DATA SHEET

SKY65028-70LF: 450 MHz–2.5 GHz Linear Power Amplifier Driver

Applications

- UHF TV broadcasts
- TETRA radios
- GSM450, GSM480, GSM750 basestations
- AMPS, PCS, DCS, 2.5G, 3G basestations
- ISM band transmitters
- WCS fixed wireless
- 802.11b/g WLANs

Features

- Wideband frequency range: 450 MHz–2.5 GHz
- High linearity: OIP3 > 40 dBm and $P_{1\ dB}$ > 24 dBm
- High efficiency: PAE 48%
- High gain: 20 dB
- Single DC supply, 3 V or 5 V
- Available lead (Pb)-free, RoHS-compliant, and Green MSL-1 @ 260 °C per JEDEC J-STD-020

Description

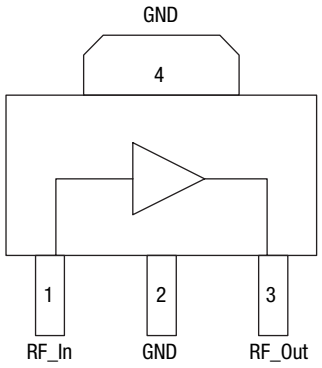
Skyworks SKY65028-70LF is a high performance, ultra-wideband linear amplifier with superior output power, linearity, and efficiency. The device is fabricated using Skyworks high reliability Aluminum Gallium Arsenide (AlGaAs) Heterojunction Bipolar Transistor (HBT) technology.

The SKY65028-70LF achieves a high linearity and superior Adjacent Channel Power Rejection/Adjacent Channel Leakage Ratio (ACPR/ACLR) performance. This makes it ideal for use in the driver stage of infrastructure transmit chains for Trans-European Trunked Radio (TETRA) transceivers, multi-band (GSM, AMPS, PCS, DCS) handsets, and many other wireless applications.

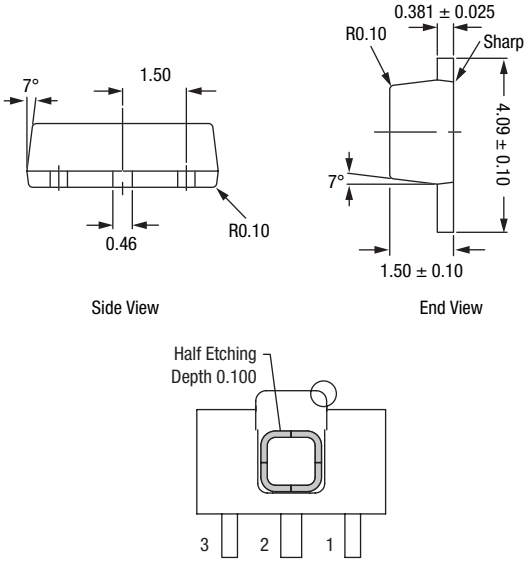
The SKY65028-70LF is a lead (Pb)-free and Green SOT-89 industry standard package.

NEW Skyworks Green products are lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, and are free from antimony trioxide and brominated flame retardants.

Pin Out — 4-Pin SOT-89 Package (Top View)



SOT-89 (-70)



Package and Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

For details on attachment techniques, precautions, and handling procedures recommended by Skyworks, please refer to Skyworks Application Note, PCB Design and SMT Assembly/ Rework Guidelines for MCM-L Packages, document number 101752. Additional information on standard SMT reflow profiles can also be found in the JEDEC Standard J-STD-020.

Electrostatic Discharge (ESD) Sensitivity

The SKY65028-70LF is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. Take proper ESD precautions.

