8000–12000 MHz Dual-Channel Si T/R Beamformer Die

LCI-BF-8000-12000-2CH is a 2-channel Si beamformer bare die for 8000–12000 MHz, combining transmit and receive paths with digital phase and attenuation control.

Phase step: 5.625 ° (typical); Attenuation step: 0.5 dB (typical). Die dimensions: 3.6 × 2.7 × 0.15 mm.



RF characteristics

CLK = 50 MHz; RFVDD = AVDD = DVDD = 3.3 V; TA = +27 °C

Parameter	Symbol	Minimum	Typical	Maximum	Value	Unit
Operating frequency	-	8000	-	12000	-	MHz
Phase-control resolution	-	-	-	-	6	bit
Attenuation-control resolution	-	-	-	-	6	bit
Phase shift range	-	0	-	360	-	°
Phase step	-	-	5.625	-	-	°
Attenuation step	-	-	0.5	-	-	dB

RF characteristics (RX)

CLK = 50 MHz; RFVDD = AVDD = DVDD = 3.3 V; TA = +27 °C; RXn → COM

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Small-signal gain @ 8000 MHz	-	-	3.8	-	dB
Small-signal gain @ 9000 MHz	-	-	3.6	-	dB
Small-signal gain @ 10000 MHz	-	-	2.7	-	dB
Small-signal gain @ 11000 MHz	-	-	1.9	-	dB
Small-signal gain @ 12000 MHz	-	-	0.6	-	dB
Noise figure @ 8000 MHz	-	-	5.8	-	dB
Noise figure @ 9000 MHz	-	-	5.4	-	dB
Noise figure @ 10000 MHz	-	-	6	-	dB
Noise figure @ 11000 MHz	-	-	6	-	dB
Noise figure @ 12000 MHz	-	-	6.8	-	dB
RMS phase error @ 8000 MHz	-	-	1.6	-	°
RMS phase error @ 9000 MHz	-	-	1.5	-	°
RMS phase error @ 10000 MHz	-	-	1.9	-	°
RMS phase error @ 11000 MHz	-	-	2	-	°
RMS phase error @ 12000 MHz	-	-	2.4	-	°

RF characteristics (RX)

CLK = 50 MHz; RFVDD = AVDD = DVDD = 3.3 V; TA = +27 °C; RXn → COM

Parameter	Symbol	Minimum	Typical	Maximum	Unit
RMS attenuation error @ 8000 MHz	-	-	0.3	-	dB
RMS attenuation error @ 9000 MHz	-	-	0.3	-	dB
RMS attenuation error @ 10000 MHz	-	-	0.6	-	dB
RMS attenuation error @ 11000 MHz	-	-	0.2	-	dB
RMS attenuation error @ 12000 MHz	-	-	0.5	-	dB

RF characteristics (TX)

CLK = 50 MHz; RFVDD = AVDD = DVDD = 3.3 V; TA = +27 °C; COM → CHn_TXDR

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Small-signal gain @ 8000 MHz	-	-	15.6	-	dB
Small-signal gain @ 9000 MHz	-	-	14.9	-	dB
Small-signal gain @ 10000 MHz	-	-	14.5	-	dB
Small-signal gain @ 11000 MHz	-	-	12.3	-	dB
Small-signal gain @ 12000 MHz	-	-	10.9	-	dB
RMS phase error @ 8000 MHz	-	-	2.9	-	°
RMS phase error @ 9000 MHz	-	-	3.5	-	°
RMS phase error @ 10000 MHz	-	-	2.5	-	°
RMS phase error @ 11000 MHz	-	-	2.7	-	°
RMS phase error @ 12000 MHz	-	-	2.9	-	°

RF characteristics (TX)

CLK = 50 MHz; RFVDD = AVDD = DVDD = 3.3 V; TA = +27 °C

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Output 1 dB compression power @ 8000 MHz	-	-	14.7	-	dBm
Output 1 dB compression power @ 9000 MHz	-	-	15	-	dBm
Output 1 dB compression power @ 10000 MHz	-	-	15.5	-	dBm
Output 1 dB compression power @ 11000 MHz	-	-	15.5	-	dBm

RF characteristics (TX)

CLK = 50 MHz; RFVDD = AVDD = DVDD = 3.3 V; TA = +27 °C

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Output 1 dB compression power @ 12000 MHz	-	-	14.7	-	dBm
Saturated output power @ 8000 MHz	-	-	17.2	-	dBm
Saturated output power @ 9000 MHz	-	-	17.2	-	dBm
Saturated output power @ 10000 MHz	-	-	17.5	-	dBm
Saturated output power @ 11000 MHz	-	-	17.5	-	dBm
Saturated output power @ 12000 MHz	-	-	16.8	-	dBm
RMS attenuation error @ 8000 MHz	-	-	0.4	-	dB
RMS attenuation error @ 9000 MHz	-	-	0.3	-	dB
RMS attenuation error @ 10000 MHz	-	-	0.7	-	dB
RMS attenuation error @ 11000 MHz	-	-	0.3	-	dB
RMS attenuation error @ 12000 MHz	-	-	0.7	-	dB

DC bias and current

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating voltage	-	3	3.3	3.6	V
Operating current [1]	-	-	0.156	-	A
Operating current [2]	-	-	0.21	-	A
Operating current [3]	-	-	0.013	-	A

[1] RX; n = 1 / 2

[2] TX; n = 1 / 2

[3] STBY; n = 1 / 2

Environmental specifications

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Storage temperature	-	-65	-	150	°C
Operating temperature	-	-55	-	85	°C

Bond-pad assignments (1–32)

Pins	Symbol	Function	Notes
1	DVDD1	Power supply	3.3 V
2, 3	DGND1 / DGND2	Ground	-
4	DVDD2	Power supply	No external connection required
5	RST	Reset	-
6	RST_SEL	Control input	-
7	CLK	Clock	-
8	DATA	Serial data input	-
9	DEN	Enable	-
10	LE	Enable	-
11	T	Control input	-
12	R	Control input	-
13	TR	Switch control	-
14	EN	Enable	-
15	MD	Load mode	-
16	LADDR	Address input	-
17	RD	Control input	-
18	DOUT	Serial data output	-
19	OEN	Enable	-
20	ODSELN	Enable	-
21	CFGDIN	Serial data input	-
22	CFGEN	Enable	-
23	CFGDOUT	Serial data output	-
24, 25, 26	AGND	Ground	-
27	AVND	Power supply	3.3 V
28, 29	AVDD	Power supply	3.3 V

Bond-pad assignments (1–32)

Pins	Symbol	Function	Notes
30	CLK_EXT	Clock	ADC
31	VDET_UV_RIN	Control input	VDET_UV
32	VDET_OV_RIN	Control input	VDET_OV

Bond-pad assignments (33–65)

