

# PTVA120121M

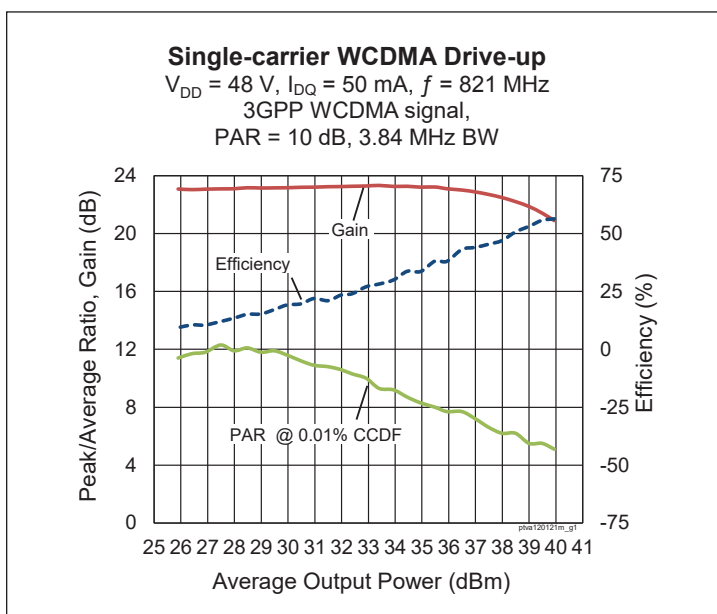
## Thermally-Enhanced High Power RF LDMOS FET 12 W, 50 V, 500 – 1400 MHz

### Description

The PTVA120121M LDMOS FET is a 12-watt LDMOS FET designed for use in power amplifier applications in the 500 MHz to 1400 MHz frequency band. Features include high gain and a thermally-enhanced, surface-mount package. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PTVA120121M  
Package PG-SON-10



### Features

- Unmatched
- Target pulsed CW performance at 821 MHz, 48 V
  - Output power = 12 W  $P_{1dB}$
  - Efficiency = 62%
  - Gain = 22 dB
- Capable of withstanding a 10:1 load mismatch at 50 V, 12 W (CW) output power
- Integrated ESD protection
- Human Body Model class 1B (per ANSI/ESDA/ JEDEC JS-001)
- Excellent thermal stability
- Pb-free and RoHS-compliant

### RF Characteristics

#### Single-carrier WCDMA Characteristics (tested in Wolfspeed production test fixture)

$V_{DD} = 48\text{ V}$ ,  $I_{DQ} = 35\text{ mA}$ ,  $P_{OUT} = 3.5\text{ W avg}$ ,  $f = 821\text{ MHz}$ , 3GPP WCDMA signal: 3.84 MHz bandwidth, 10 dB PAR @ 0.01% CCDF.

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	20.5	21.5	—	dB
Drain Efficiency	$\eta_D$	35.5	38.5	—	%
Adjacent Channel Power Ratio	ACPR	—	-33.5	-31.5	dBc

All published data at  $T_{CASE} = 25^\circ\text{C}$  unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

**DC Characteristics** (each side)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$	$V_{(BR)DSS}$	105	—	—	V
Drain Leakage Current	$V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	0.1	$\mu\text{A}$
	$V_{DS} = 105\text{ V}$ , $V_{GS} = 0\text{ V}$	$I_{DSS}$	—	—	1.0	$\mu\text{A}$
Gate Leakage Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	—	—	0.1	$\mu\text{A}$
On-State Resistance	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$	$R_{DS(on)}$	—	2.96	—	$\Omega$
Operating Gate Voltage	$V_{DS} = 48\text{ V}$ , $I_{DQ} = 0.05\text{ A}$	$V_{GS}$	3	3.57	4	V

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	105	V
Gate-Source Voltage	$V_{GS}$	-6 to +12	V
Operating Voltage	$V_{DD}$	0 to +55	V
Junction Temperature	$T_J$	225	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 13 W CW)	$R_{\theta JC}$	4.9	$^{\circ}\text{C/W}$

**Moisture Sensitivity Level**

Level	Test Standard	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	$^{\circ}\text{C}$

