LTC6431-20 Details of Datasheet Revision

Overview of Datasheet Revision

ANALOG DEVICES
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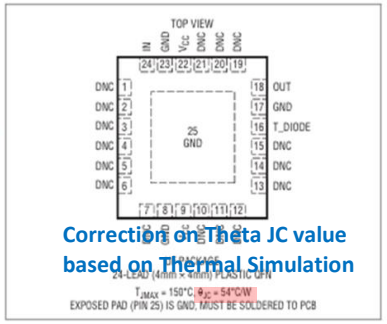
ABSOLUTE MAXIMUM RATINGS

(Note 1)

Total Supply Voltage (V_{CC} to GND).....5.5V
Amplifier Output Current (+OUT) 120mA
RF Input Power, Continuous, 50Ω (Note 2).....15dBm
RF Input Power, 100µs Pulse, 50Ω (Note 2) 20dBm
Operating Case Temperature Range
(T_{CASE}).....–40°C to 85°C
Storage Temperature Range .....–65°C to 150°C
Junction Temperature (T_J) ..... 150°C

Change Tcase Range:
-40C to 105C,

PIN CONFIGURATION



Correction on Theta JC value based on Thermal Simulation

ORDER INFORMATION

Change Tcase Range:
-40C to 105C,

LEAD FREE FINISH	TAPE AND REEL	PART MARKING*	PACKAGE DESCRIPTION	TEMPERATURE RANGE
LTC6431AIUF-20#PBF	LTC6431AIUF-20#TRPBF	43120	24-Lead (4mm × 4mm) Plastic QFN	–40°C to 85°C T_{CASE}
LTC6431BIUF-20#PBF	LTC6431BIUF-20#TRPBF	43120	24-Lead (4mm × 4mm) Plastic QFN	–40°C to 85°C T_{CASE}

Consult LTC Marketing for parts specified with wider operating temperature ranges. *The temperature grade is identified by a label on the shipping container.
Consult LTC Marketing for information on nonstandard lead based finish parts.

For more information on lead free part marking, go to: http://www.linear.com/leadfree/
For more information on tape and reel specifications, go to: http://www.linear.com/tapeandreel/

DC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. V_{CC} = 5V, Z_{SOURCE} = Z_{LOAD} = 50Ω. Typical measured DC electrical performance using Test Circuit A.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_S	Operating Supply Range		●	4.75	5.0	5.25	V
$I_{S(TOT)}$	Total Supply Current	All V_{CC} Pins Plus OUT		75	93	113	mA
			●	68		129	mA
$I_{S(OUT)}$	Total Supply Current to OUT Pin	Current to OUT		55	75	95	mA
			●	51		115	mA
I_{CC}	Current to V_{CC} Pin	Either V_{CC} Pin May Be Used		15	18	21	mA
			●	12.5		21.5	mA

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AC ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C (Note 3). V_{CC} = 5V, Z_{SOURCE} = Z_{LOAD} = 50Ω unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Frequency = 700 MHz						
S21	Power Gain	De-embedded to Package		20.8		dB
OIP3	Output Third-Order Intercept Point	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		40.7		dBm
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		39.7		dBm
IM3	Third-Order Intermodulation	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		–77.4		dBc
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		–75.4		dBc
HD2	Second Harmonic Distortion	P_{OUT} = 6dBm		–42.1		dBc
HD3	Third Harmonic Distortion	P_{OUT} = 6dBm		–60.7		dBc
P1dB	Output 1dB Compression Point			21.4		dBm
NF	Noise Figure	De-embedded to Package		3.2		dB
Frequency = 800MHz						
S21	Power Gain	De-embedded to Package		20.8		dB
OIP3	Output Third-Order Intercept Point	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		39.2		dBm
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		38.2		dBm
IM3	Third-Order Intermodulation	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		–74.4		dBc
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		–72.4		dBc
HD2	Second Harmonic Distortion	P_{OUT} = 6dBm		–40.5		dBc
HD3	Third Harmonic Distortion	P_{OUT} = 6dBm		–63.1		dBc
P1dB	Output 1dB Compression Point			21.3		dBm
NF	Noise Figure	De-embedded to Package		3.4		dB
Frequency = 900MHz						
S21	Power Gain	De-embedded to Package		20.8		dB
OIP3	Output Third-Order Intercept Point	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		38.5		dBm
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		37.5		dBm
IM3	Third-Order Intermodulation	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		–73.0		dBc
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		–71.0		dBc
HD2	Second Harmonic Distortion	P_{OUT} = 6dBm		–37.1		dBc
HD3	Third Harmonic Distortion	P_{OUT} = 6dBm		–60.4		dBc
P1dB	Output 1dB Compression Point			21.1		dBm
NF	Noise Figure	De-embedded to Package		3.7		dB
Frequency = 1000MHz						
S21	Power Gain	De-embedded to Package		20.8		dB
OIP3	Output Third-Order Intercept Point	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		37.5		dBm
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		36.5		dBm
IM3	Third-Order Intermodulation	P_{OUT} = 2dBm/Tone, Δf = 1MHz, A-Grade		–71.0		dBc
		P_{OUT} = 2dBm/Tone, Δf = 1MHz, B-Grade		–69.0		dBc
HD2	Second Harmonic Distortion	P_{OUT} = 6dBm		–36.9		dBc
HD3	Third Harmonic Distortion	P_{OUT} = 6dBm		–55.1		dBc
P1dB	Output 1dB Compression Point			20.8		dBc
NF	Noise Figure	De-embedded to Package		3.8		dB

Change Temp Range:
-40C to 105C,

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: Guaranteed by design and characterization. This parameter is not tested.

Note 3: The LTC6431-20 is guaranteed functional over the case operating temperature range of –40°C to 85°C.

Note 4: Small-signal parameters S and noise are de-embedded to the package pins, while large-signal parameters are measured directly from the circuit.