Pin Descriptions

Pin #	Name	Description
1	RF_In	RF input
2	GND	Ground
3	RF_Out	RF output
4	GND	Ground

Absolute Maximum Ratings

Characteristic	Value
RF input power (P_{IN})	15 dBm max.
RF output power (P_{OUT})	27 dBm
Supply voltage (V_{CC})	6 V
Supply current (I_{CC})	160 mA
Power dissipation (P_D)	1.2 W
Operating case temperature (T_C)	-40 °C to +85 °C
Storage temperature (T_{ST})	-55 °C to +125 °C
Junction temperature (T_J)	150 °C

Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal values.
Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

CAUTION: *Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.*

Recommended Operating Conditions

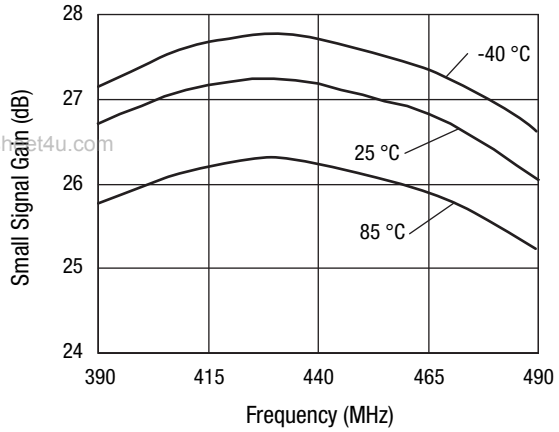
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}		5		V
Frequency range	F	250		2700	MHz
Junction temperature	T_J			140	°C

Electrical Characteristics

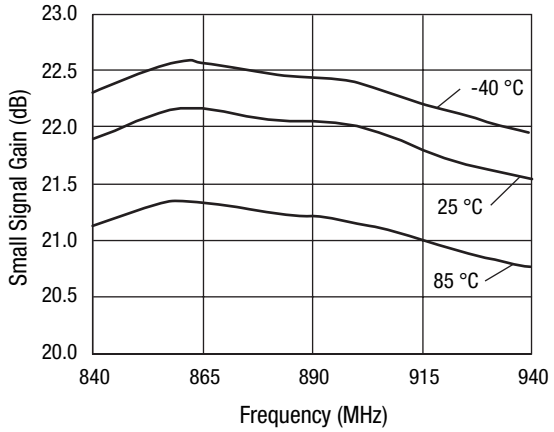
V_{CC} = 5 V, T_C = 25 °C unless otherwise noted

Parameter[1]	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Test Frequency = 450 MHz						
Small signal gain	G	CW		27		dB
Output power @ 1 dB compression	$P_{1\ dB}$	CW		24		dBm
Output 3rd order intercept point	OIP3	Two tones, each @ 7 dBm output power		42		dBm
Test Frequency = 900 MHz						
Small signal gain	G	CW		22		dB
Output power @ 1 dB compression	$P_{1\ dB}$	CW		24		dBm
Output 3rd order intercept point	OIP3	Two tones, each @ 7 dBm output power		42		dBm
Noise figure	NF			4		dB
Output power @ ACPR = -45 dBc, 750 kHz offset	P_{OUT}	IS-95. Nine forward channels		18		dBm
Test Frequency = 1960 MHz						
Small signal gain	G	CW	14.5	16		dB
Output power @ 1 dB compression	$P_{1\ dB}$	CW	23	25		dBm
Output 3rd order intercept point	OIP3	Two tones, each @ 7 dBm output power	39	42		dBm
Noise figure	NF			5.5	6.5	dB
Power added efficiency	PAE	CW @ $P_{OUT} = P_{1\ dB}$	42	48		%
Supply current	I_S			125	145	mA
Output power @ ACPR = -45 dBc, 885 kHz offset	P_{OUT}	IS-95. Nine forward channels	17	19		dBm
Test Frequency = 2140 MHz						
Small signal gain	G	CW		15		dB
Output power @ 1 dB compression	$P_{1\ dB}$	CW		25		dBm
Output 3rd order intercept point	OIP3	Two tones, each @ 7 dBm output power		42		dBm
Output power @ ACLR = -45 dBc, 5 MHz offset	P_{OUT}	WCDMA. Test model #1; 64 DPCH		17		dBm
Test Frequency = 2450 MHz						
Small signal gain	G	CW		14.5		dB
Output power @ 1 dB compression	$P_{1\ dB}$	CW		25		dBm
Output 3rd order intercept point	OIP3	Two tones, each @ 7 dBm output power		42		dBm
Noise figure	NF			5		dB
Power added efficiency	PAE	CW, P_{OUT} = 26 dBm		50		%
Test Frequency = 2600 MHz						
Small signal gain	G	CW		14		dB
Output power @ 1 dB compression	$P_{1\ dB}$	CW		25		dBm
Output 3rd order intercept point	OIP3	Two tones, each @ 7 dBm output power		41		dBm