**Ordering Information**

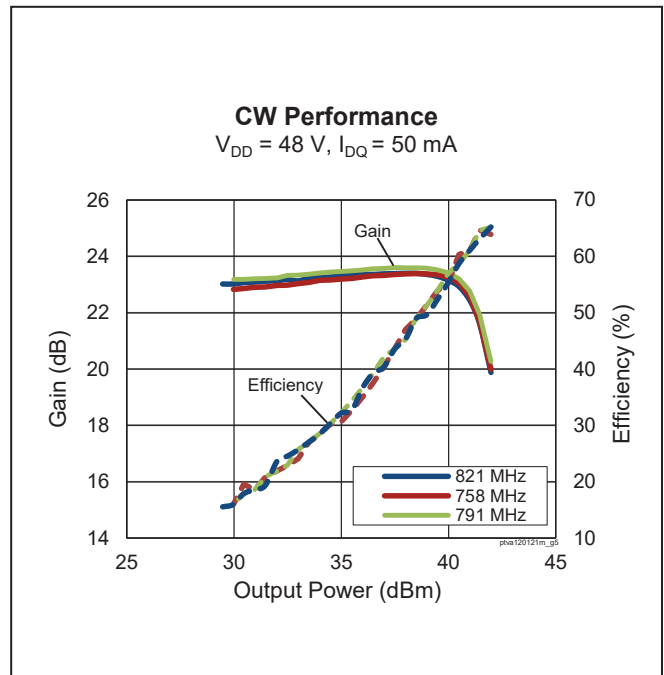
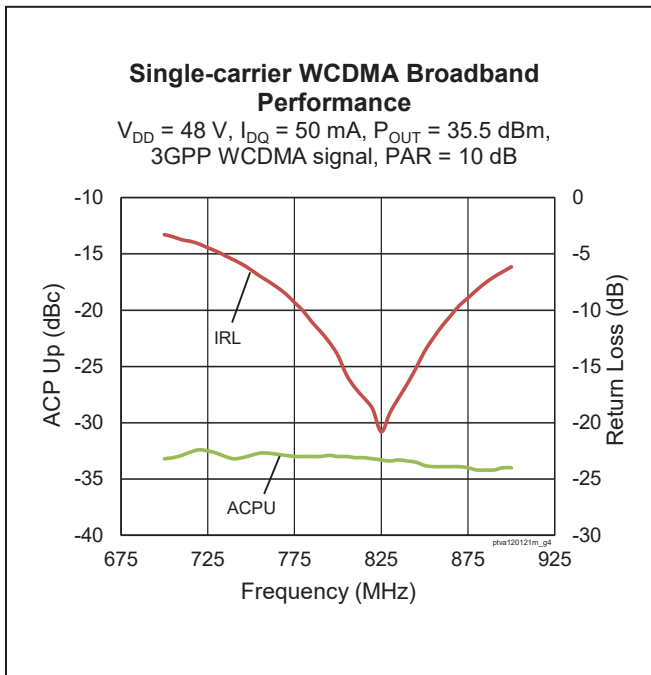
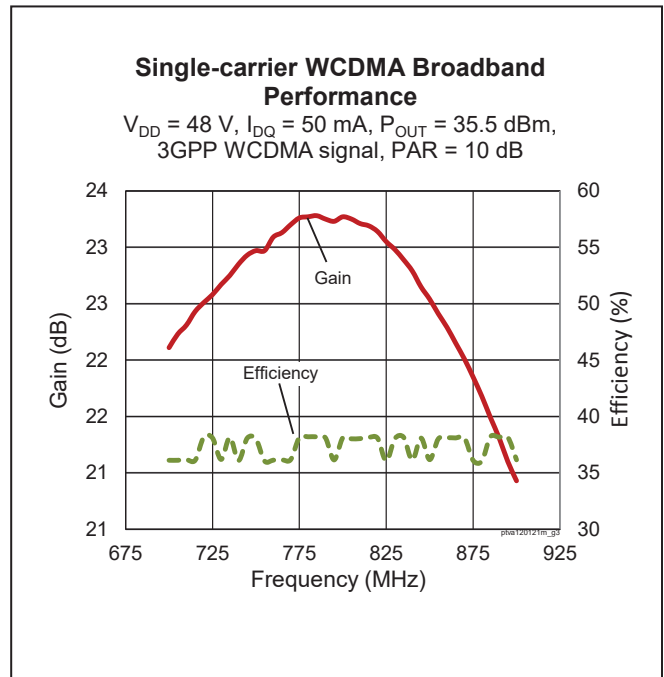
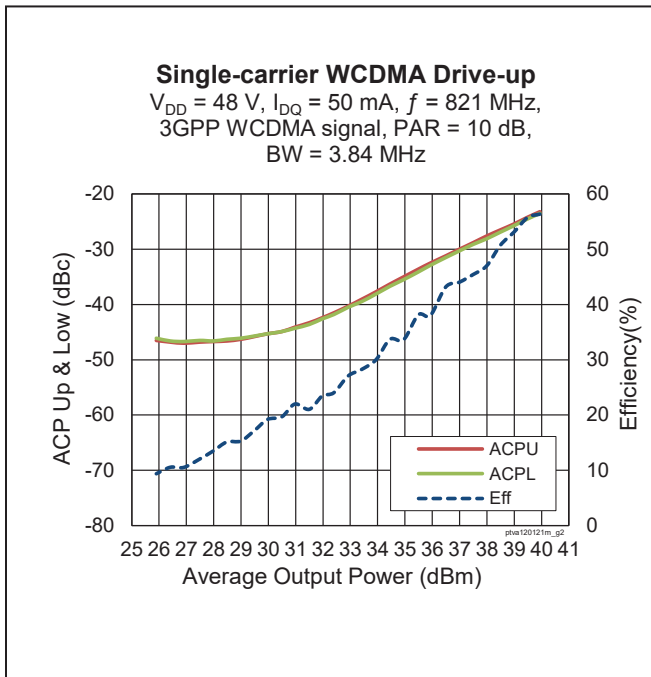
Type and Version	Order Code	Package Description	Shipping
PTVA120121M V1 R1K	PTVA120121M-V1-R1K	PG-SON-10, molded plastic, SMD	Tape & Reel, 1,000 pcs

