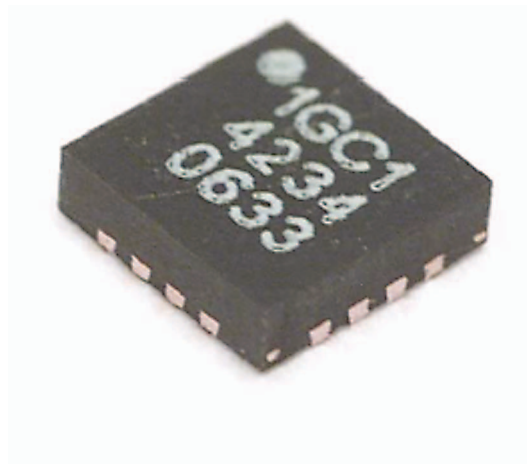


Keysight Technologies
TC230P 0–18 GHz
Packaged Active Mixer
1GC1-8234

Data Sheet



Features

- DC-18 GHz on RF and LO
- DC-1 GHz IF
- Low Conversion Loss:
4 dB typ
- High Input P_{-1dB} :
+9 dBm @ 10 GHz
+2 dBm @ 20 GHz
- Single-Supply Operation
 $V_{Supply} = -7 V$

Description

The TC230P offers substantially improved frequency range and improved broadband performance in a Gilbert-cell mixer. It enables low-cost topologies for both RF and low-microwave instrumentation, which need bestavailable performance, cost, and manufacturability.

The TC230 can be utilized as a fundamental, 3rd, 5th, or 7th order harmonic mixer. The mixer is fabricated using WPTC's HBT process, which provides excellent process uniformity, reliability, and 1/f noise performance.

The TC230P is packaged in a 3x3mm plastic molded QFN package.

- Package Type:
3 x 3 mm MLF-16/QFN-16
- Package Dimensions:
3 x 3 mm (118 x 118 mils)
- Package Thickness:
0.90 mm (35 mils)
- Pad (lead) Pitch:
0.5 mm (20 mils)
- Pad (lead) Width:
0.25 mm (10 mils)

Absolute Maximum Ratings¹

Symbol	Parameters/Conditions	Min.	Max.	Units
V_{EE}	Emitter Voltage	-7.5	-6.5	V
P_{in-RF}	CW Input Power - RF port		+10	dBm
P_{in-LO}	CW Input Power - LO port	-55	+10	dBm
T_{ch}	Operating Channel Temperature [2]		150	°C
T_{case}	Operating Case Temperature	-55		°C
T_{stg}	Storage Temperature	-65	165	°C
T_{max}	Maximum Assembly Temperature (60 seconds maximum)		300	°C

1. Operatin in excess of any one of these conditions may result in permanent damage to this device
TA = 25 °C except for T_{ch} , T_{stg} , and T_{max} .
2. Refer to DC Specifications / Physical Properties table for derating information.

DC Specifications/Physical Properties¹

Symbol	Parameters/Conditions	Min.	Typ.	Max.	Units
V_{EE}	Emitter Voltage		-7		V
I_{EE}	Emitter Current	-100	-95	-90	mA

1. Measured on wafer with $T_{chuck} = 25^{\circ}\text{C}$ unless otherwise noted.

RF Specifications¹

Symbol	Parameters/Conditions	Min.	Typ. 0-8	Typ. 0-18	Max.	Units
BW-LO	LO Bandwidth	0			20	GHz
BW-RF	RF Bandwidth	0			20	GHz
BW-IF	IF Bandwidth	0			1	GHz
P_{comp}	Power Compression at 0 dBm Input		.1	.5	.9	dB
CE	Conversion Efficiency	-1	-4	-4	-8	dB
IP_{-1dB}	Input 1 dB Power Compression		9	2		dBm
NF	Noise Figure		24	25		dB
L-R	LO to IF Isolation		35	35		dB
R-L	RF to LO Isolation			35		dB
L-I	LO to IF Isolation			25		dB
R-I	RF to IF Isolation			25		dB
RL RF	RF Port Return Loss		18	11		dB
RL LO	LO Port Return Loss		15	10		dB
RL IF	IFPort Return Loss		14	10		dB

1. Measured on wafer with $T_{chuck} = 25^{\circ}\text{C}$ with $V_{EE} = -7\text{V}$ and $P_{LO} = -5\text{ dBm}$. Numbers giver are worst-case across the band unless otherwise noted.