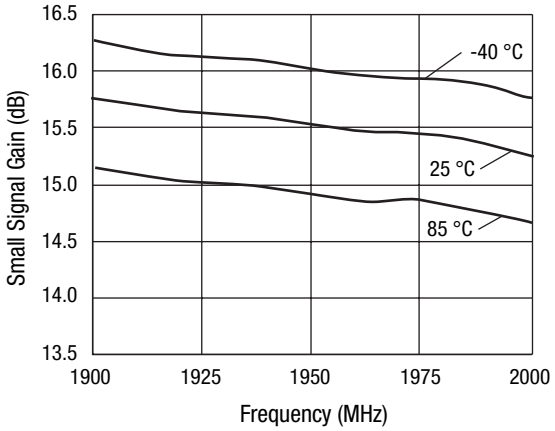
Typical Performance Data



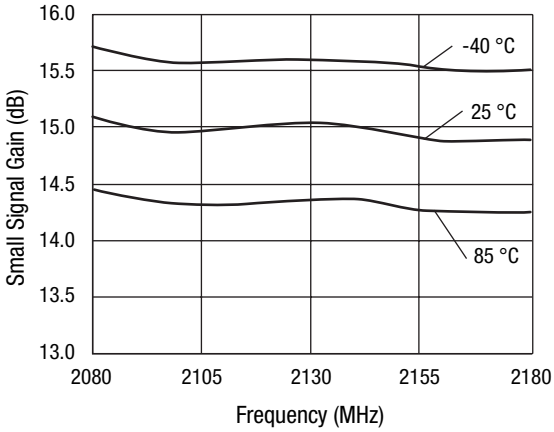
Typical Small Signal Gain From 390–490 MHz Over Temperature



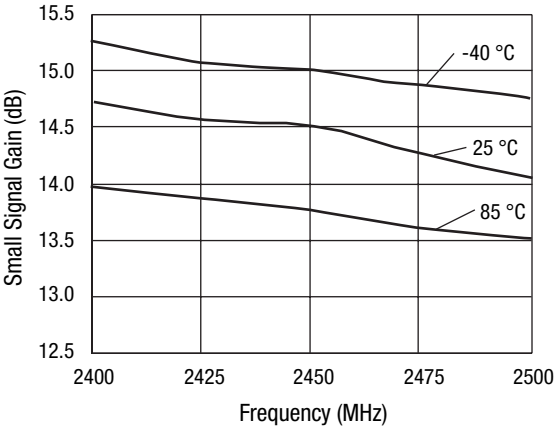
Typical Small Signal Gain From 840–940 MHz Over Temperature



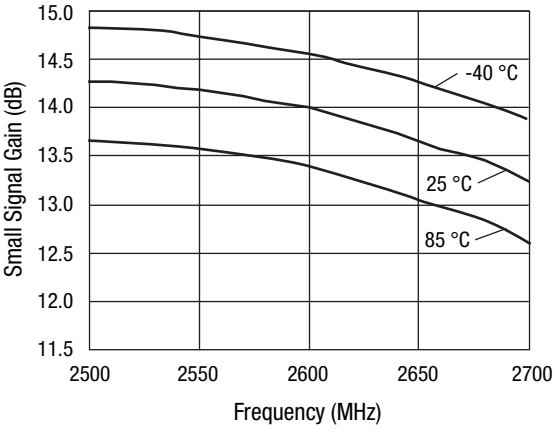
Typical Small Signal Gain From 1900–2000 MHz Over Temperature



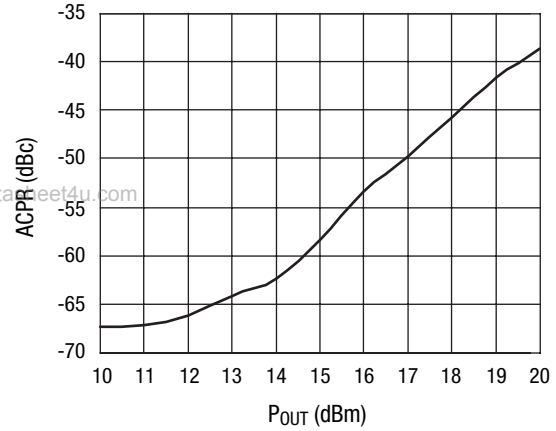
Typical Small Signal Gain From 2080–2180 MHz Over Temperature