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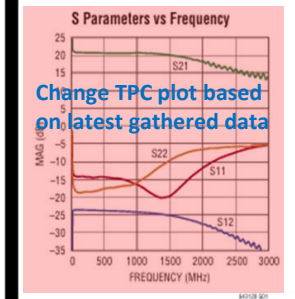
TYPICAL PERFORMANCE CHARACTERISTICS

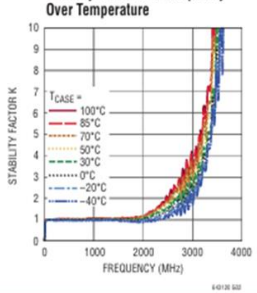
T_A = 25°C, V_{CC} = 5V, Z_{SOURCE} = Z_{LOAD} = 50Ω unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).

S Parameters vs Frequency

Change TPC plot based on latest gathered data

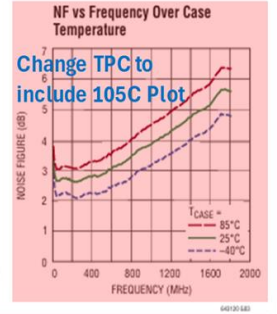


Stability Factor K vs Frequency Over Temperature



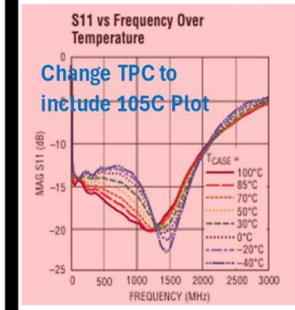
NF vs Frequency Over Case Temperature

Change TPC to include 105C Plot



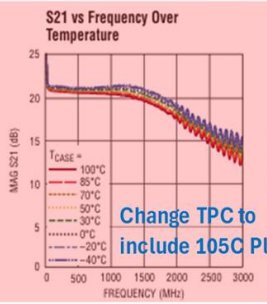
S11 vs Frequency Over Temperature

Change TPC to include 105C Plot



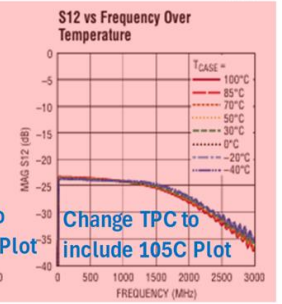
S21 vs Frequency Over Temperature

Change TPC to include 105C Plot



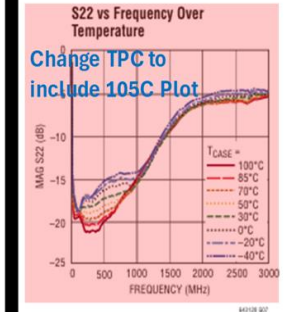
S12 vs Frequency Over Temperature

Change TPC to include 105C Plot

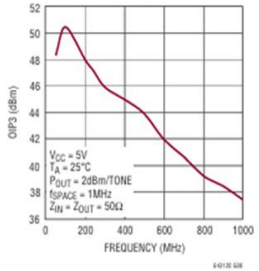


S22 vs Frequency Over Temperature

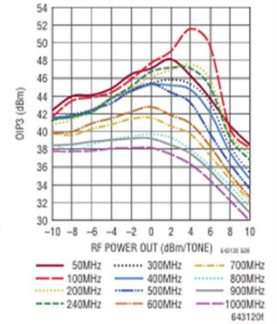
Change TPC to include 105C Plot



OIP3 vs Frequency



OIP3 vs Power Out Over Frequency



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Datasheet Revision: Page 2 (*Temp Range and Theta JC*)

ANALOG DEVICES
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LTC6431-20

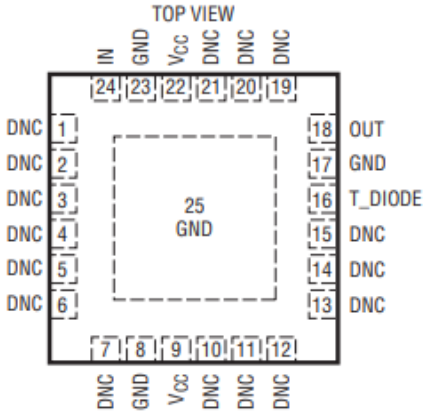
ABSOLUTE MAXIMUM RATINGS

(Note 1)

Total Supply Voltage (V_{CC} to GND).....5.5V
Amplifier Output Current (+OUT) 120mA
RF Input Power, Continuous, 50Ω (Note 2).....15dBm
RF Input Power, 100µs Pulse, 50Ω (Note 2) 20dBm
Operating Case Temperature Range
(T_{CASE}).....–40°C to 85°C
Storage Temperature Range .....–65°C to 150°C
Junction Temperature (T_J) ..... 150°C

Change 85°C to 105°C

PIN CONFIGURATION



UF PACKAGE
24-LEAD (4mm × 4mm) PLASTIC QFN
T_{JMAX} = 150°C, θ_{JC} = 54°C/W
EXPOSED PAD (PIN 25) IS GND, MUST BE SOLDERED TO PCB

Change 54°C/W to 4.8°C/W

ORDER INFORMATION

LEAD FREE FINISH	TAPE AND REEL	PART MARKING*	PACKAGE DESCRIPTION	TEMPERATURE RANGE
LTC6431AIUF-20#PBF	LTC6431AIUF-20#TRPBF	43120	24-Lead (4mm × 4mm) Plastic QFN	–40°C to 85°C T_{CASE}
LTC6431BIUF-20#PBF	LTC6431BIUF-20#TRPBF	43120	24-Lead (4mm × 4mm) Plastic QFN	–40°C to 85°C T_{CASE}

Change 85°C to 105°C

Change 85°C to 105°C

Consult LTC Marketing for parts specified with wider operating temperature ranges. *The temperature grade is identified by a label on the shipping container.
Consult LTC Marketing for information on nonstandard lead based finish parts.

