

GTRA374902FC

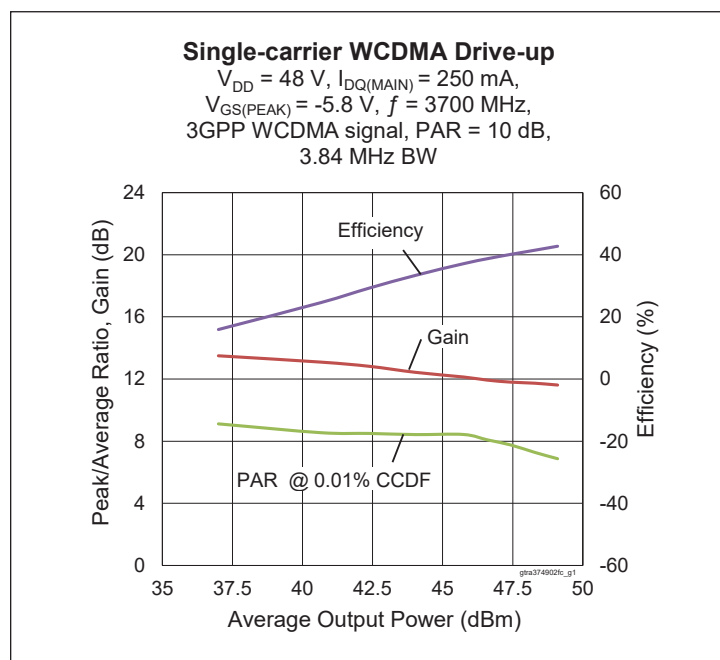
Thermally-Enhanced High Power RF GaN on SiC HEMT 450 W, 48 V, 3600 – 3700 MHz

Description

The GTRA374902FC is a 450-watt (P_{3dB}) GaN on SiC high electron mobility transistor (HEMT) for use in multi-standard cellular power amplifier applications. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.



GTRA374902FC
Package H-37248C-4



Features

- GaN on SiC HEMT technology
- Input matched
- Asymmetrical Doherty design
 - Main: $P_{3dB} = 220\text{ W Typ}$
 - Peak: $P_{3dB} = 300\text{ W Typ}$
- Typical Pulsed CW performance, 3700 MHz, 48 V, Doherty @ P_{3dB} , 10 μs , 10% duty cycle
 - Output power = 450 W
 - Drain efficiency = 60%
 - Gain = 11.5 dB
- Capable of handling 10:1 VSWR @ 48 V, 63 W (WCDMA) output power
- Human Body Model Class 1A, (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in Wolfspeed Doherty production test fixture)

$V_{DD} = 48\text{ V}$, $I_{DQ} = 250\text{ mA}$, $P_{OUT} = 63\text{ W avg}$, $V_{GSPEAK} = -5.8\text{ V}$, $f = 3700\text{ MHz}$, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	10.8	12	—	dB
Drain Efficiency	η_D	32	37.5	—	%
Adjacent Channel Power Ratio	ACPR	—	-32.5	-28.5	dBc
Output PAR @ 0.01% CCDF	OPAR	7.5	8.2	—	dB

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-source Breakdown Voltage (main)	$V_{GS} = -8\text{ V}, I_D = 10\text{ mA}$	$V_{(BR)DSS}$	150	—	—	V
	(peak) $V_{GS} = -8\text{ V}, I_D = 10\text{ mA}$	$V_{(BR)DSS}$	150	—	—	V
Drain-source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$	I_{DSS}	—	—	5	mA
Gate Threshold Voltage (main)	$V_{DS} = 10\text{ V}, I_D = 25.2\text{ mA}$	$V_{GS(th)}$	-3.8	-3	-2.3	V
	(peak) $V_{DS} = 10\text{ V}, I_D = 36\text{ mA}$	$V_{GS(th)}$	-3.8	-3	-2.3	V

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Voltage		V_{DD}	0	—	50	V
Gate Quiescent Voltage	$V_{DS} = 48\text{ V}, I_D = 250\text{ mA}$	$V_{GS(Q)}$	-3.65	-3	-2.4	V

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	125	V
Gate-source Voltage	V_{GS}	-10 to +2	V
Operating Voltage	V_{DD}	55	V
Gate Current (main)	I_G	25.2	mA
	(peak) I_G	36	mA
Drain Current (main)	I_D	9.5	A
	(peak) I_D	13.5	A
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

