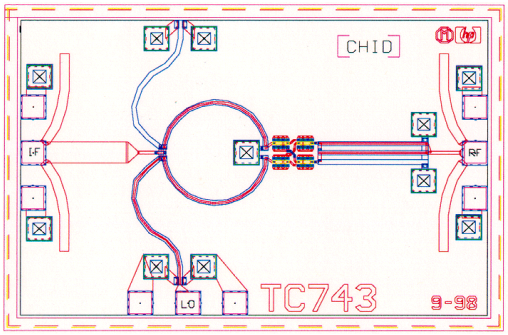
DATA SHEET

HMMC-5643
40 GHz Double Balanced Mixer

Description

The HMMC-5643 is a double balanced ring–diode mixer capable of operation from 20 to 43.2 GHz on the LO, 20 to 40 GHz on the RF, and 0 to 20.7 GHz on the IF port. The design is optimized for maximum LO–RF isolation and good conversion efficiency over broad frequency ranges.



Chip size:
1540 x 1030 µm (60.6 x 40.6 mils)

Chip size tolerance:
±10 µm (±0.4 mils)

Chip thickness:
127 ± 15 µm (5.0 ± 0.6 mils)

Pad dimensions:
70 x 70 µm (2.8 x 2.8 mils)

Features

Frequency range:
20 – 43.2 GHz LO
20 – 40 GHz RF
0 – 20.7 GHz IF

Conversion loss:
Typically < 10 dB

Isolation:
LO–RF: 40 dB
LO–IF: 30 dB
RF–IF: 25 dB

Absolute Maximum Ratings[1]

Symbol	Parameters/conditions	Min.	Max.	Units
I_{dc}	DC Current, RF, LO & IF Ports	-20	+20	mA
P_{in}	RF Input Power, any Port		23	dBm
T_{op}	Operating Temperature	-55	+100	°C
T_{st}	Storage Temperature	-65	+165	°C
T_{max}	Max. Assembly Temperature		+200	°C
ESD	Electrostatic Discharge @ IF Port (Human Body Model)	-1000	+1000	volts

[1] Operation in excess of any one of these may result in permanent damage to this device. T_A= 25°C except for T_{op}, T_{st}, and T_{max}.

KEYSIGHT TECHNOLOGIES

DC Specifications/Physical Properties

(T_A = 25°C)

Symbol	Parameters/conditions	Min.	Typ.	Max.	Units
$V(f)_{IF}$	IF Port Voltage @ 200 µA DC, no LO Drive		0.62		Volts

RF Specifications

(T_A = 25°C, Z_0 = 50 Ω, LO Drive Level = 16 dBm nominal, RF Input Power Level = -8 dBm nominal)

Symbol	Parameters/conditions	Min.	Typ.	Max.	Units
Ce_10ghz	Conv.Loss, LO = 32 GHz, RF = 22 GHz, IF=10 GHz		8.2	9.5	dB
Ce_20.5ghz	Conv.Loss, LO = 42.5 GHz, RF = 22 GHz, IF = 20.5 GHz		8	9.5	dB
Ce_2ghz	Conv.Loss, LO = 32 GHz, RF = 30 GHz, IF = 2 GHz		7	9.5	dB
LO_IF30	L–I Isolation, LO = 30 GHz	25	29		dB
LO_IF40	L–I Isolation, LO = 40 GHz	25	32		dB
LO–RF	LO–RF Isolation, LO 20 – 46 GHz, 16 dBm nominally		40		dB
LO–IF	LO–IF Isolation, LO 20 – 46 GHz, 16 dBm nominally		24		dB
RF_IF22	RF–IF Isolation, LO 32 GHz, RF 22 GHz	20	24		dB
RF_IF30	RF–IF Isolation, LO 32 GHz, RF 30 GHz	20	24		dB
Spur12ghz	2R–L Spur @ 12 GHz, L = 32 GHz, R = 22 GHz	40	50		dBc
Spur2ghz	3R–2L Spur @ 2 GHz, L = 32 GHz, R = 22 GHz	40	56		dBc
Spur8ghz	4R–3L Spur @ 8 GHz, L = 32 GHz, R = 22 GHz	50	59		dBc
Tempcox	Conversion Loss Temperature Coefficient, LO = 32 GHz, RF = 30 GHz, IF = 2 GHz		-0.0042		dB/°C

Applications

The HMMC-5643 can be used in instrumentation, communications, radar, ECM, EW, and many other systems requiring frequency conversion. It can also be used for bi–phase modulation and phase detection.

Assembly Techniques

Die attach should be done with conductive epoxy. Gold thermosonic bonding is recommended for all bonds. The top and bottom metallization is gold.