For more information on lead free part marking, go to: http://www.linear.com/leadfree/
For more information on tape and reel specifications, go to: http://www.linear.com/tapeandreel/

Datasheet Revision: Page 5 *(Note 3)*

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: Guaranteed by design and characterization. This parameter is not tested.

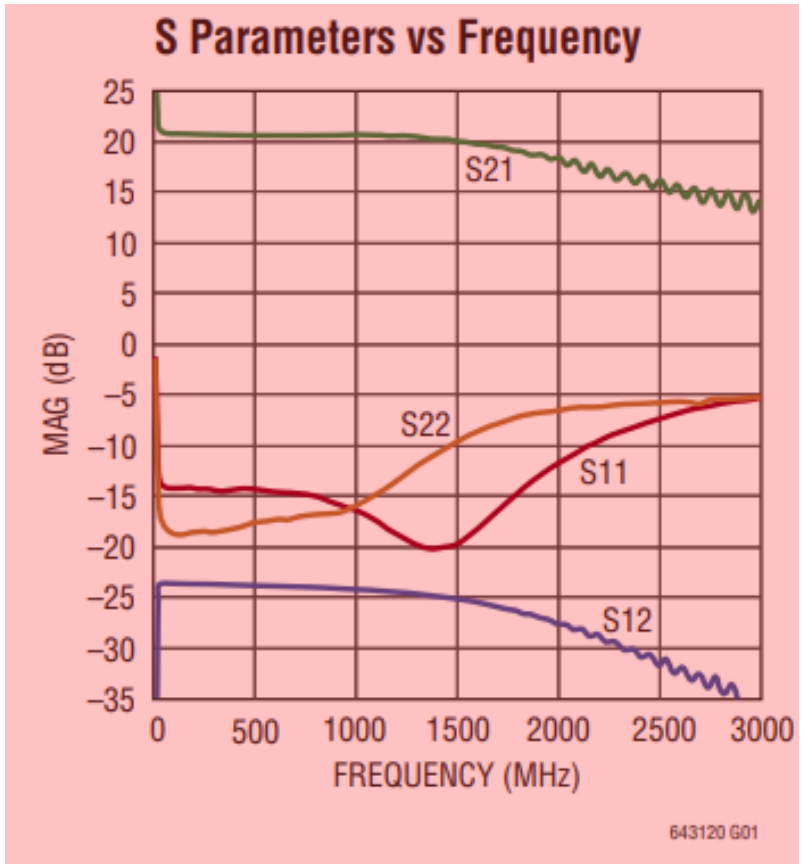
Note 3: The LTC6431-20 is guaranteed functional over the case operating temperature range of –40°C to 85°C. **Change 85°C to 105°C**

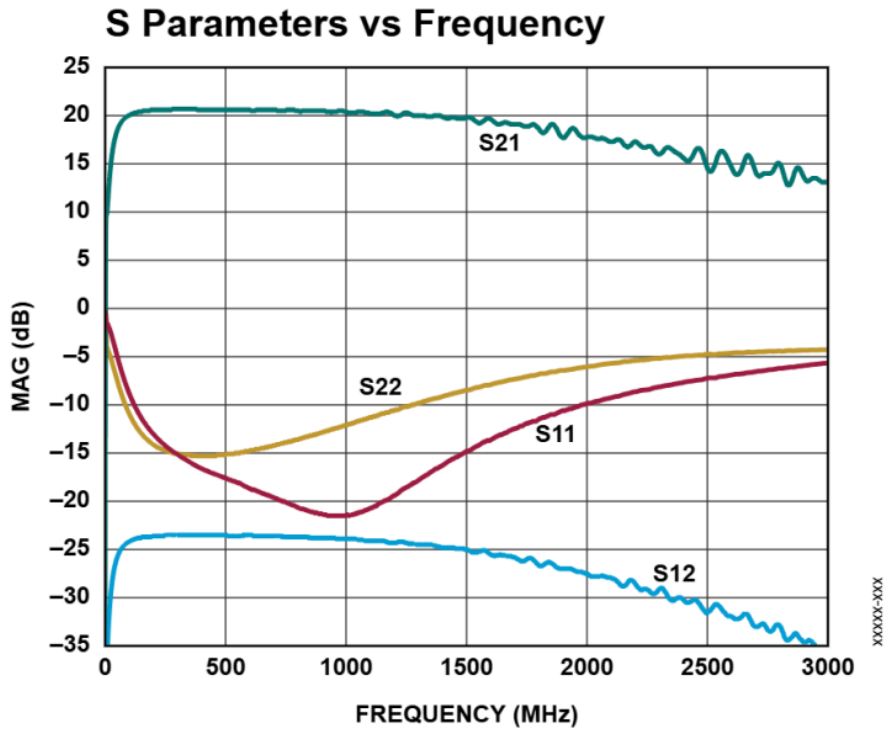
Note 4: Small-signal parameters S and noise are de-embedded to the package pins, while large-signal parameters are measured directly from the circuit.

Datasheet Revision: Page 6 (*S-Parameters vs. Freq*)

LTC6431-20

TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 5V$, $Z_{SOURCE} = Z_{LOAD} = 50\Omega$ unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).