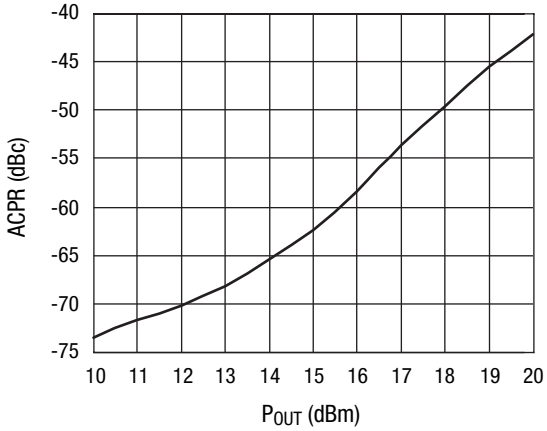
Typical Small Signal Gain From 2400–2500 MHz Over Temperature



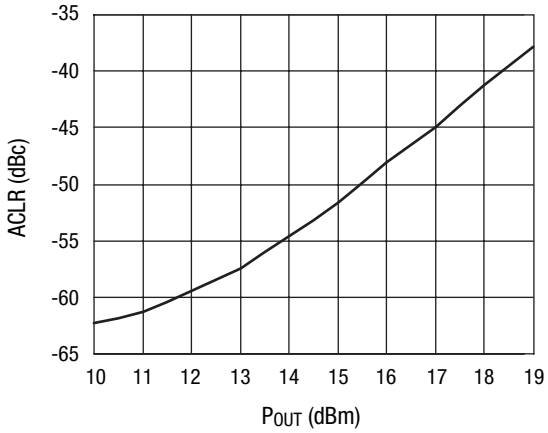
Typical Small Signal Gain From 2500–2700 MHz Over Temperature



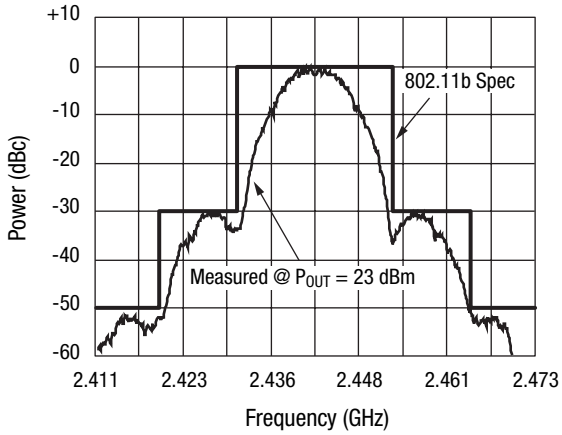
Typical ACPR vs P_{OUT} @ 900 MHz, 750 kHz Offset and 25 °C



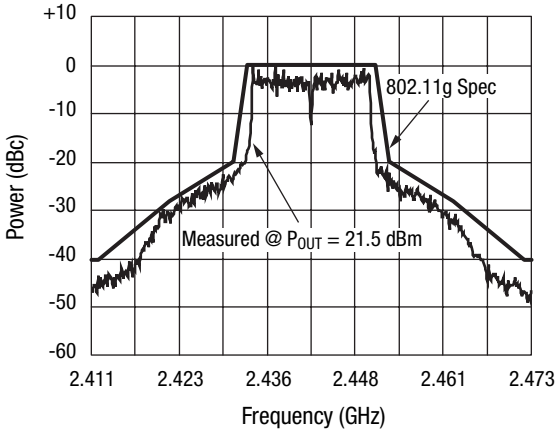
Typical ACPR vs P_{OUT} @ 1960 MHz, 885 kHz Offset and 25 °C



Typical ACPR vs P_{OUT} @ 2140 MHz, 5 MHz Offset and 25 °C



Spectral Response with 802.11b Signal (CCK @ 11 Mbps, V_{CC} = 3.3 V)



Spectral Response with 802.11g Signal (64 QAM @ 54 Mbps, V_{CC} = 3.3 V)

Evaluation Board Description

The Skyworks SKY65028-70LF Evaluation Board is used to test the performance of the SKY65028-70LF power amplifier driver.