Pins	Symbol	Function	Notes
33	CH2_D27	Control output	CH2
34	CH2_D26	Control output	CH2
35	CH2_SWL	Control output	CH2
36	CH2_SWT	Control output	CH2
37	CH2_SWR	Control output	CH2
38	CH2_RXDR	Control output	CH2
39, 40, 52, 53	RFVDD	Power supply	3.3 V
41, 43, 44, 45, 46, 47, 48, 50, 63, 65	RFGND	Ground	-
42	R2	RF input	CH2
49	T2	RF output	CH2
51	CH2_TXDR	Control output	CH2
54	CFGDOUT_B	Serial data output	-
55	CFGEN_B	Enable	-
56	CFGDIN_B	Serial data input	-
57	ODSELN_B	Enable	-
58	OEN_B	Enable	-
59	DOUT_B	Serial data output	-
60	RD_B	Control	-
61	LADDR_B	Address input	-
62	MD_B	Load mode	-
64	COM	Common RF port	-

Bond-pad assignments (66–98)

Pins	Symbol	Function	Notes
66	EN_B	Enable	-
67	TR_B	Switch control	-
68	R_B	Control input	-
69	T_B	Control input	-
70	LE_B	Enable	-
71	DEN_B	Enable	-
72	DATA_B	Serial data input	-
73	CLK_B	Clock	-
74	RST_SEL_B	Control input	-
75	RST_B	Reset	-
76, 77, 89, 90	RFVDD	Power supply	3.3 V
78	CH1_TXDR	Control output	CH1
79, 81, 82, 83, 84, 85, 86, 88	RFGND	Ground	-
80	T1	RF output	CH1
87	R1	RF input	CH1
91	CH1_RXDR	Control output	CH1
92	CH1_SWR	Control output	CH1
93	CH1_SWT	Control output	CH1
94	CH1_SWL	Control output	CH1
95	CH1_D26	Control output	CH1
96	CH1_D27	Control output	CH1
97	DVDD_OUT	Power supply	Wire-bond to DVDD2
98	VREF_VOUT	Monitor output	VREF

Control interface (1)

Pins	Symbol	Function	Notes
DEN / DEN_B	DEN / DEN_B	Enable	CLK↑
DATA / DATA_B	DATA / DATA_B	Serial data input	-

Control interface (1)

Pins	Symbol	Function	Notes
CLK / CLK_B	CLK / CLK_B	Clock	Data input: CLK↓; data output: CLK↑
LE / LE_B	LE / LE_B	Enable	CLK↑; 6 bit
RD / RD_B	RD / RD_B	Control input	CLK↑
MD / MD_B	MD / MD_B	Load mode	-
LADDR / LADDR_B	LADDR / LADDR_B	Address input	16 bit

Control interface (2)

Pins	Symbol	Function	Notes
OEN / OEN_B	OEN / OEN_B	Enable	1 = Z; 0 = DOUT
ODSELN / ODSELN_B	ODSELN / ODSELN_B	Enable	OEN = 0; ODSELN = 0: Open-drain; External pull-up resistor required
EN / EN_B	EN / EN_B	Enable	1: SWLn = 1; TXn = 0; RXn = 0; n = 1, 2
RST / RST_B	RST / RST_B	Reset	0

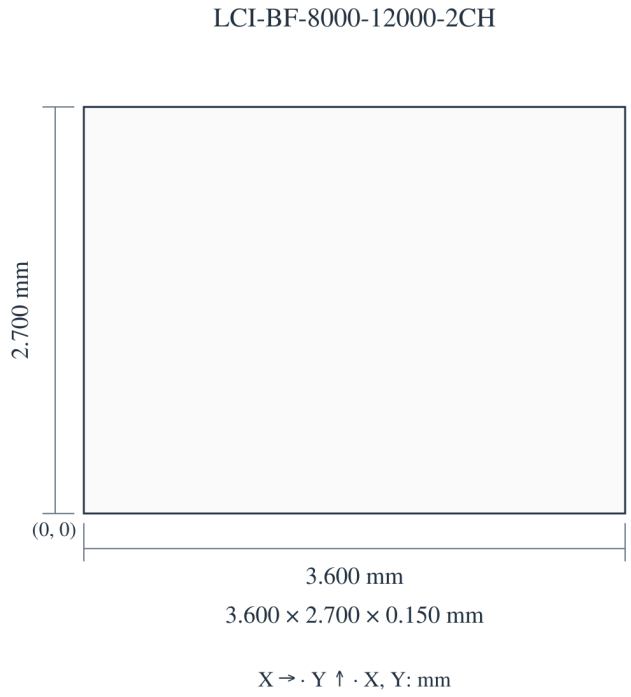
Control interface (3)

Pins	Symbol	Function	Notes
T / T_B	T / T_B	Control input	TX
R / R_B	R / R_B	Control input	RX
TR / TR_B	TR / TR_B	Switch control	TX / RX
CFGEN / CFGEN_B	CFGEN / CFGEN_B	Enable	0
CFGDIN	CFGDIN	Serial data input	CLK↓
DOUT / DOUT_B	DOUT / DOUT_B	Serial data output	CLK↑
CFGDOUT / CFGDOUT_B	CFGDOUT / CFGDOUT_B	Serial data output	CLK↑

Die dimensions

Parameter	Value	Unit
Die dimensions	3.6 × 2.7 × 0.15	mm

Partial dimensional reference in mm. Fabrication and wire bonding require complete drawings.



Current publication record · 1.6 · 2026-11-12. Product description or editorial content updated. Replaces revision 1.5.

Die integration and bias sequencing

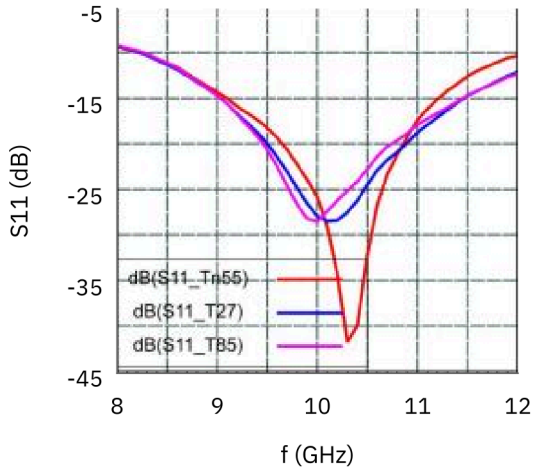
Control interface: Serial control / SPI.