Applications

The TC230 is ideal for downconverting 0-20 GHz signals to an IF of 0-1 GHz. The TC230 is particularly well suited for applications that require load-insensitive conversion loss, good spurious signal suppression, reasonable dynamic range, and low LO power over a wide bandwidth.

Biasing

The TC230 requires a single -7 V power supply to V_{EE} . Current will be approximately 95 mA.

The TC230 does not require capacitors on any ports other than V_{EE} . It is capable of operation (including pass-through operation) without connecting RFbar and LObar. LO power can vary between -10 and 0 dBm.

Pass-through mode is available with LObar held at a non-zero voltage – see the Pass-Thru Mode S-Parameter plot. For increased gain (S21b), hold LObar positive; for decreased gain (S21a), hold LObar negative.

Recommended pass-thru LObar voltage is +0.5V, although voltages between +0.4V and +1V are acceptable. These are dissipated through 55 ohms on-chip.

Assembly Techniques

GaAs MMICs are ESD sensitive. ESD preventive measures must be employed in all aspects of handling, assembly, and storage. This package is compatible with wave-solder or reflow printed circuit board soldering processes. Keysight Application Note #54 (5991-3484EN), "GaAs MMIC ESD, Die Attach and Bonding Guidelines" provides basic information on these subjects.

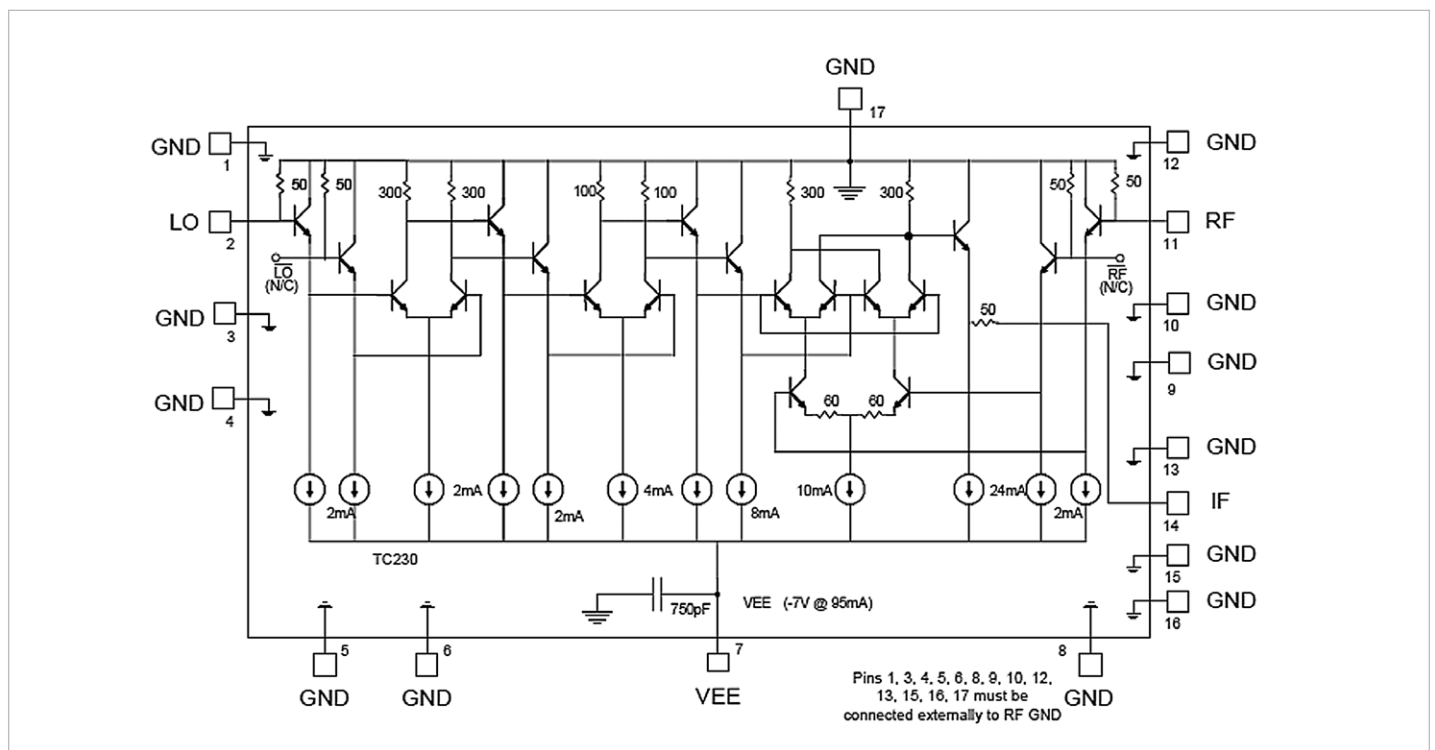


Figure 1. TC230P Schematic

Figure 2. TC230P Package Pin 3uts - Top View

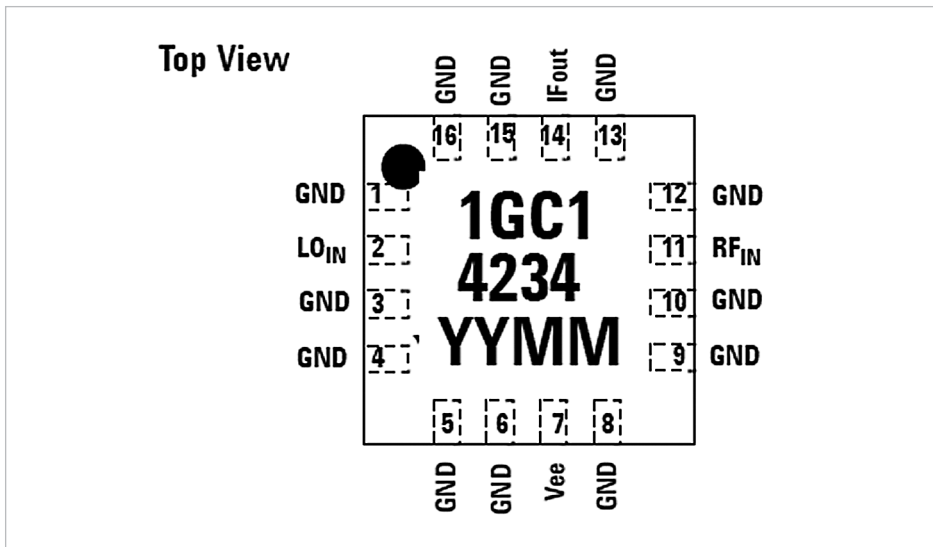


Figure 3. TC230P Board Configuration

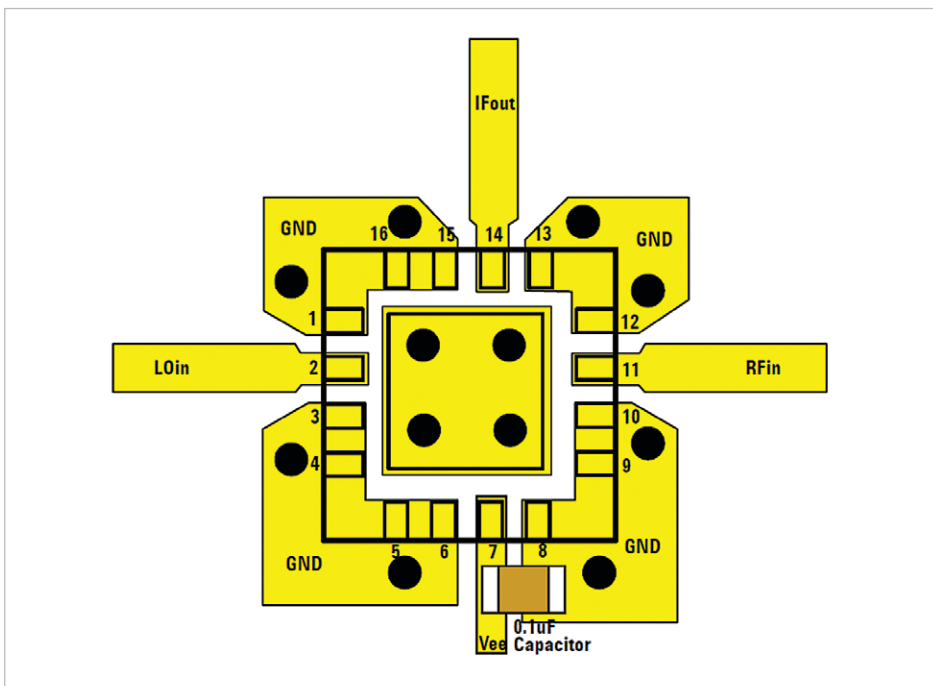


Figure 4. TC230P Package Dimensions

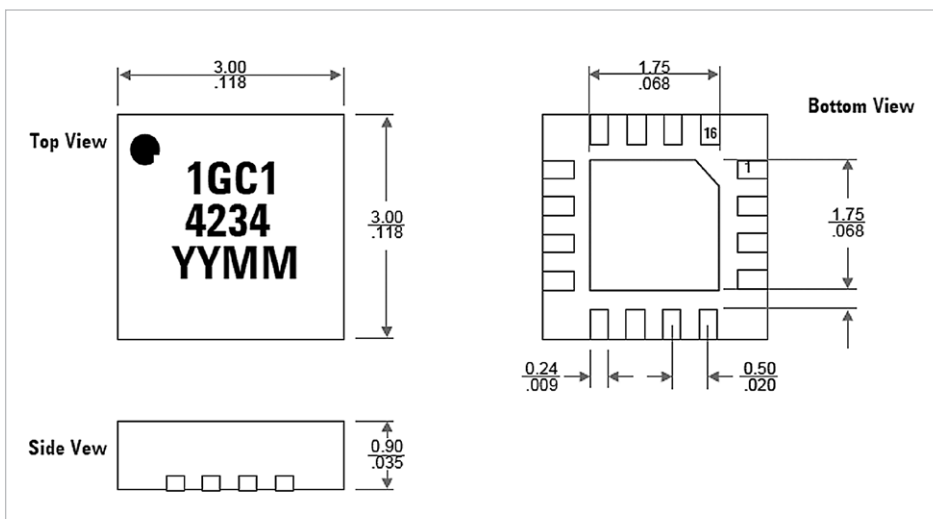


Figure 5. TC230P Conversion Gain

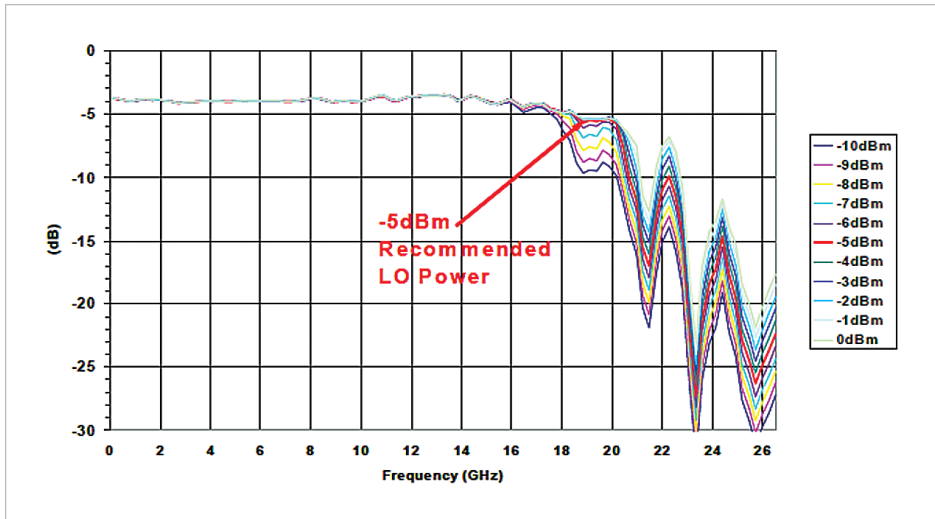