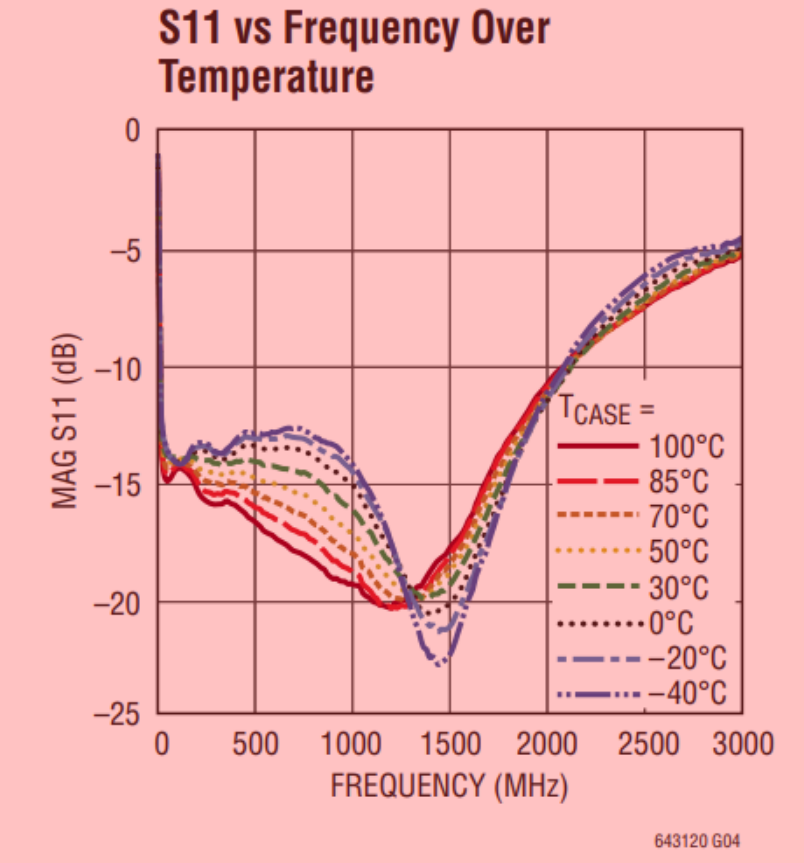


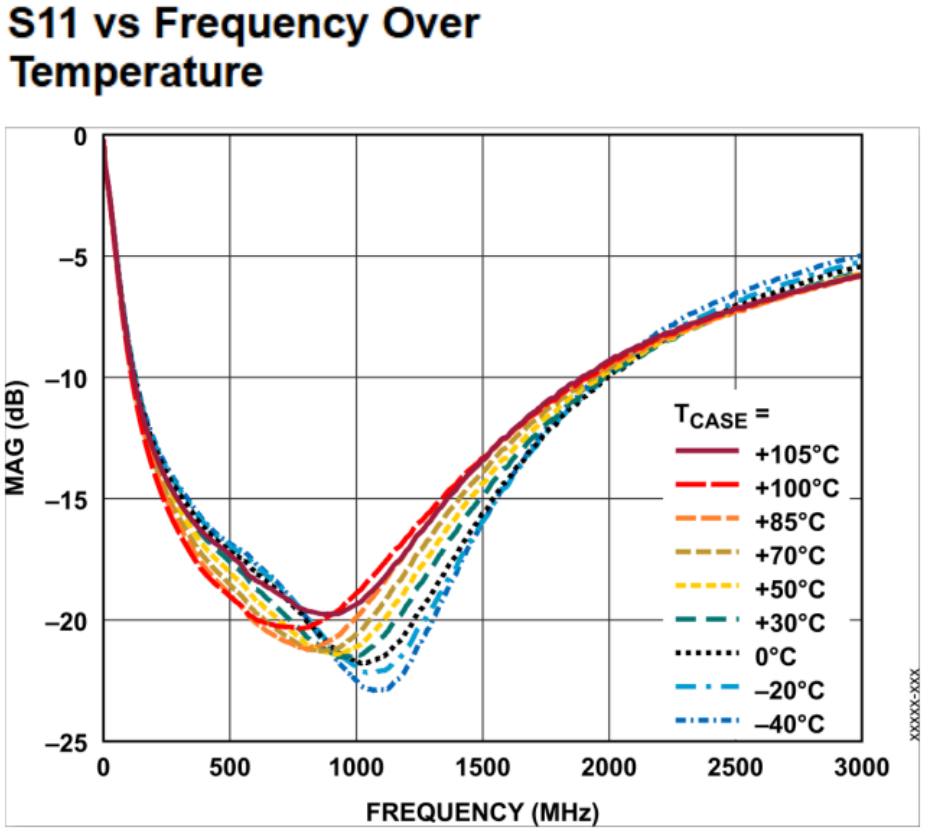
Change the TPC plot based on latest gathered bench data.

Datasheet Revision: Page 6 (*S11 vs. Freq over Temp*)

LTC6431-20

TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 5V$, $Z_{SOURCE} = Z_{LOAD} = 50\Omega$ unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).