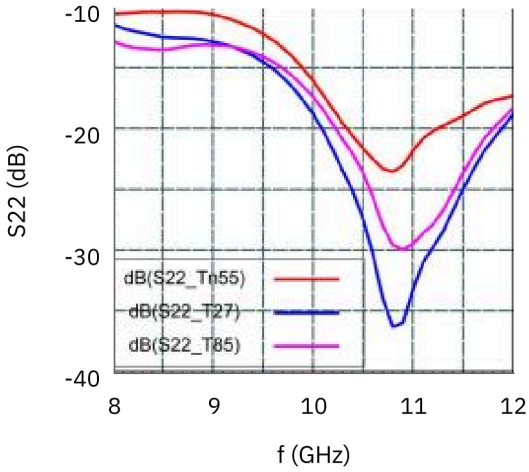
Performance curves

Each performance plot applies to its stated operating conditions.

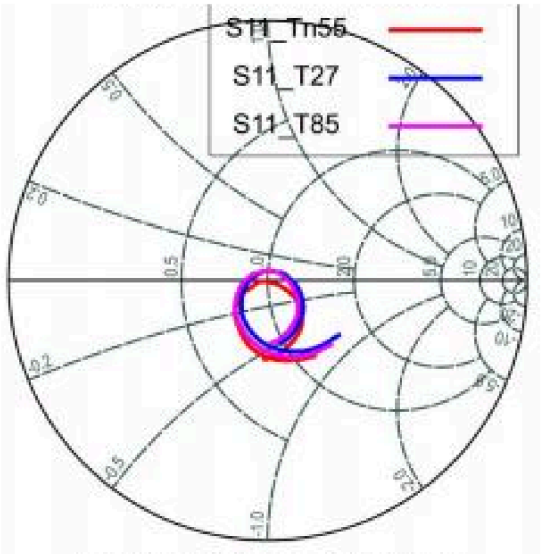
Rx — Input matching; Output matching; Smith chart.

Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system. S11 / S22 (dB).



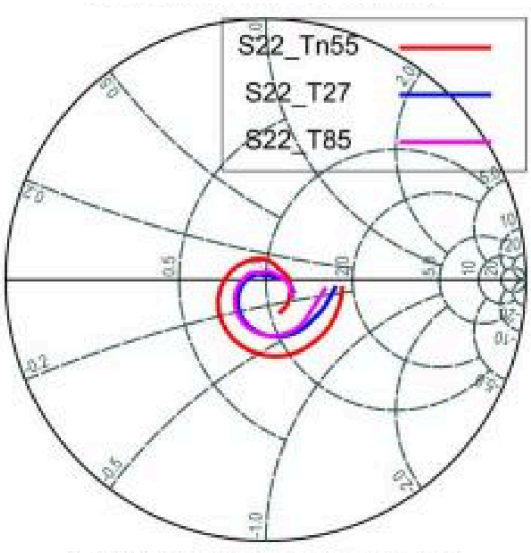


S11



f = 8–12 GHz

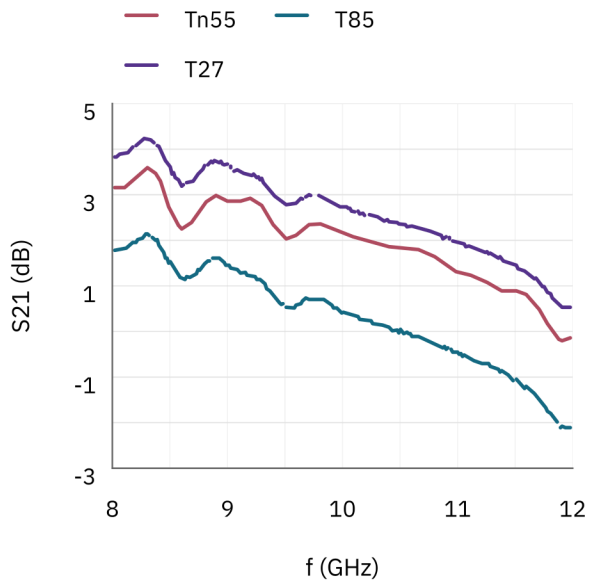
S22

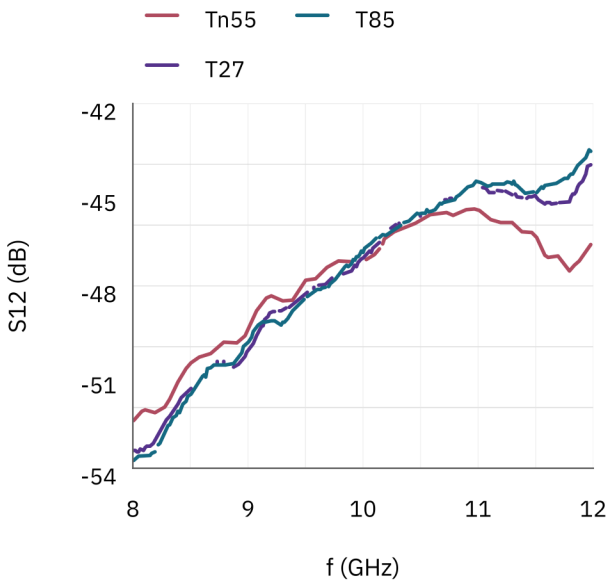


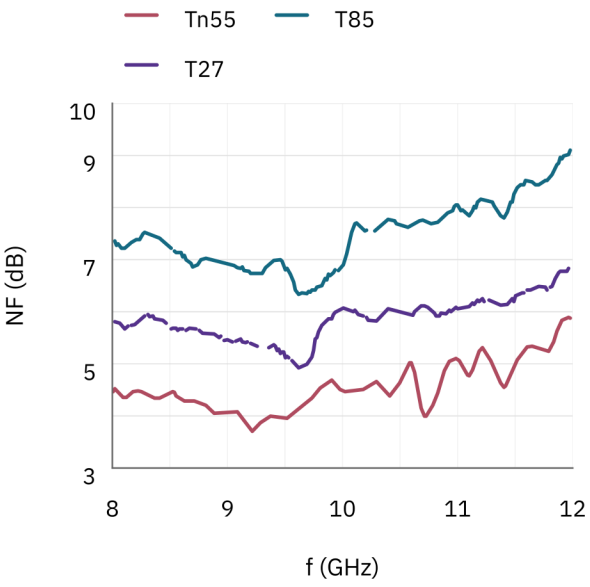
f = 8–12 GHz

Rx — S21; S12; Noise figure.

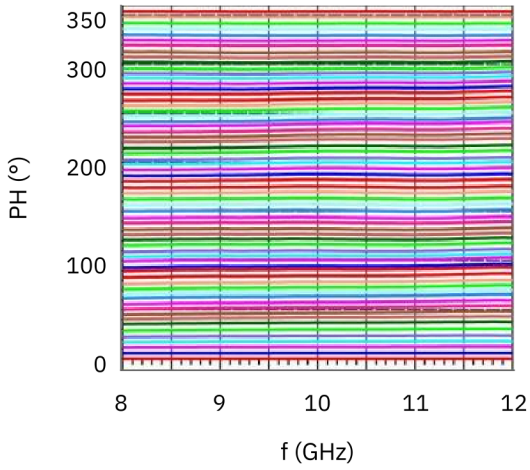
Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. Readings are approximate. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system.