**Evaluation Boards**

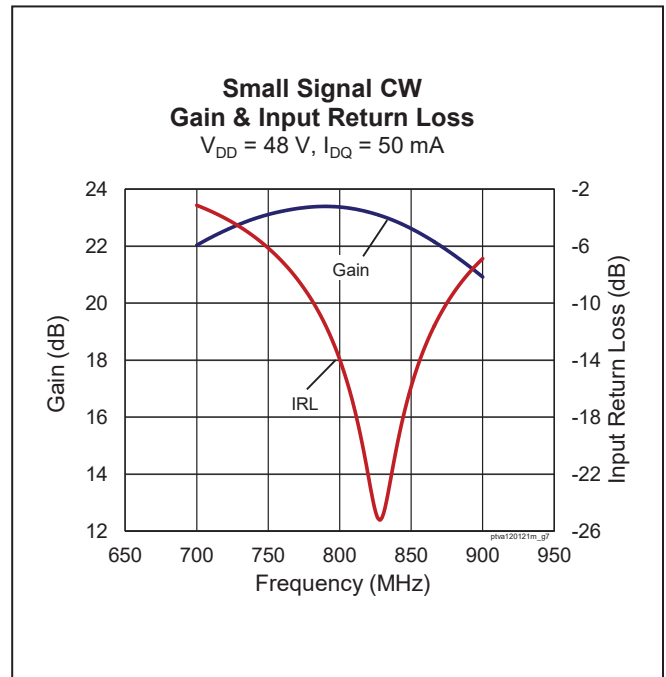
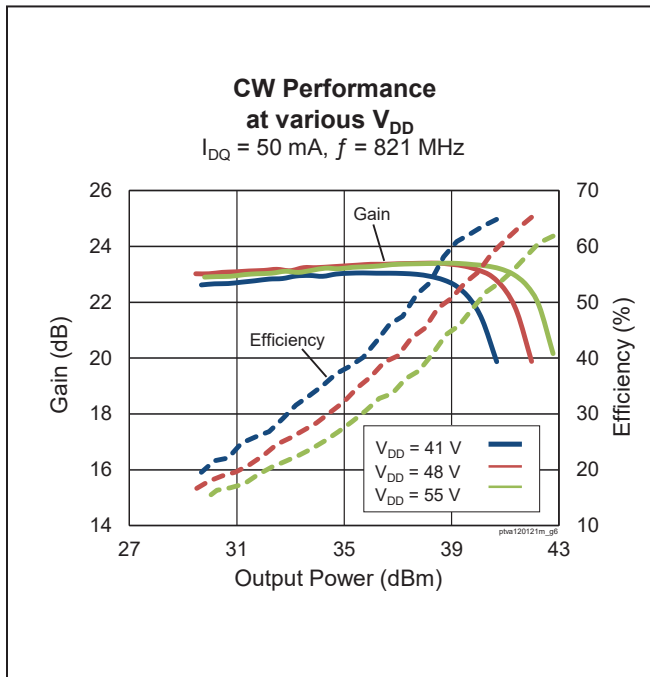
Order Code	Frequency	Description
LTN/PTVA120121M V1	758 – 821 MHz	Class AB, RO4350
LTN/PTVA120121M E2	1200 – 1400 MHz	Class AB, RO3010
LTN/PTVA120121M E3	960 – 1215 MHz	Class AB, RO3010