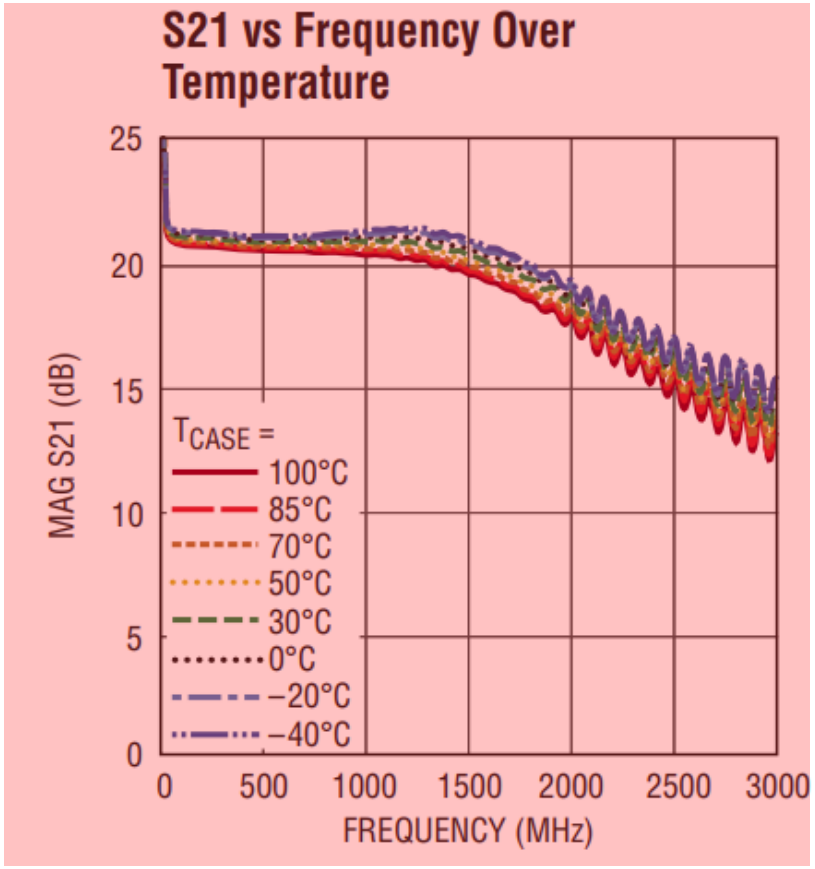


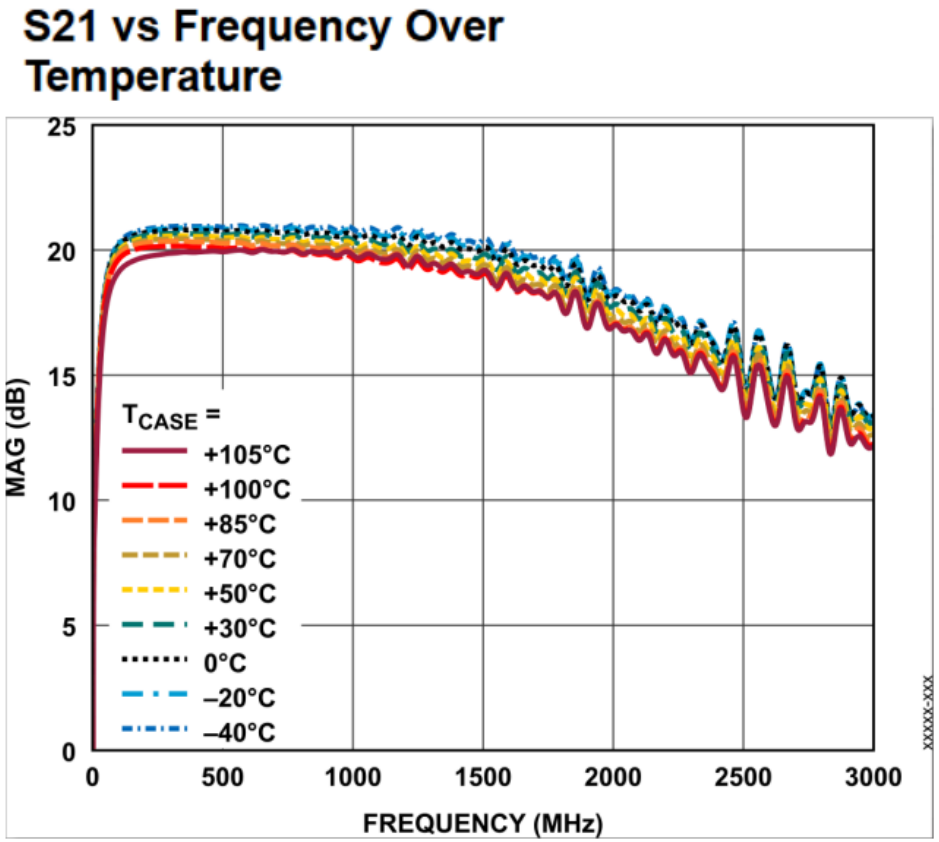
Change the TPC plot to add 105C plot based on customer requirement.

Datasheet Revision: Page 6 (*S21 vs. Freq over Temp*)

LTC6431-20

TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 5V$, $Z_{SOURCE} = Z_{LOAD} = 50\Omega$ unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).