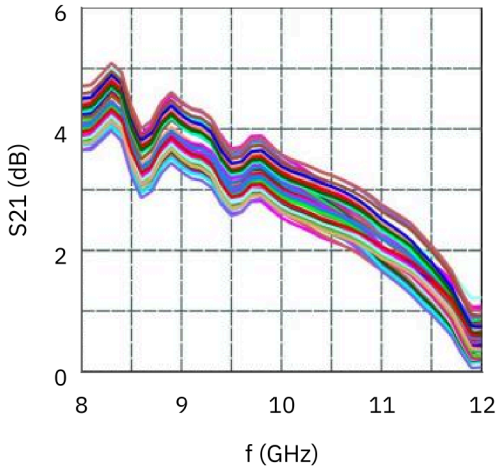


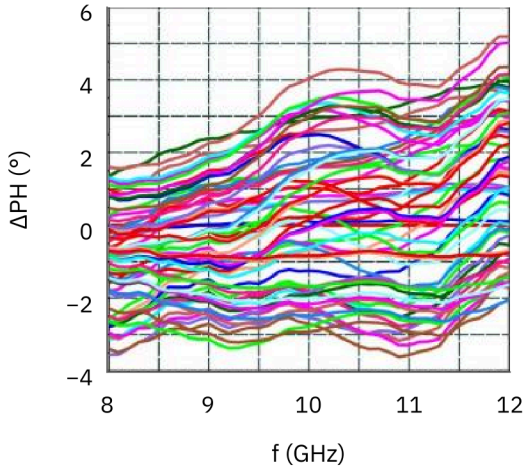


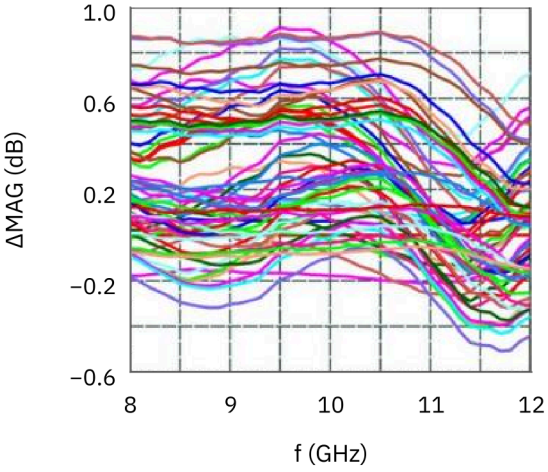


Rx — Phase shift; S21; Phase error; Amplitude error. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. PH denotes “Normal Phase”. ΔPH and ΔMAG compare phase and magnitude with the ideal states; they are not RMS errors.

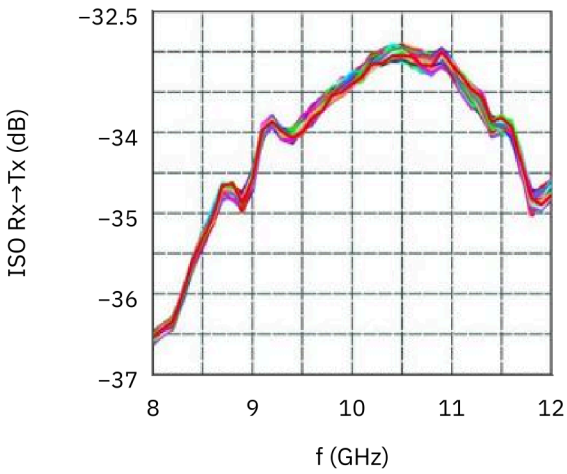


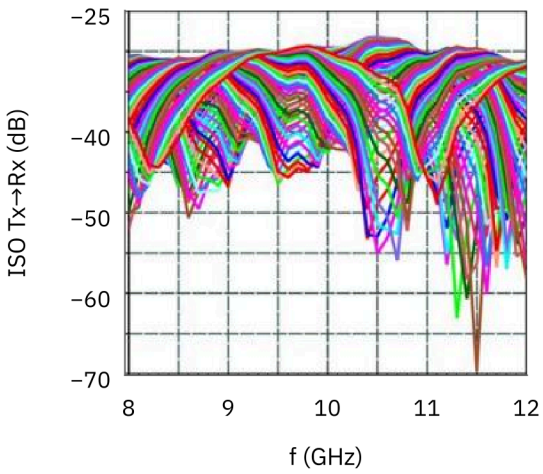


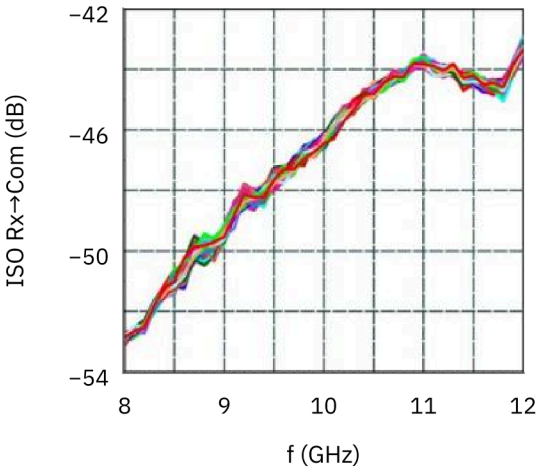


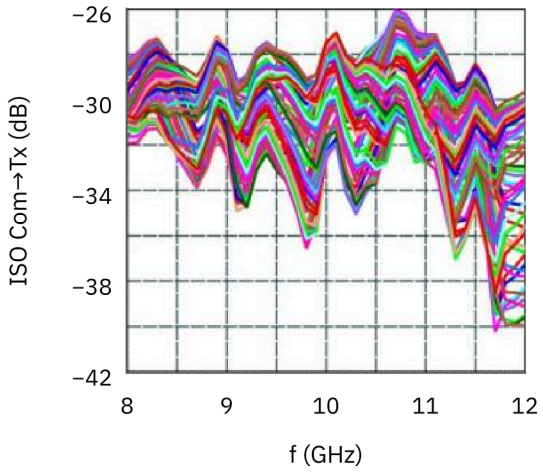


Rx — Isolation. The Tn55, T27 and T85 trace labels do not specify numeric temperatures.

