drive		-35	-25	dBm
Sideband Suppression[2]			-40	-30	dBc
Amplitude Imbalance		-0.2	±0.05	+0.2	dB
Quadrature Phase Error		-3	±0.5	+3	Degree
Output Noise Level	10 MHz Offset		-162		dBm/Hz
Operating Temperature Range		-40		+85	°C
LO/RF/IQ Input Power w/o Damage				+16	dBm

Notes:

1. Standard lowpass filters. Contact factory for other options.
2. For upper sideband operation: $I = \cos(t)$, $\bar{I} = -\cos(t)$, $Q = \sin(t)$, $\bar{Q} = -\sin(t)$

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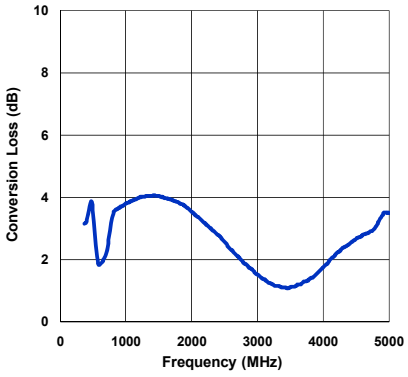
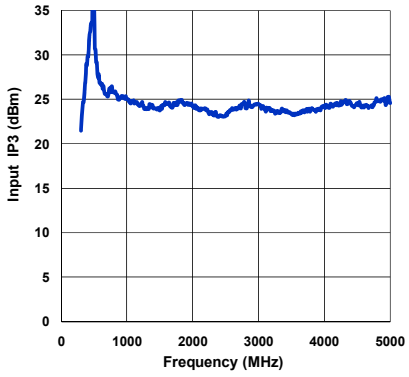
TYPICAL PERFORMANCE CHARACTERISTICS

Standard Test Conditions: +25°C, LO = +5 dBm, I/Q inputs = 0 dBm total @ 100 kHz.