GaAs MMICs are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly. MMIC ESD precautions, handling considerations, die attach and bonding methods are critical factors in successful GaAs MMIC performance and reliability.

Keysight application note #54, "GaAs MMIC ESD, Die Attach and Bonding Guidelines" provides basic information on these subjects.

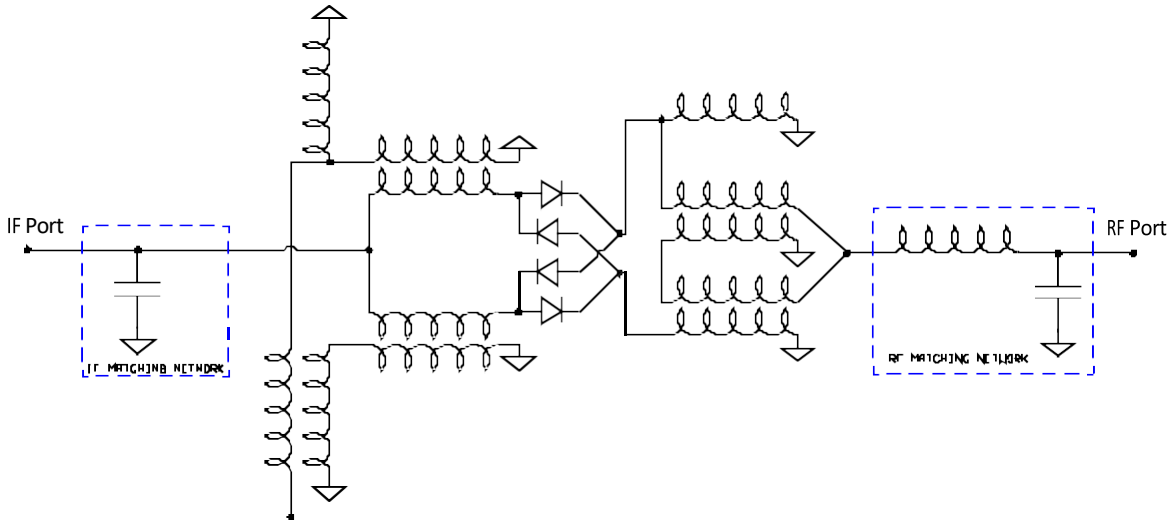


Figure 1. Schematic

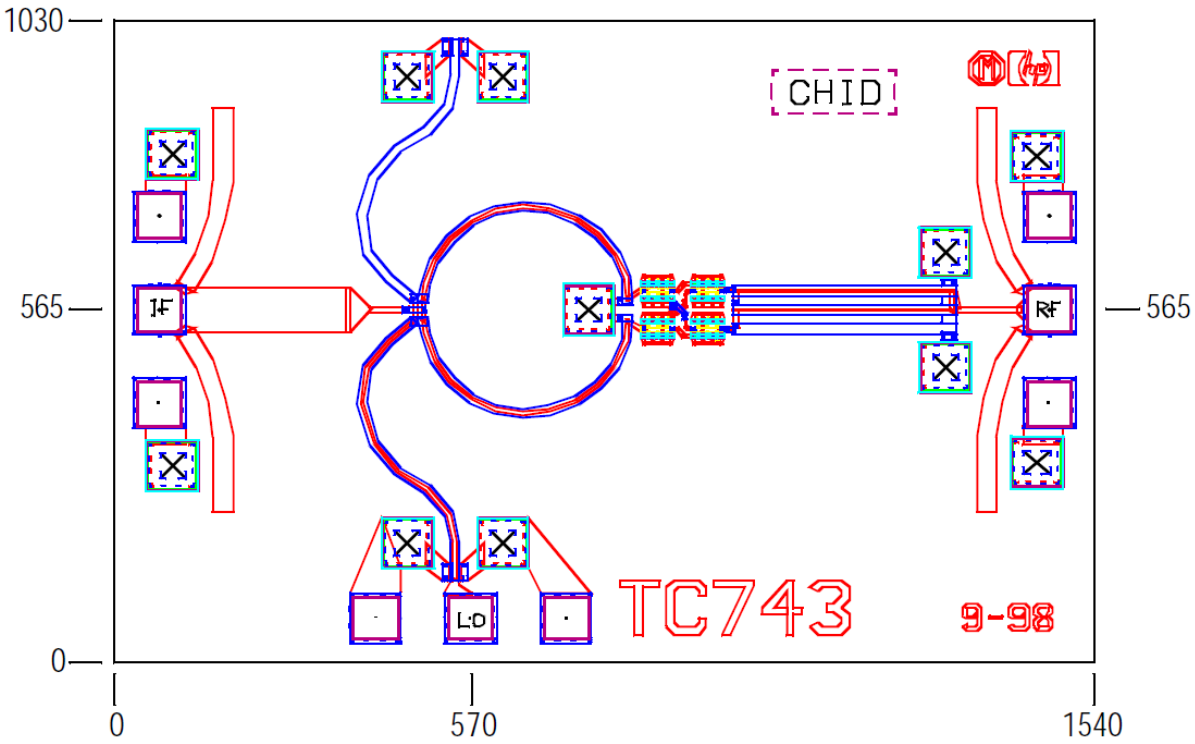


Figure 2. Bonding Pad Positions (Shown in micrometers)
Centers of bonding pads nominally in 70 µm from edge of substrate.

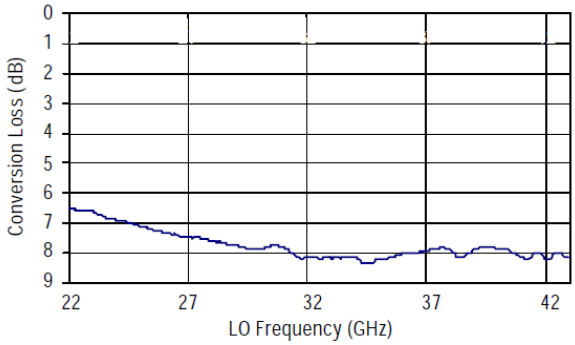