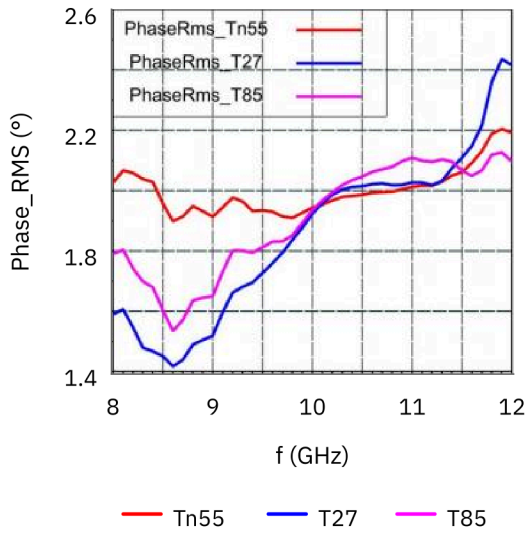


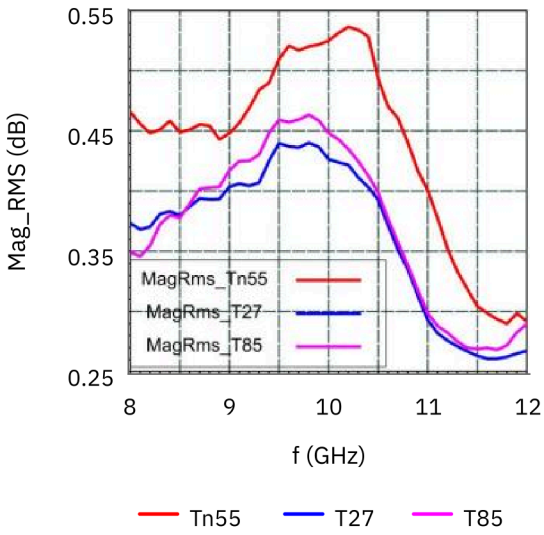


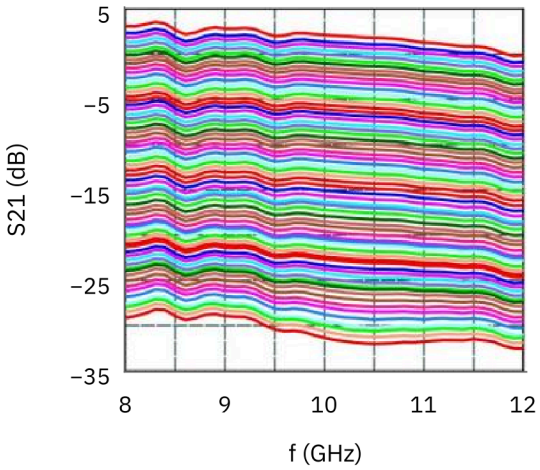


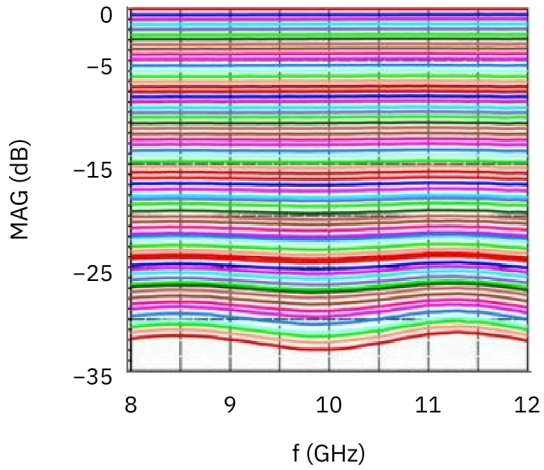


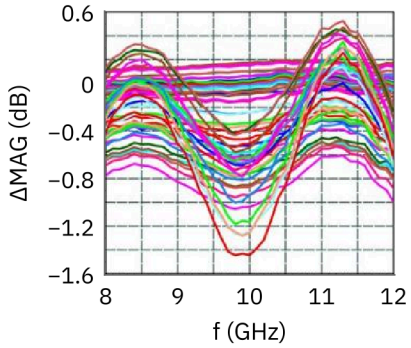
Phase_RMS (°); Mag_RMS (dB); S21 (dB); MAG (dB). The Tn55, T27 and T85 trace labels do not specify numeric temperatures.