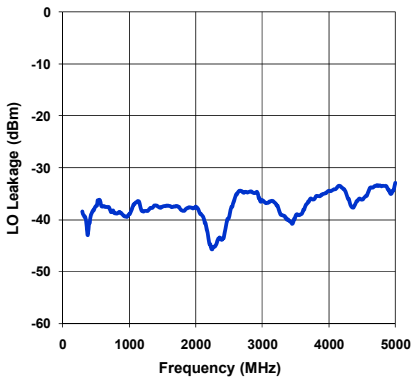
Conversion Loss



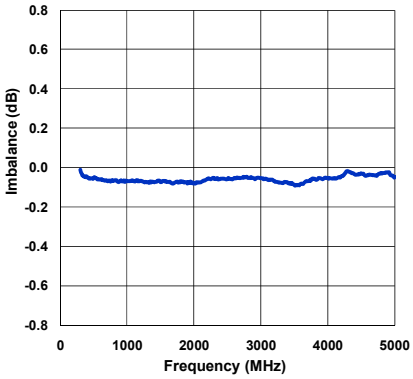
Input IP3



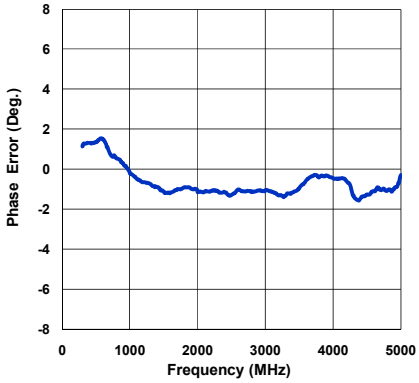
LO Leakage at RF Port



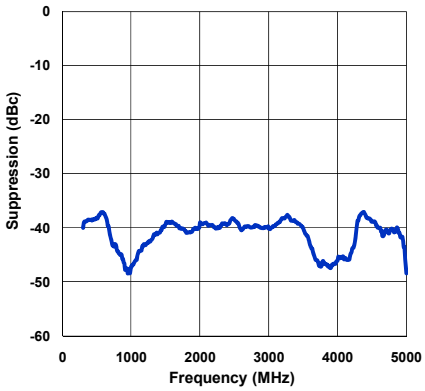
Amplitude Imbalance



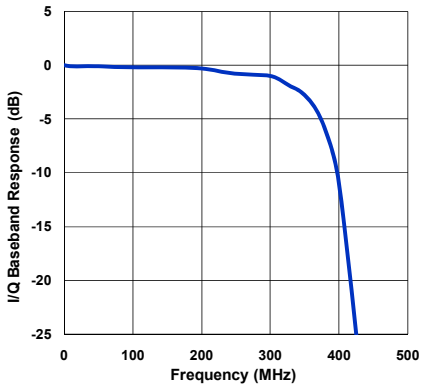
Quadrature Phase Error



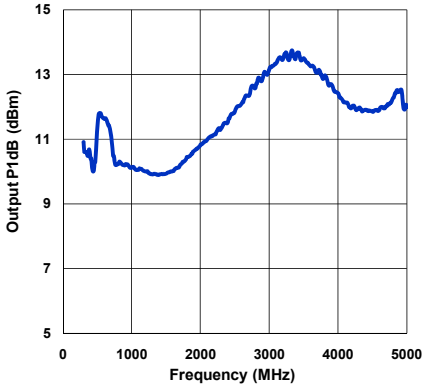
Sideband Suppression



I/Q Baseband Response



Output P1dB



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MODULATOR INTERFACING

I/Q INPUTS

The AM0350A is designed for easy interfacing to both single-ended and differential I and Q sources. The modulator's I and Q inputs are differential with 100 Ω of input impedance. The allowed common-mode voltage range (DC bias) is -2.5 V to + 2.5 V and the differential-mode voltage range is -1 V to +1 V. Internal lowpass filters set the modulator's I/Q signal bandwidth to 300 MHz. Contact the factory for other available filter bandwidths.

SINGLE-ENDED I/Q DRIVE

The AM0350A can be driven with single-ended I/Q signals. Connect the single-ended I and Q sources directly to the modulator's I and Q inputs as shown in Figure 1. To minimize LO leakage, it is important to terminate the unused $\overline{I}$ and $\overline{Q}$ inputs with termination resistors to ground. The termination resistors should be chosen to provide the modulator's 4 I/Q input ports with identical resistance to ground at DC (0 Hz).

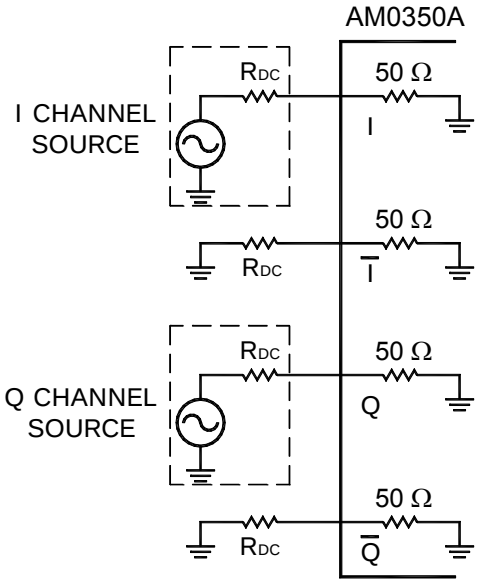

Figure 1. Single-Ended I/Q Drive

Single-ended I/Q signals should not contain any DC bias or offset as this will result in increased LO leakage. Single-ended I and Q signals should be maintained within the range of -2.5 V to +2.5 V.

DAC INTERFACING

The AM0350A is designed for direct connection to high-speed DACs having differential current-source outputs. One example is the Analog Devices AD9783, a dual 16-bit 500 MSPS DAC. Figure 2 shows the AD9783 DAC driving the AM0350A modulator. No external resistors, amplifiers, or filters are required.

When configured for 20 mA full-scale current, the AD9783 provides the AM0350A with 1 V_{p-p} differential signals centered at a common-mode voltage of 500 mV.