Figure 3. Conversion Loss with RF Freq. = 22 GHz (LO Drive = 16 dBm)

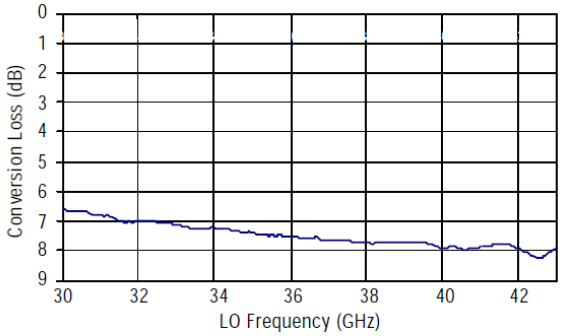


Figure 4. Conversion Loss with RF Freq. = 30 GHz (LO Drive = 16 dBm)

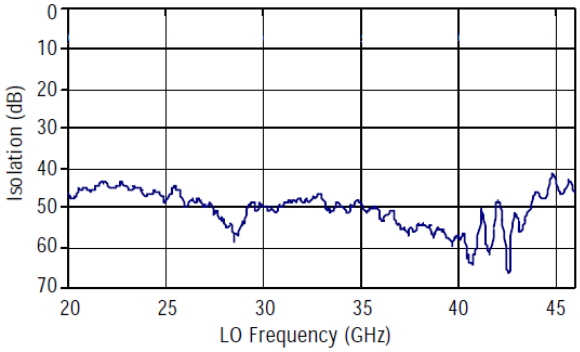


Figure 5. LO – RF Isolation (LO Drive = 16 dBm)

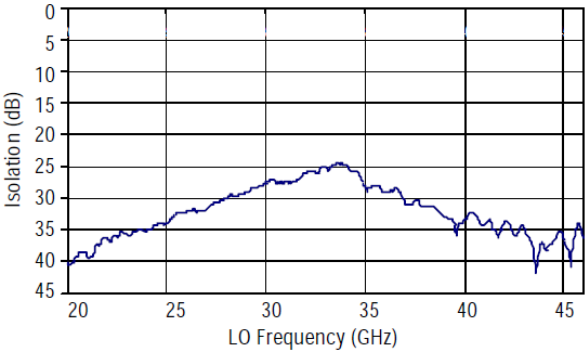


Figure 6. LO – IF Isolation (LO Drive = 16 dBm)

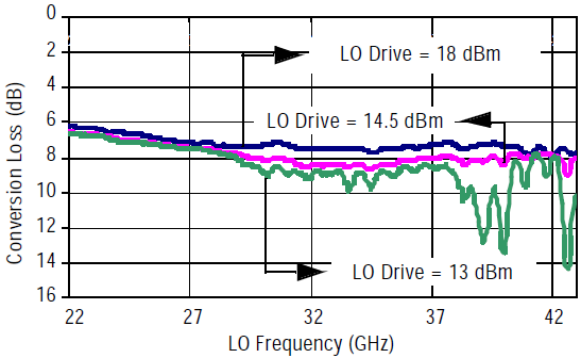


Figure 7. Conversion Loss for Various LO Drive Levels (RF Freq. = 22 GHz)

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.

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