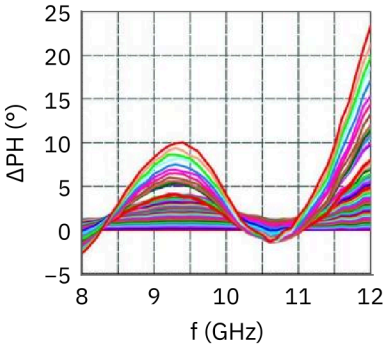


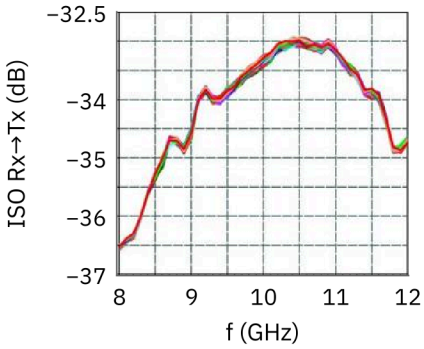


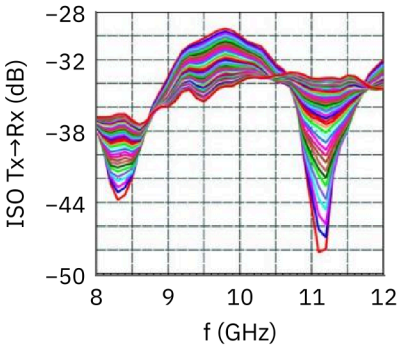


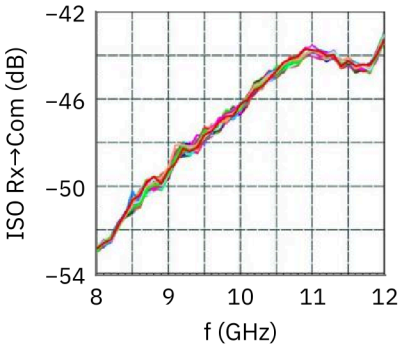


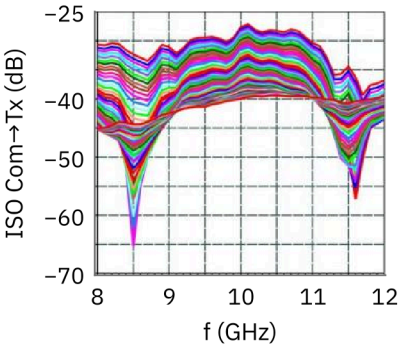








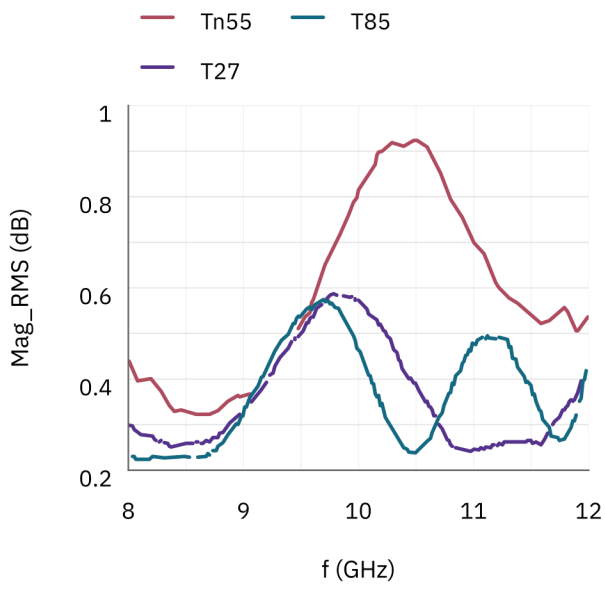


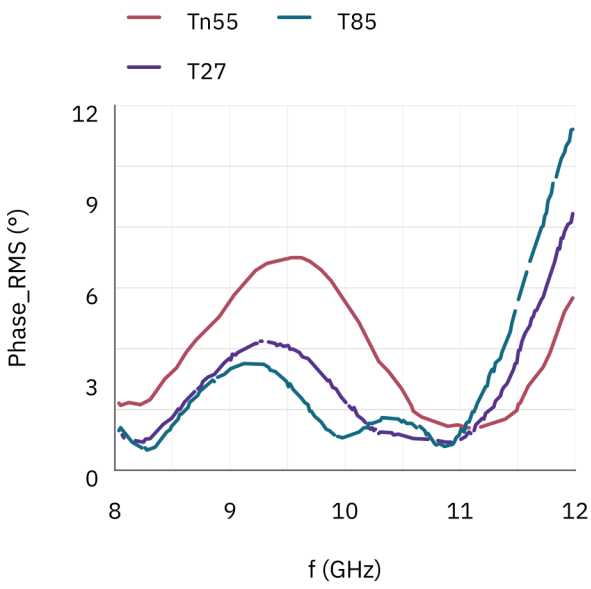


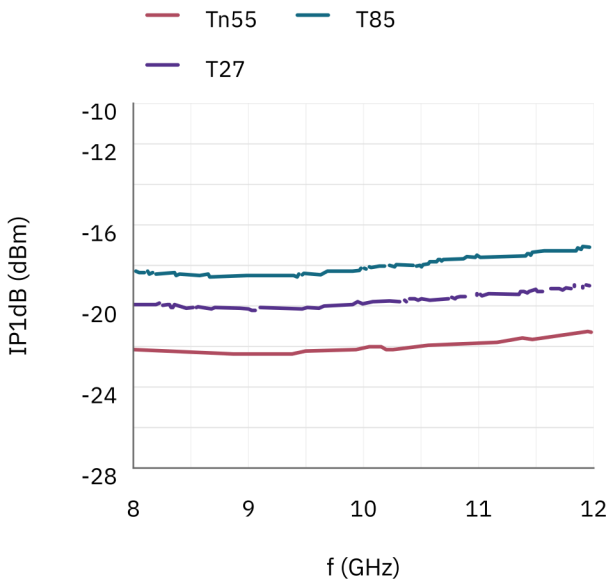
ΔMAG (dB); ΔPH (°); ISO Rx→Tx / Tx→Rx / Rx→Com / Com→Tx (dB). The Tn55, T27 and T85 trace labels do not specify numeric temperatures. PH denotes “Normal Phase”. ΔPH and ΔMAG compare phase and magnitude with the ideal states; they are not RMS errors.

Mag_RMS (dB); Phase_RMS (°); IP1dB (dBm).

Readings are approximate. The Tn55, T27 and T85 trace labels do not specify numeric temperatures.

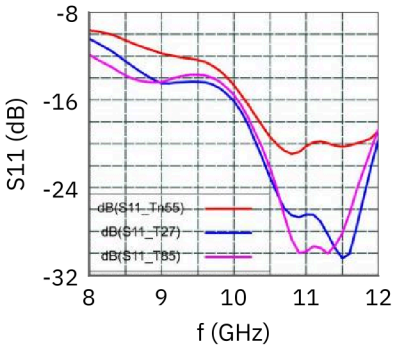


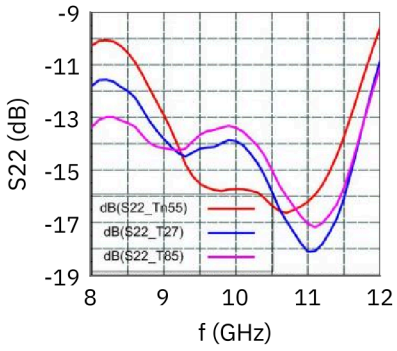


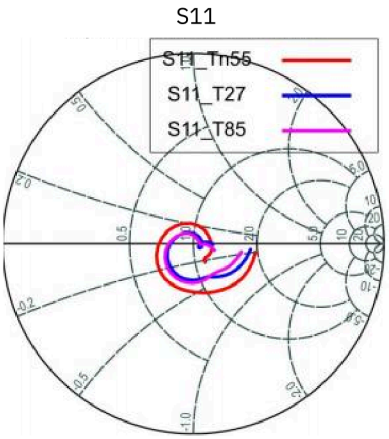


Tx — Input matching; Output matching; Smith chart; S21; S12.

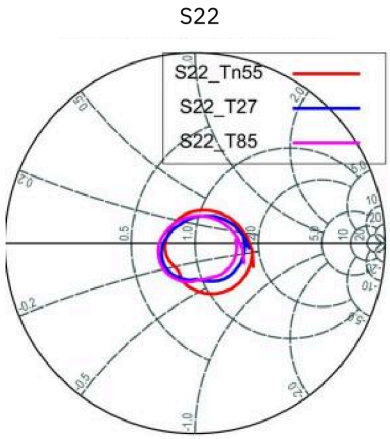
Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system. S11 / S22 (dB).