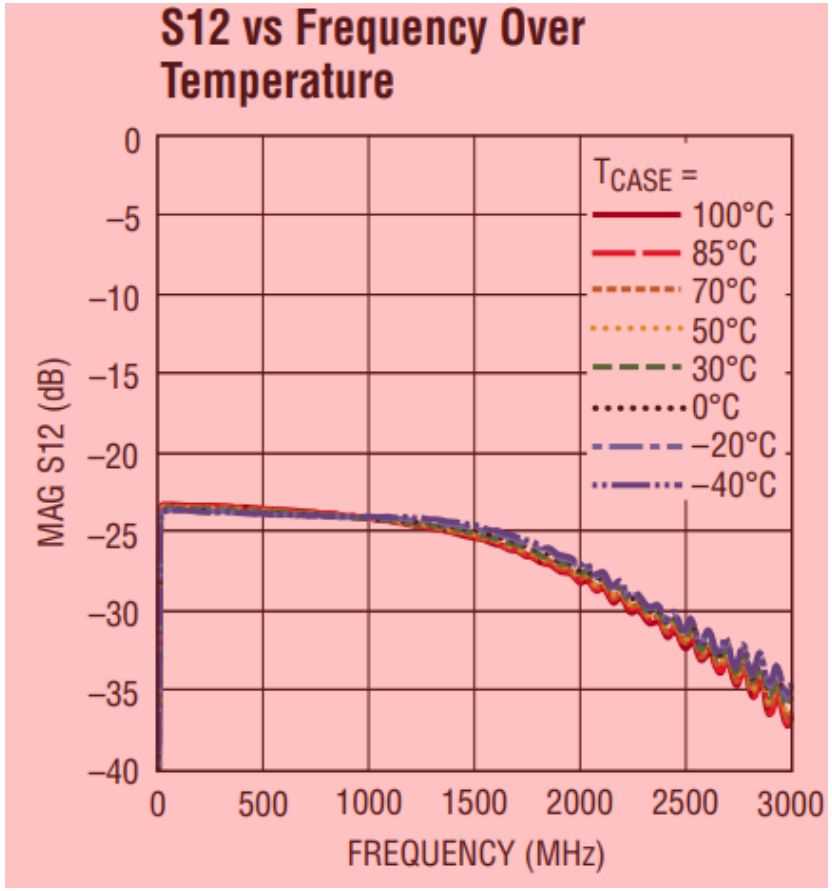


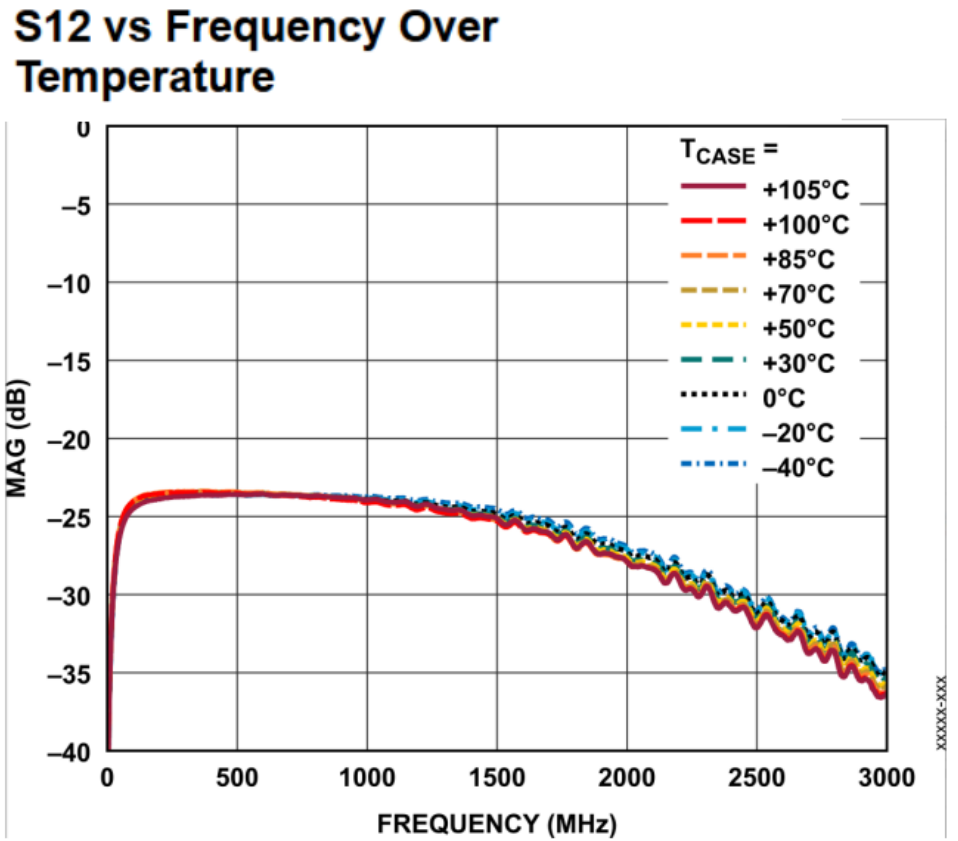
Change the TPC plot to add 105C plot based on customer requirement.

Datasheet Revision: Page 6 (*S12 vs. Freq over Temp*)

LTC6431-20

TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 5V$, $Z_{SOURCE} = Z_{LOAD} = 50\Omega$ unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).