**Typical RF Performance** (data taken in production test fixture)



Typical RF Performance (cont.)

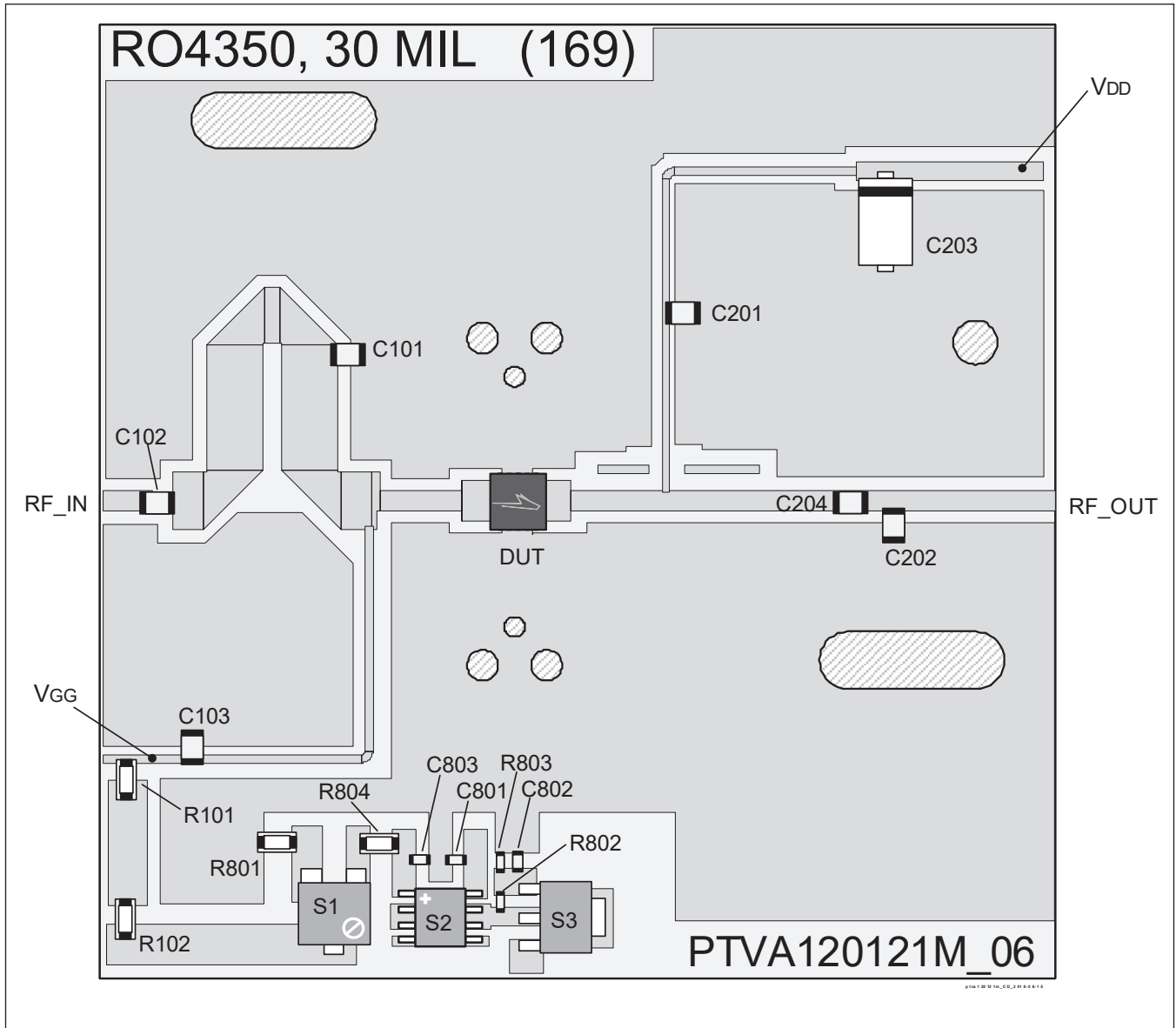


Load Pull Performance

Load Pull Performance – CW signal: 48 V,  $I_{DQ} = 36 \text{ mA}$

Freq [MHz]	$Z_s$ [ $\Omega$ ]	$P_{1dB}$					$P_{1dB}$				
		$Z_L$ [ $\Omega$ ]	Gain [dB]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	PAE [%]	$Z_L$ [ $\Omega$ ]	Gain [dB]	$P_{OUT}$ [dBm]	$P_{OUT}$ [W]	PAE [%]
758	6.22+j14	44.9+j21.8	22.64	41.69	14.76	66.8	26.9+j64.4	25.3	37.43	5.53	84.0
791	6.07+j12	36.2+j14.5	21.85	42.00	15.93	63.0	23+j62.4	25	36.97	4.97	81.6
821	6.14+j10.9	35+j14.5	21.64	41.94	15.62	63.0	14.8+j50.4	24.9	36.60	4.55	80.2

Reference Circuit, 758 – 821 MHz



Reference circuit assembly diagram (not to scale)