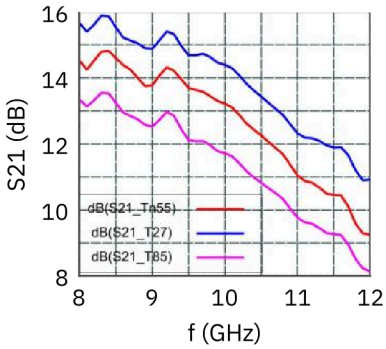


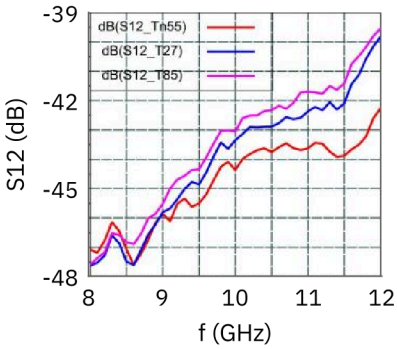


f = 8–12 GHz



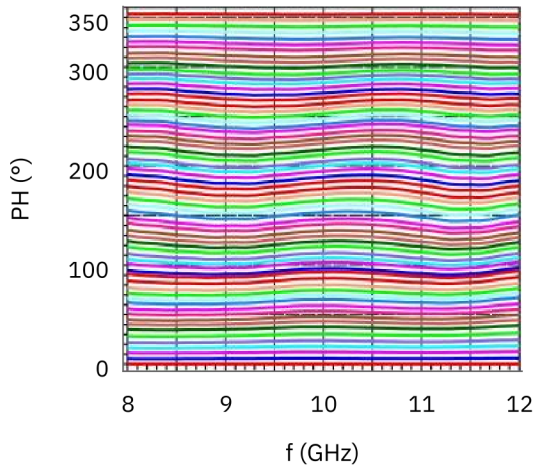
f = 8–12 GHz

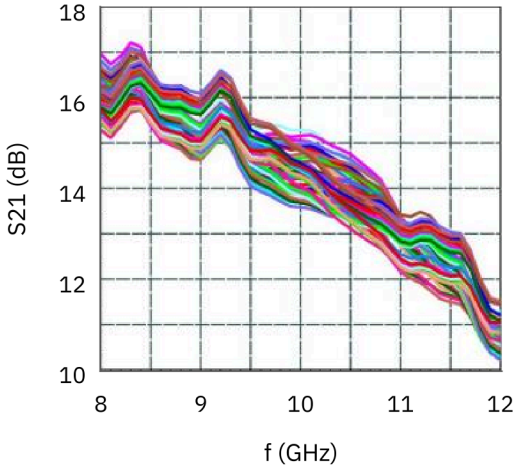


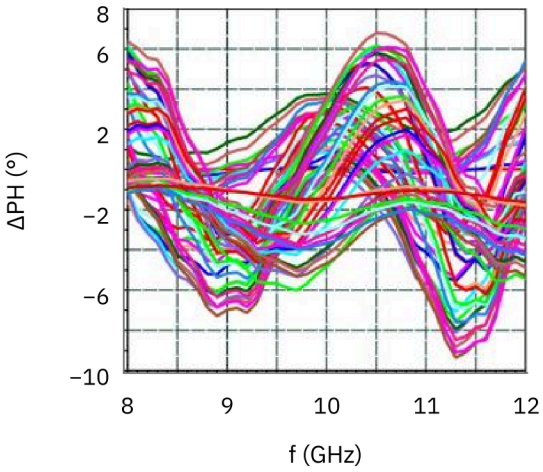


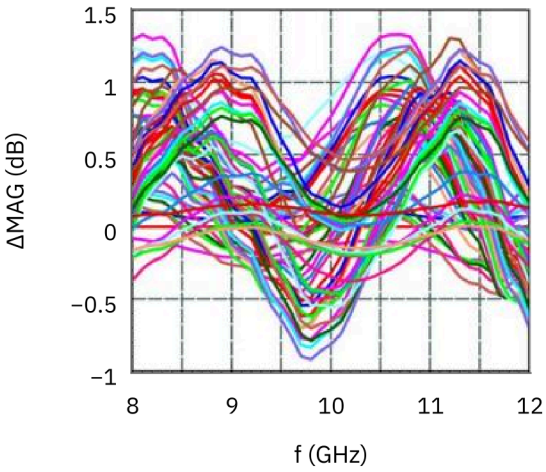
Tx — Phase shift; S21; Phase error; Amplitude error.

Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system. PH denotes “Normal Phase”. ΔPH and ΔMAG compare phase and magnitude with the ideal states; they are not RMS errors.



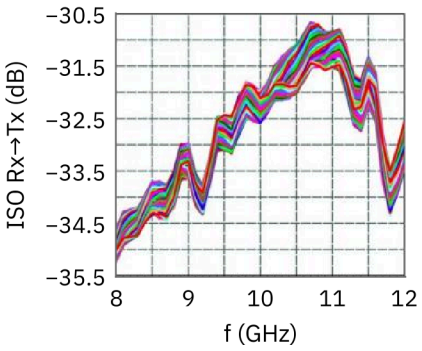


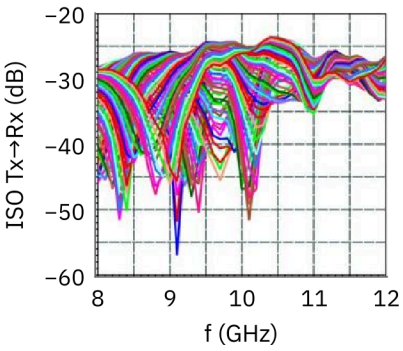


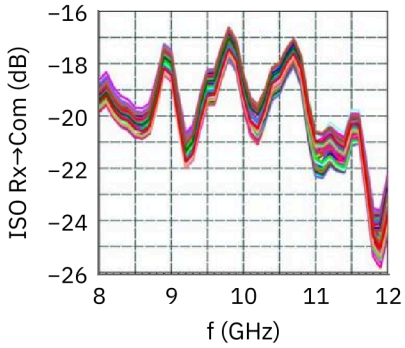


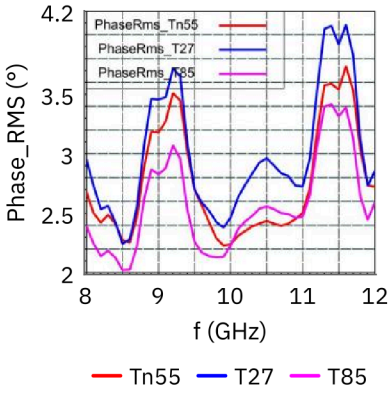
Tx — Isolation; RMS phase error; Amplitude error (RMS).

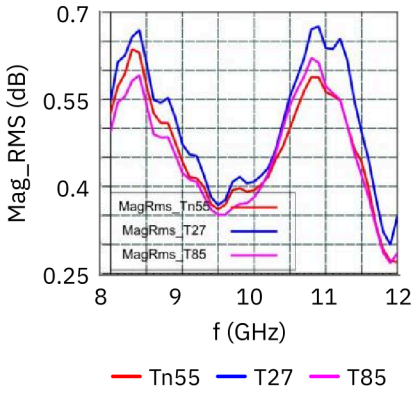
Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system.