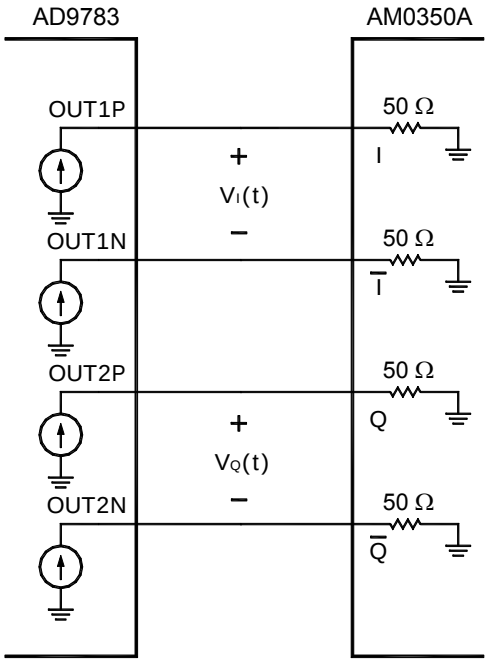

Figure 2. AD9783 Interfacing

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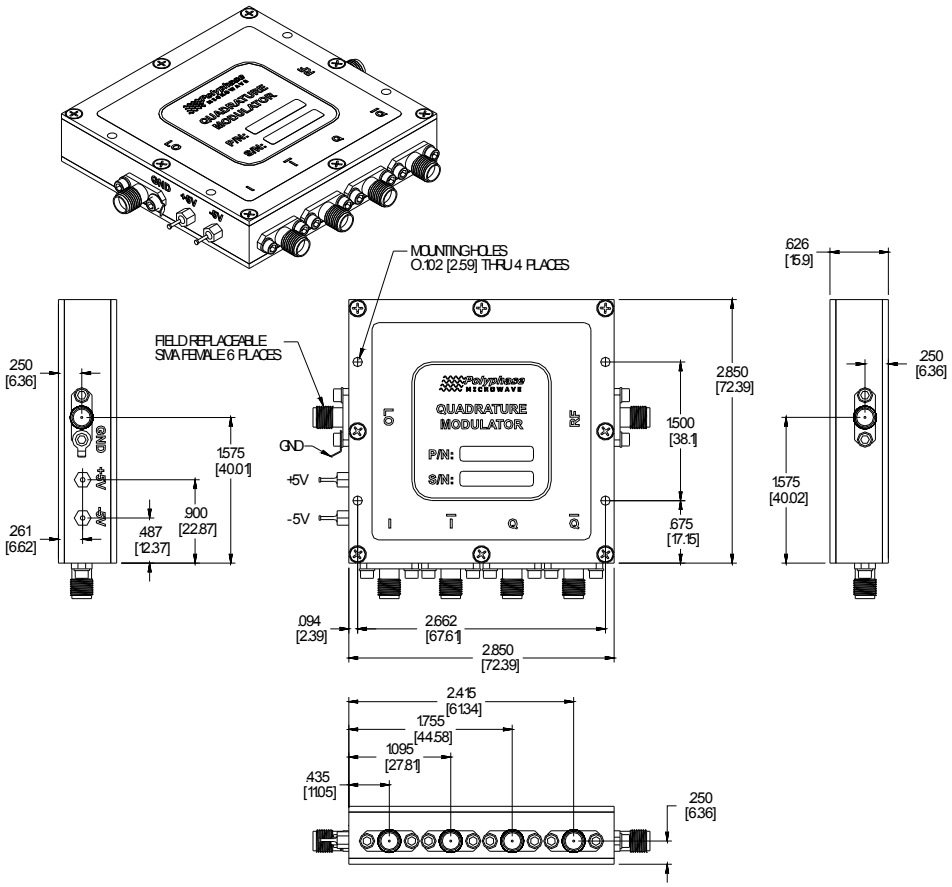
LO DRIVE

The LO input power should be in the range of +4 dBm to +7 dBm (+5 dBm nominal). The AM0350A modulator will perform (with degraded quadrature phase error) over the input range of -5 dBm to +10 dBm. The LO signal's second harmonic should be maintained below -30 dBc relative to the fundamental. LO leakage of the modulator will degrade as the second harmonic of the LO drive signal increases.

DC SUPPLIES

The DC input pins will tolerate accidental reverse polarity and overvoltage conditions from -15V to +15V without damage.

CASE DRAWING



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