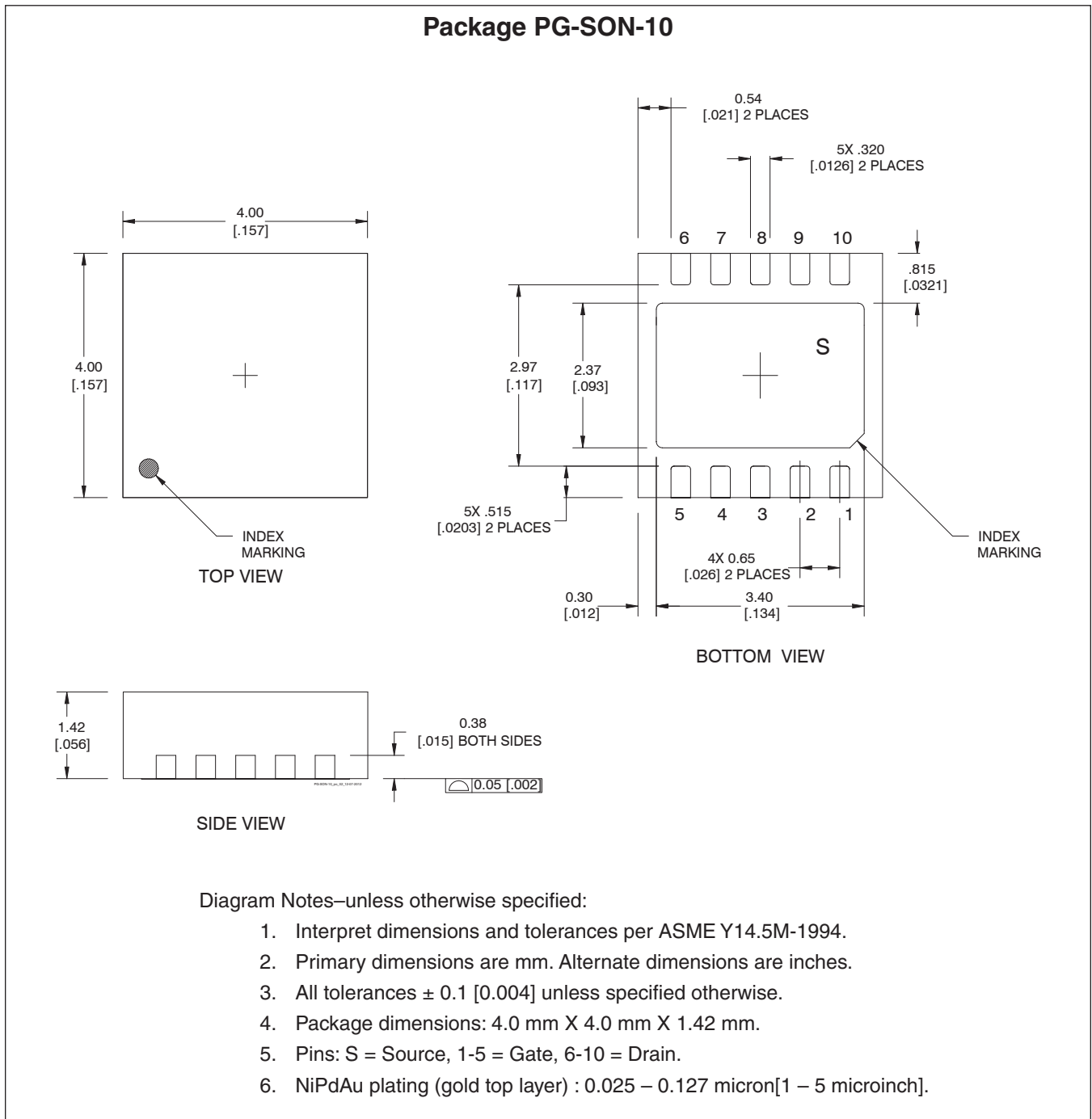
**Reference Circuit** (cont.)**Reference Circuit Assembly**

DUT	PTVA120121M V1
Test Fixture Part No.	LTN/PTVA120121M V1
PCB	Rogers 4350, 0.762 mm [0.030"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 758 - 821$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at <a href="http://www.wolfspeed.com/RF">www.wolfspeed.com/RF</a>	

**Components Information**

Component	Description	Manufacturer	P/N
<b>Input</b>			
C101	Capacitor, 6.8 pF	ATC	ATC100B6R8CW500XB
C102, C103	Capacitor, 47 pF	ATC	ATC100B470KW500XB
R101	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
R102	Resistor, 200 ohms	Panasonic Electronic Components	ERJ-8GEYJ221V
C801, C802, C803	Capacitor, 1000 pF	Panasonic Electronic Components	ECJ-1VB1H102K
R801	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
R802	Resistor, Chip 1.2K ohms	Panasonic Electronic Components	ERJ-3GEYJ122V
R803	Resistor, Chip 1.3K ohms	Panasonic Electronic Components	ERJ-3GEYJ132V
R804	Resistor, 100 ohms	Panasonic Electronic Components	ERJ-8GEYJ101V
S1	Resistor, Variable 2K ohms	Bourns Inc.	3224W-1-202E
S2	Voltage Regulator	Texas Instruments	LM78L05ACM
S3	Transistor	Infineon Technologies	BCP56
<b>Output</b>			
C201, C204	Capacitor, 47 pF	ATC	ATC100B470KW500XB
C202	Capacitor, 0.9 pF	ATC	ATC100B0R9CW500XB
C203	Capacitor, 10 $\mu$ f	AVX / Geratte	TPSE106M050R0400

## Package Outline Specifications



## Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2014-10-07	Advance	All	Data Sheet reflects advance specification for product development
02	2016-07-14	Production	All	Data Sheet reflects released product specification
02.1	2017-02-03	Production	2	Update operating voltage and junction temperature
03	2018-06-15	Production	All	Converted to Wolfspeed Data Sheet

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## Notes

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