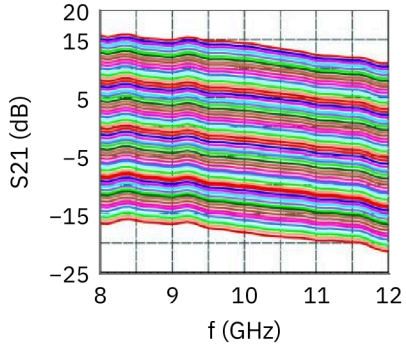


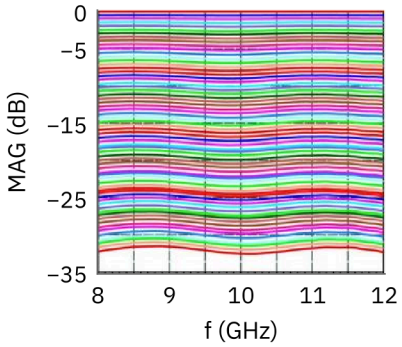


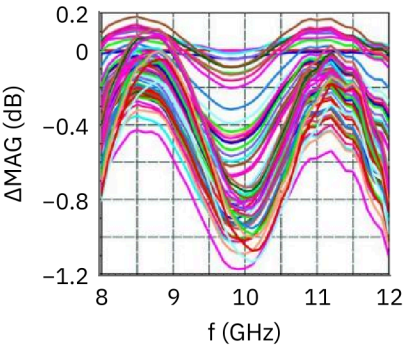


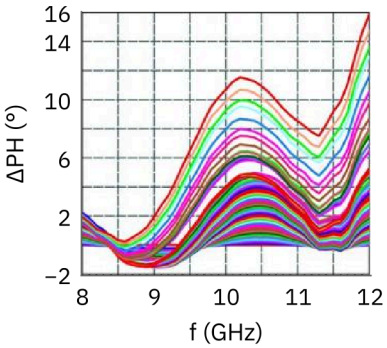
Tx — S21 (dB); MAG (dB); ΔMAG (dB); ΔPH (°); ISO Rx→Tx / Tx→Rx (dB).

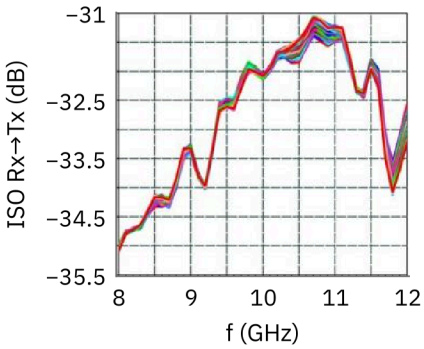
Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system. PH denotes “Normal Phase”. ΔPH and ΔMAG compare phase and magnitude with the ideal states; they are not RMS errors.

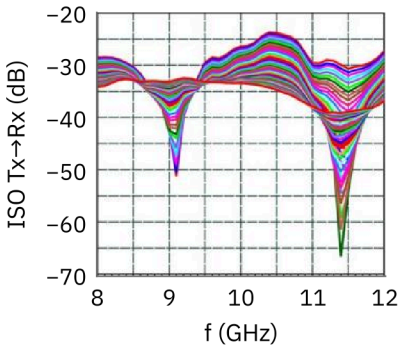






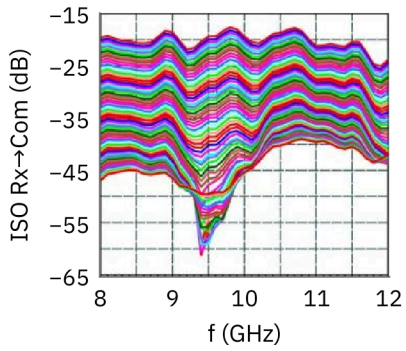


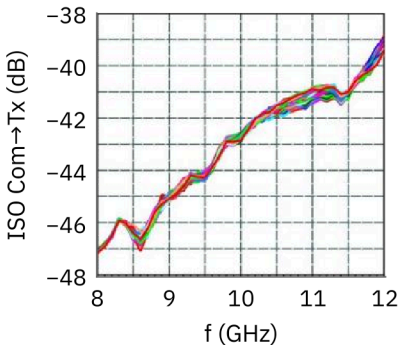


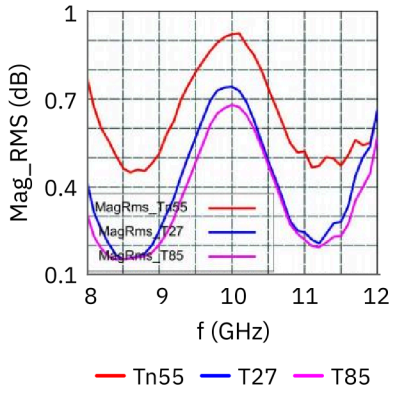


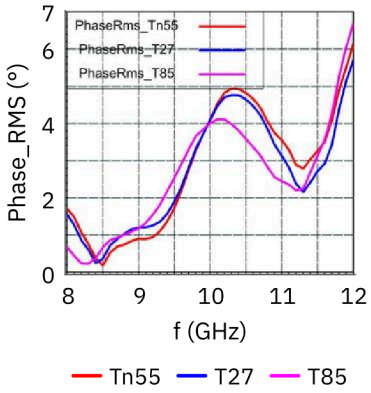
Tx — ISO Rx→Com / Com→Tx (dB); Mag_RMS (dB); Phase_RMS (°); OP1dB (dBm); OP3dB (dBm).

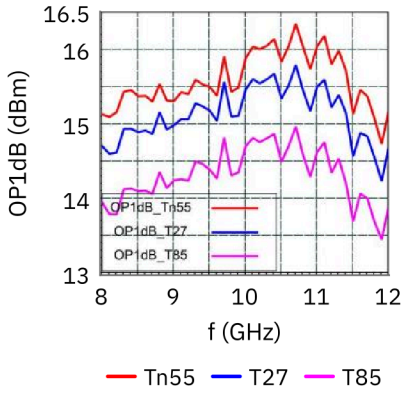
Figure notes: RFVDD=3.3V; DVDD=3.3V; TA=+27°C. The Tn55, T27 and T85 trace labels do not specify numeric temperatures. 50 Ω system.

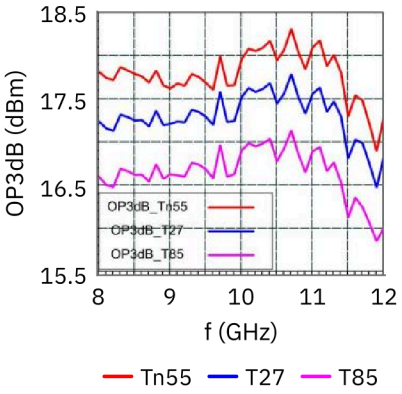












Document notice

Specifications are subject to revision. Before design release, confirm the current document revision and product-specific requirements with LCRF. The approved quotation and order documentation define the supplied configuration.