The following design considerations are general in nature and must be followed regardless of final use or configuration.

1. Paths to ground should be made as short as possible.
2. The ground pad of the SKY65028-70LF power amplifier has special electrical and thermal grounding requirements. This pad is the main thermal conduit for heat dissipation. Since the circuit board acts as the heat sink, it must shunt as much heat as possible from the amplifier. As such, design the connection to the ground pad to dissipate the maximum wattage produced to the circuit board. Multiple vias to the grounding layer are required.

NOTE: *Junction temperature (T_J) of the device increases with a poor connection to the slug and ground. This reduces the lifetime of the device.*

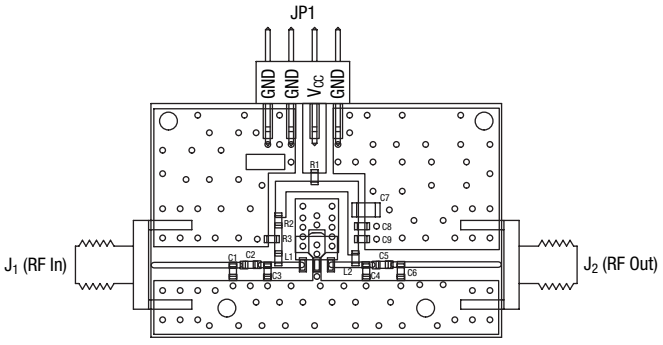
Testing Procedure

Use the following procedure to set up the SKY65028-70LF Evaluation Board for testing:

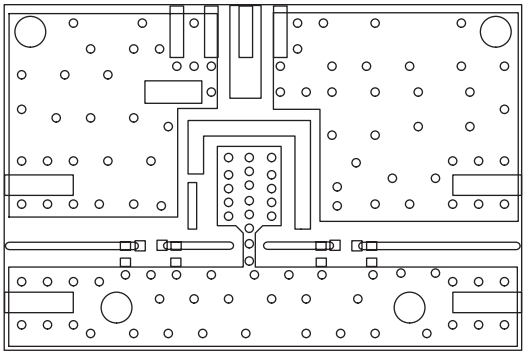
1. Connect a 5.0 V supply to V_{CC}. If available, enable the current limiting function of the power supply to 240 mA.
2. Connect a signal generator to the RF signal input port. Set it to the desired RF frequency at a power level of -15 dBm or less to the evaluation board but do NOT enable the RF signal.
3. Connect a spectrum analyzer to the RF signal output port.
4. Enable the power supply.
5. Enable the RF signal.
6. Take measurements.

CAUTION: *If any of the output signals exceed the rated maximum values, the SKY65028-70LF evaluation board can be permanently damaged.*