Figure 6. TC230P Isolation

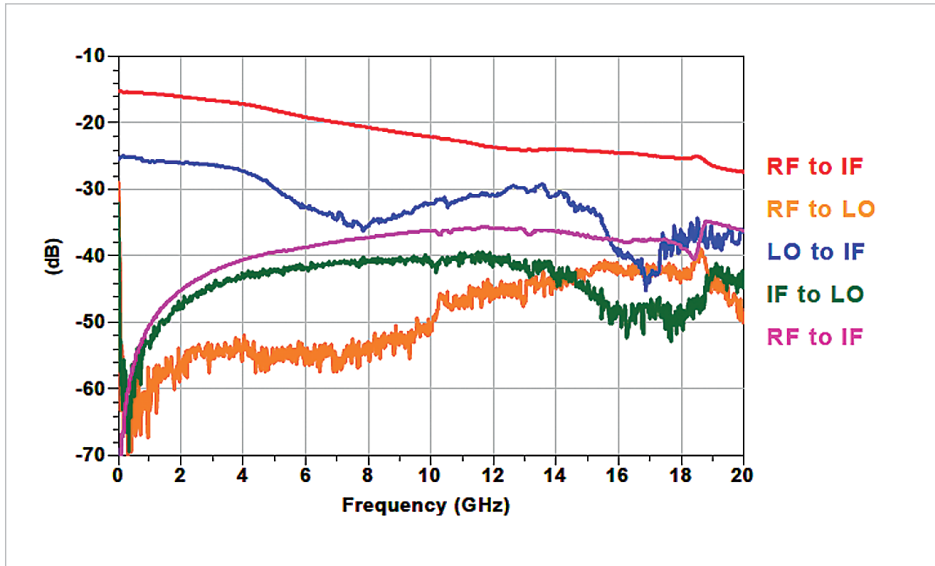


Figure 7. TC230P Compression

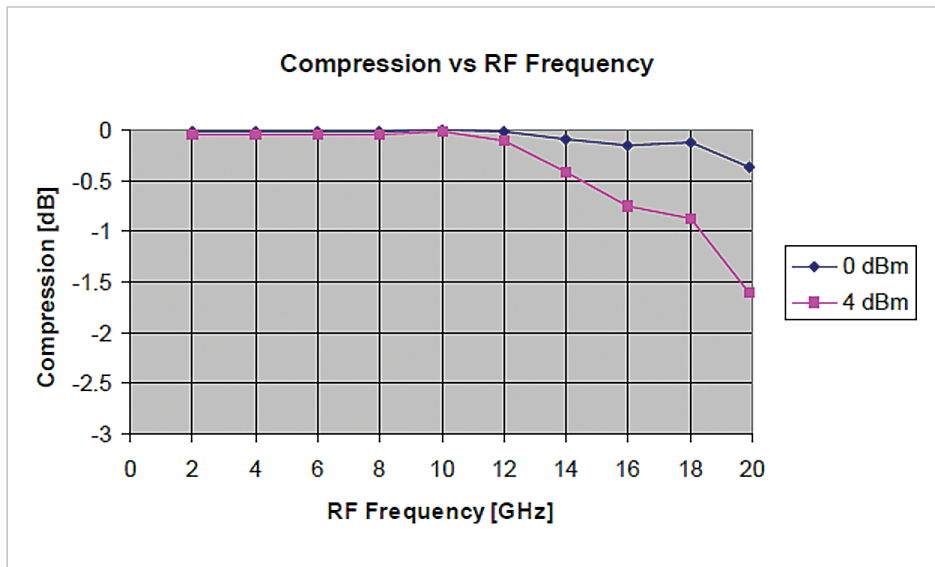


Figure 8. TC230P Noise Figure

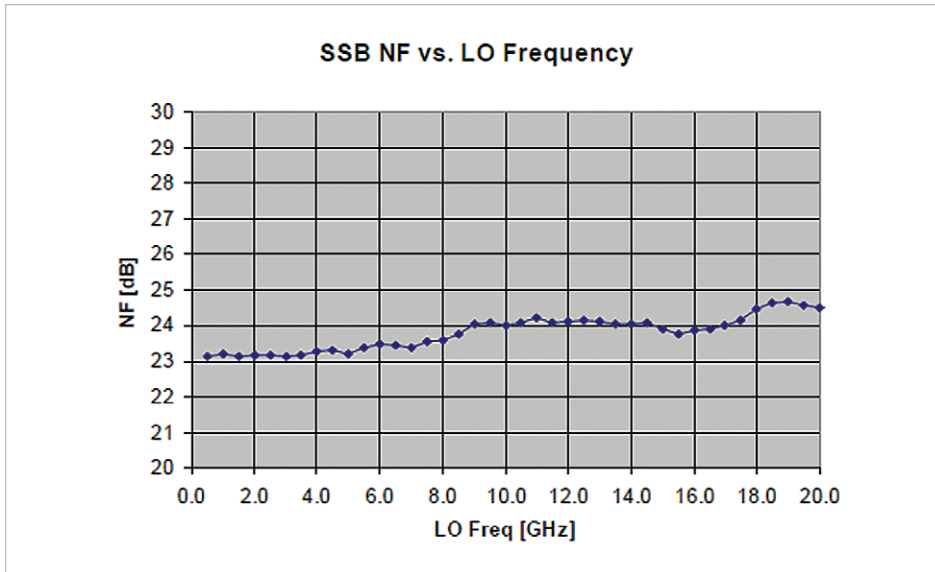


Figure 9. TC230P RF and LO Port Return

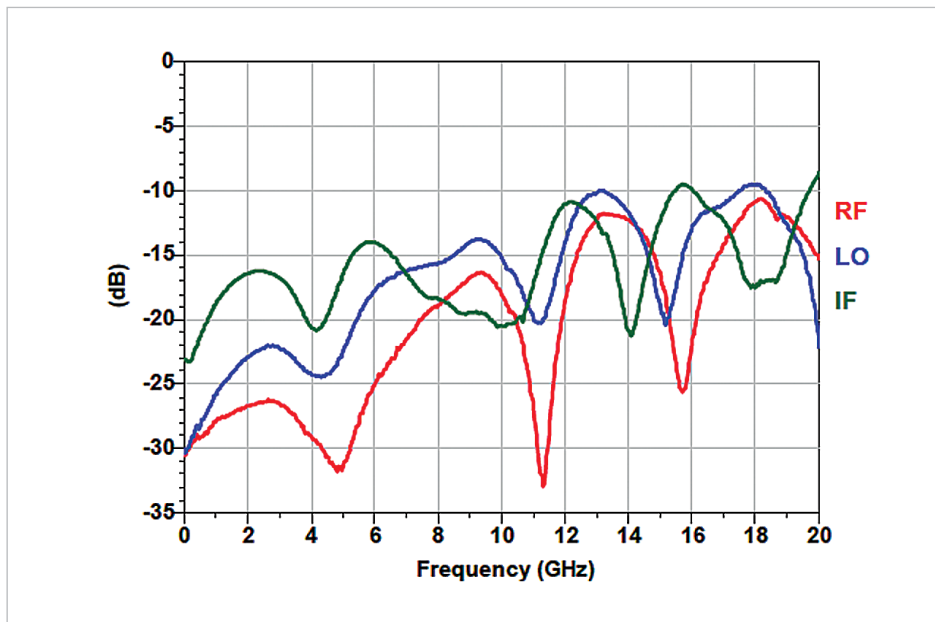


Figure 10. TC230P Pass Through Mode

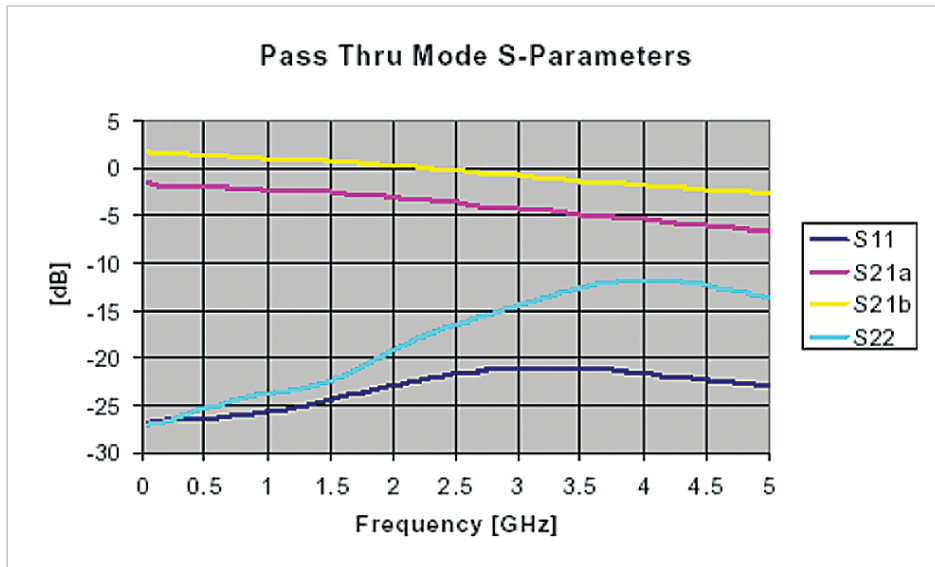
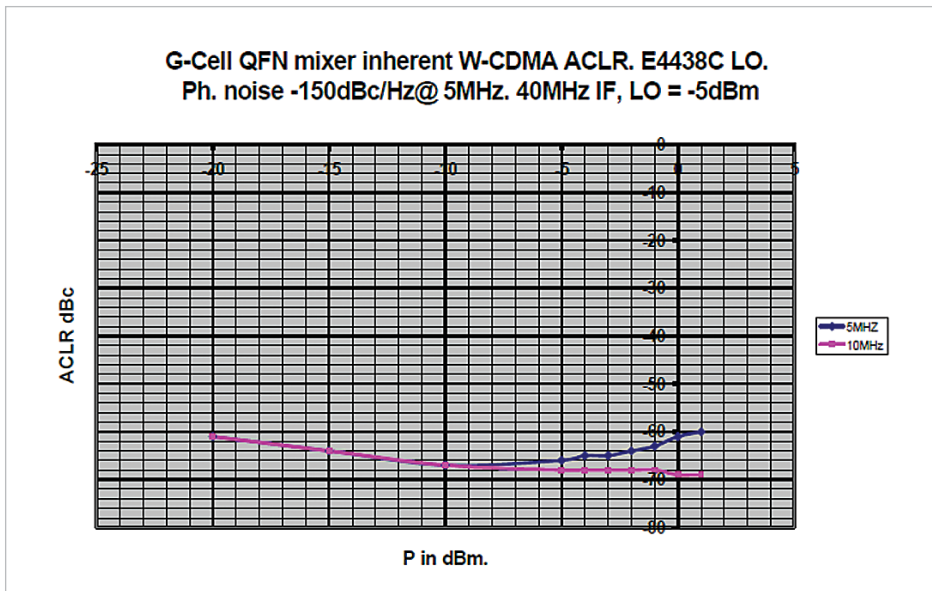


Figure 11. TC230P Pass Through Mode



This data sheet contains a variety of typical and guaranteed performance data. The information supplied should not be interpreted as a complete list of circuit specifications.

In this data sheet the term typical refers to the 50th percentile performance. For additional information contact Keysight WPTC Marketing at 1-707-577-4482.



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