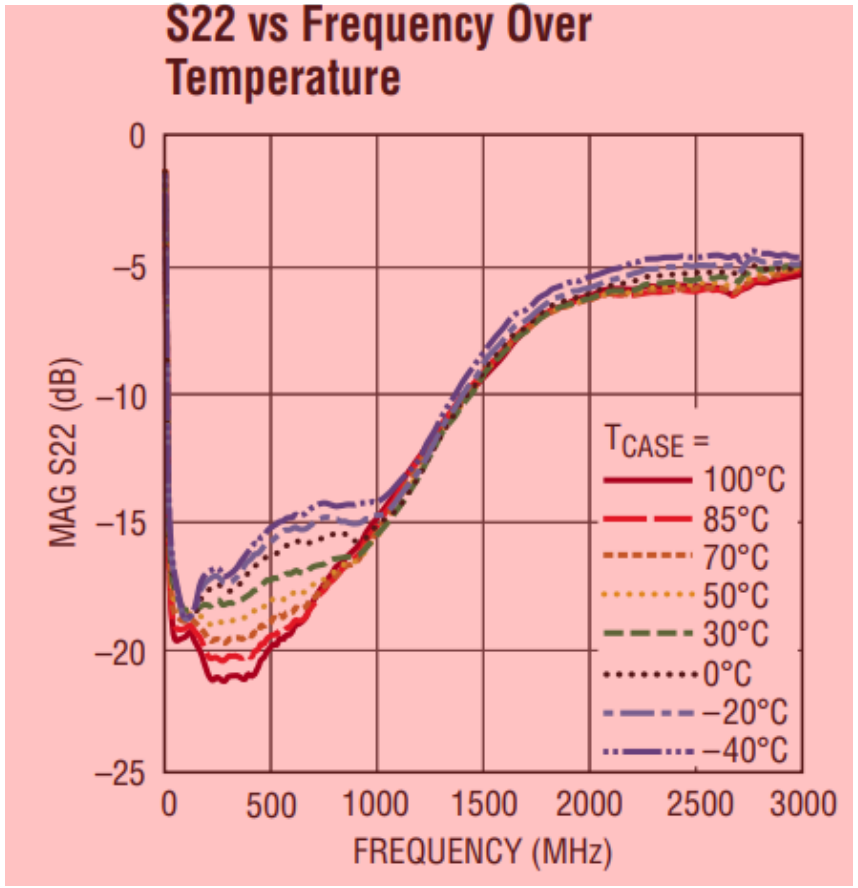


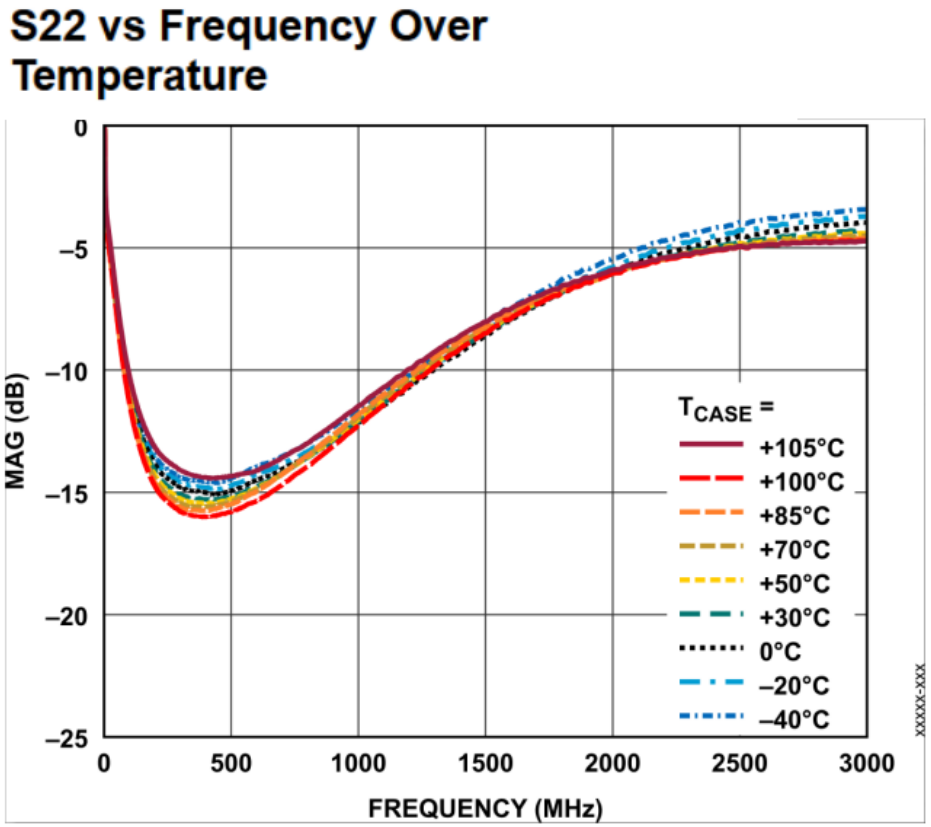
Change the TPC plot to add 105C plot based on customer requirement.

Datasheet Revision: Page 6 (*S22 vs. Freq over Temp*)

LTC6431-20

TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 5V$, $Z_{SOURCE} = Z_{LOAD} = 50\Omega$ unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).



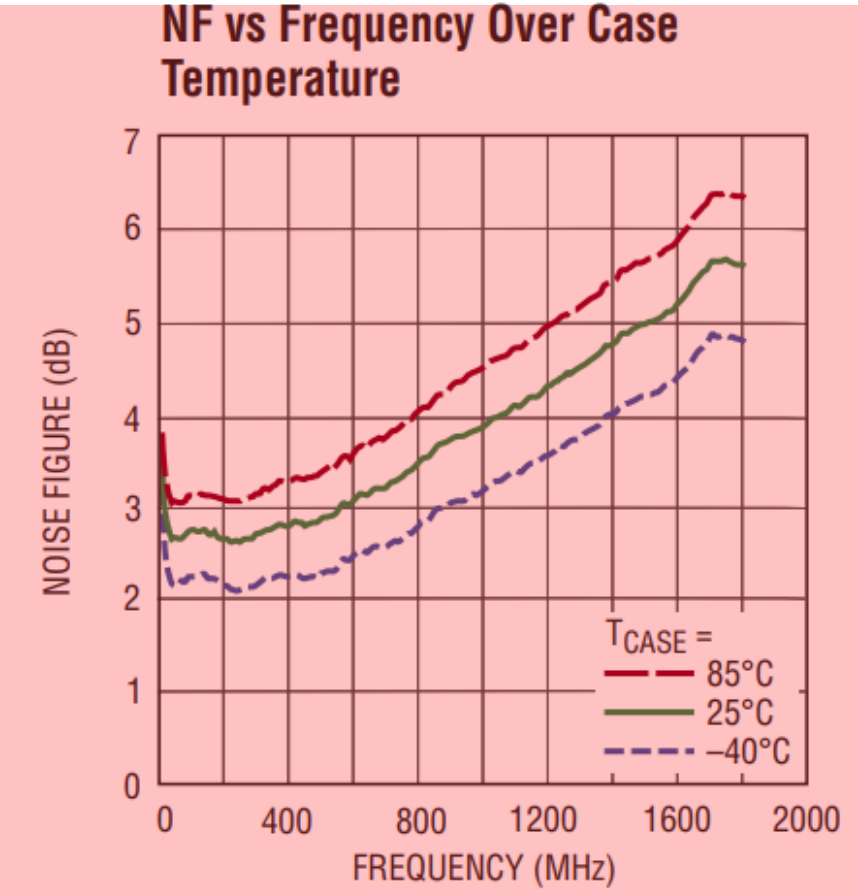


Change the TPC plot to add 105C plot based on customer requirement.

Datasheet Revision: Page 6 (*NF vs. Freq over Temp*)

LTC6431-20

TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 5V$, $Z_{SOURCE} = Z_{LOAD} = 50\Omega$ unless otherwise noted. Measurements are performed using Test Circuit A, measuring from 50Ω SMA to 50Ω without de-embedding (Note 4).