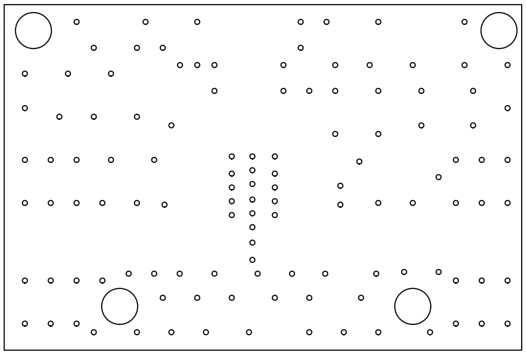
Evaluation Board Assembly



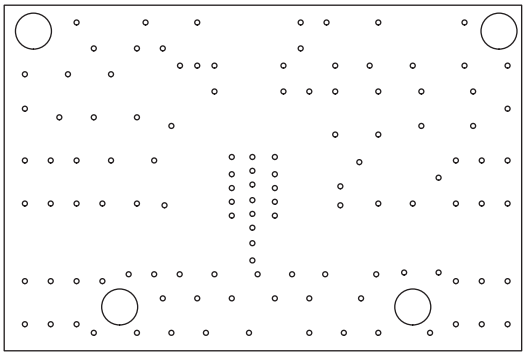
Evaluation Board Layer Detail



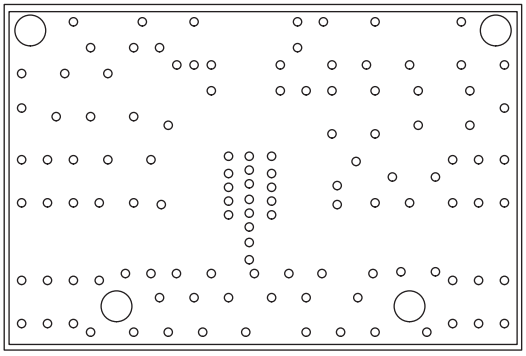
Layer 1: Top - Metal



Layer 2: Ground

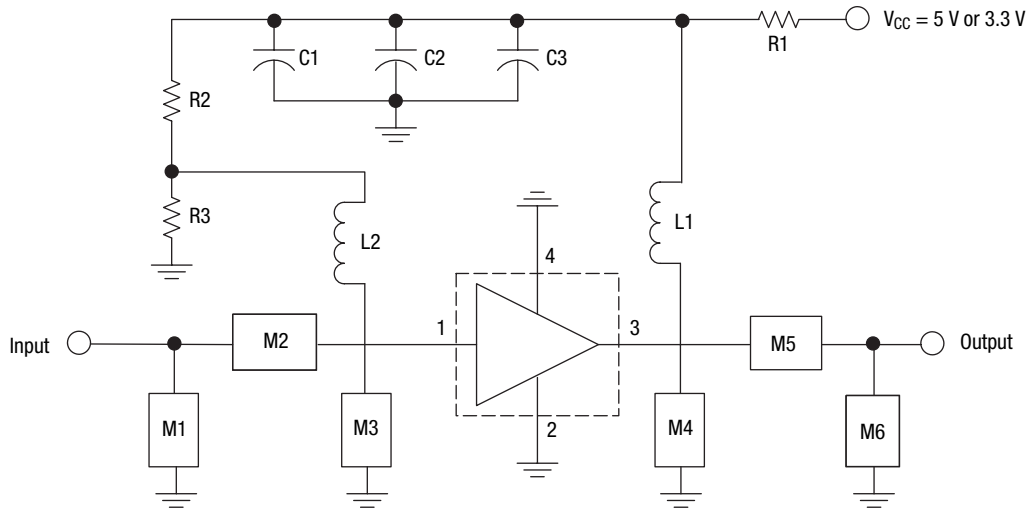


Layer 3: Ground



Layer 4: Solid Ground Plane

Evaluation Board Schematic



Refer to Evaluation Board Component Values vs. Frequency Table for component values.

Evaluation Board Component Values vs. Frequency

Component	Evaluation Board Frequency (MHz)						
	450	900	1960	2140	2450	2450	2600
	VCC = 5 V					VCC = 3.3 V	VCC = 5 V
R1	0 Ω	0 Ω	0	0 Ω	0 Ω	0 Ω	0 Ω
R2	390 Ω	390 Ω	390	390 Ω	390 Ω	220 Ω	390 Ω
R3	180 Ω	180 Ω	180	180 Ω	180 Ω	200 Ω	180 Ω
C1	0.1 µF	0.1 µF	0.1 µF	0.1 µF	0.1 µF	0.1 µF	0.1 µF
C2	1000 pF	1000 pF	1000 pF	1000 pF	1000 pF	1000 pF	1000 pF
C3	68 pF	68 pF	18 pF	18 pF	18 pF	18 pF	18 pF
L1	39 nH	39 nH	27 nH	27 nH	27 nH	27 nH	22 nH
L2	39 nH	39 nH	27 nH	27 nH	27 nH	27 nH	22 nH
M1	6.8 nH	6.8 nH	15 nH	6.8 nH	6.8 nH	1 pF	1 pF
M2	15 pF	6.8 pF	12 pF	1 pF	1.5 pF	1.5 pF	1.2 pF
M3	DNI	10 pF	1.5 pF	1 pF	DNI	DNI	DNI
M4	DNI	DNI	DNI	2.2 pF	DNI	DNI	DNI
M5	22 pF	10 pF	2.2 pF	3.3 pF	20 pF	20 pF	20 pF
M6	0.5 pF	8.2 nH	3.9 nH	2.2 nH	0.5 pF	0.5 pF	0.5 pF

DNI: Do Not Install.