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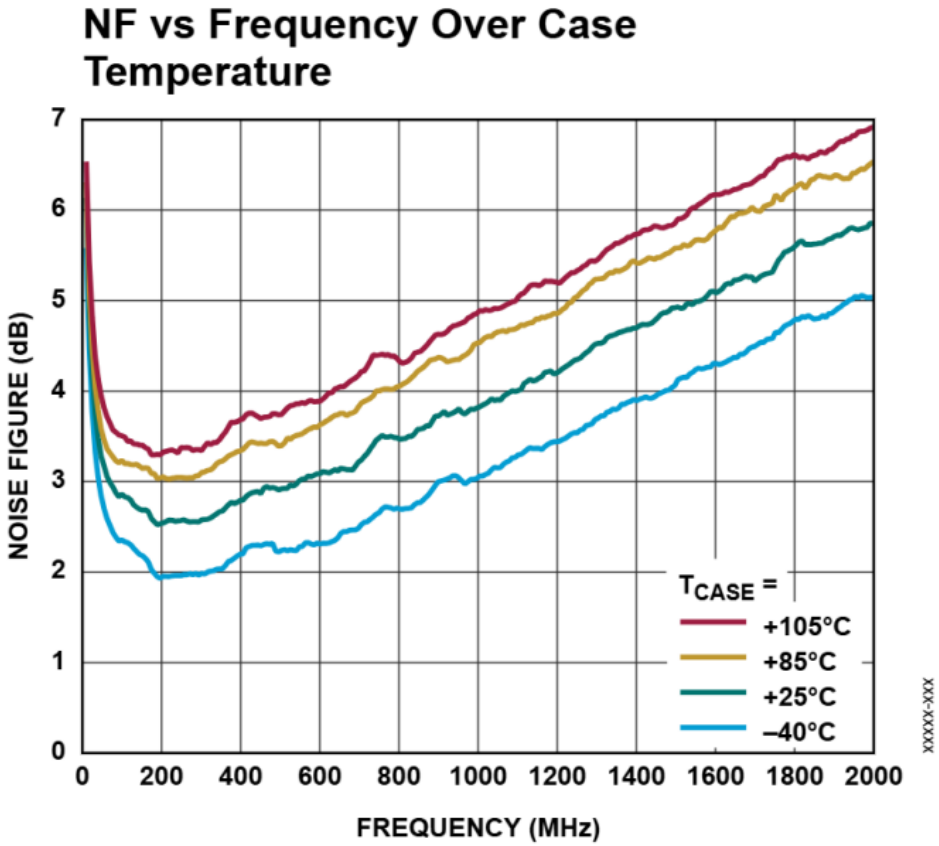

Change the TPC plot to add 105C plot based on customer requirement.

ANALOG DEVICES
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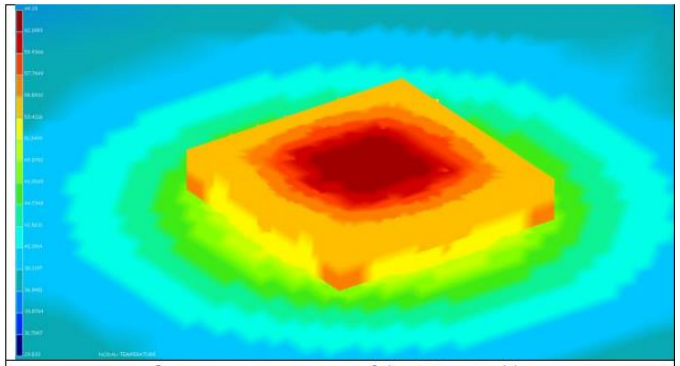
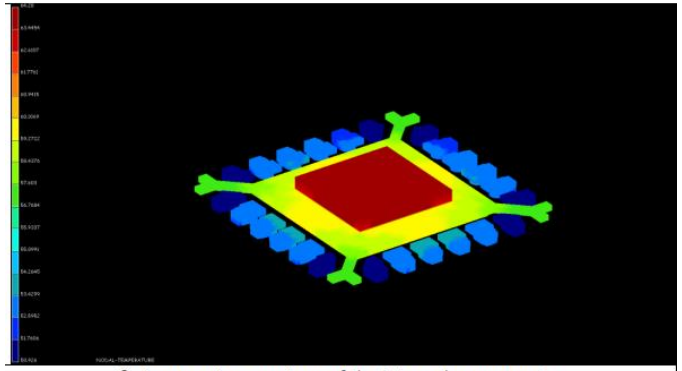
Supporting Slides

LTC6431-20 Thermal Simulations

Thermal Simulations Report Link: SSA-2352



θ_{JA} temperature contour of the PCB assembly



θ_{JA} temperature contour of the internal components

LTC6431 thermal model summary

For more details, contact Jeho Kim <Jae.Kim@analog.com>

PCB:	2s2p JEDEC Board											
Device:	LTC6431	$T_{ambient}$ (°C) =	25									
			Convection Analysis						Conduction Analysis			
			θ_{JA} Summary						θ_{JCtop} Summary		θ_{JCbot} Summary	
	Source	P_{loss} (W)	T_{case} (°C)	T_j (°C)	θ_{JA} (K/W)	ψ_{jt} (K/W)	Q_{bottom}	$Q_{elsewhere}$	T_j (°C)	θ_{JCtop} (K/W)	T_j (°C)	θ_{JCbot} (K/W)
	U1	1	63.9	64.3	39.3	0.4	94%	6%	62.7	37.7	29.8	4.8
	Total Power:	1										

Additional Information:

PCB conditions	
Board Type	2s2p JEDEC Board
Board Thickness	1.6 mm
Board Dimension	114.3 mm x 76.2 mm
Board Material	FR-4
Trace Cu Thickness	74 µm - 37 µm - 37 µm - 74 µm

Material Properties	
Material	Thermal conductivity k (W/m·K)
Molding compound	0.96
Copper	260
Die attach	2.5
Solder	50