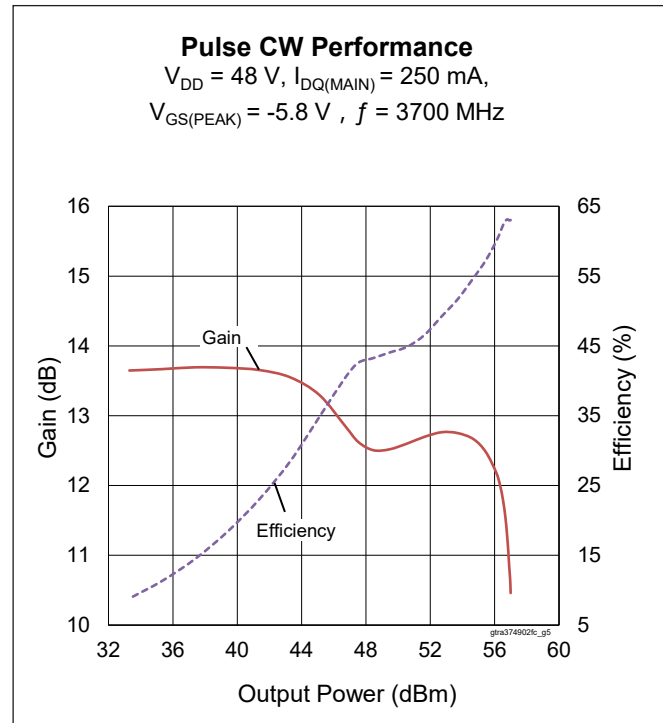
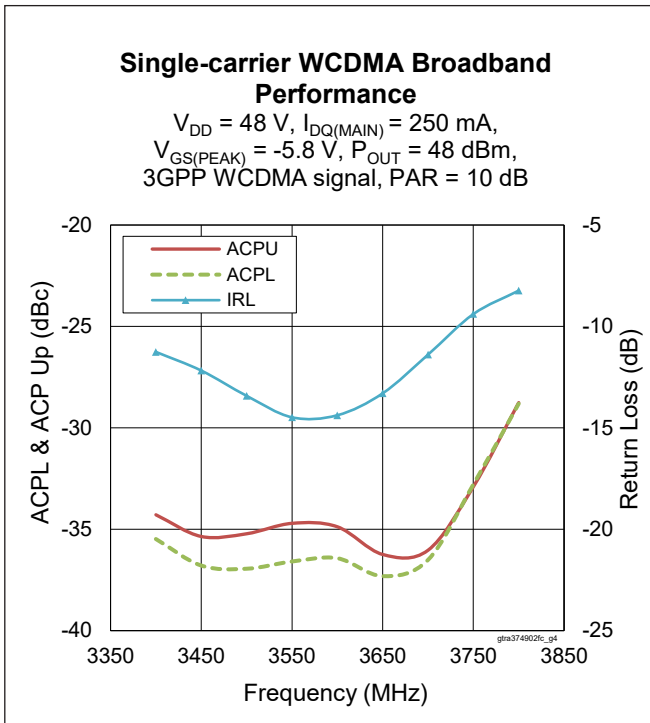
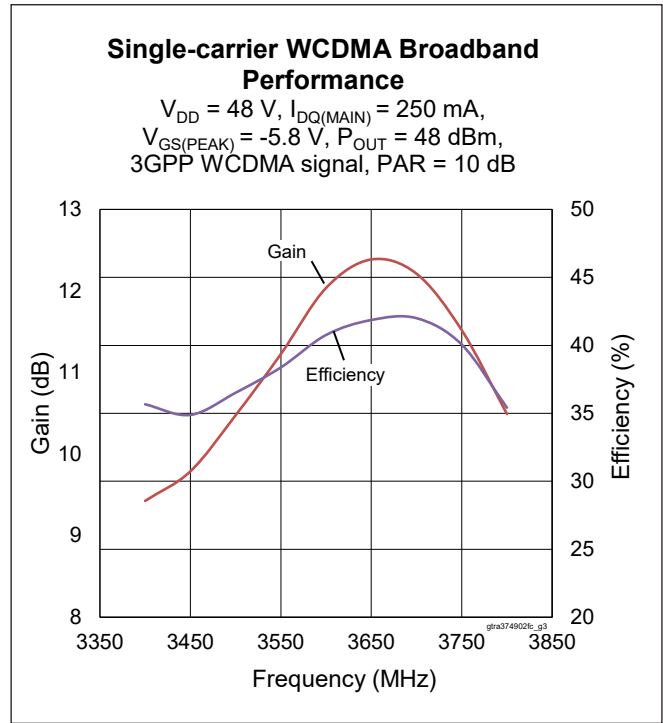
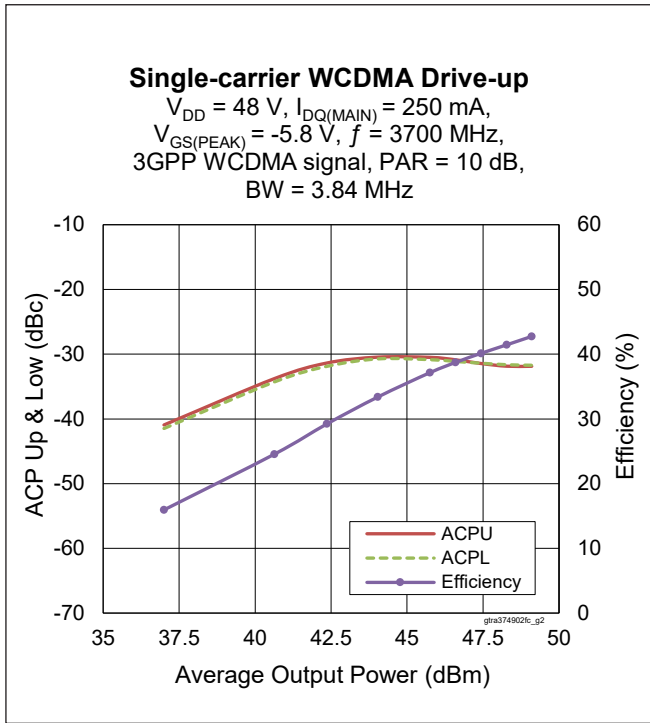
Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance (main, $T_{CASE} = 85^\circ\text{C}$, 100 W DC)	$R_{\theta JC}$	1.6	°C/W
(peak, $T_{CASE} = 85^\circ\text{C}$, 140 W DC)	$R_{\theta JC}$	1.1	°C/W

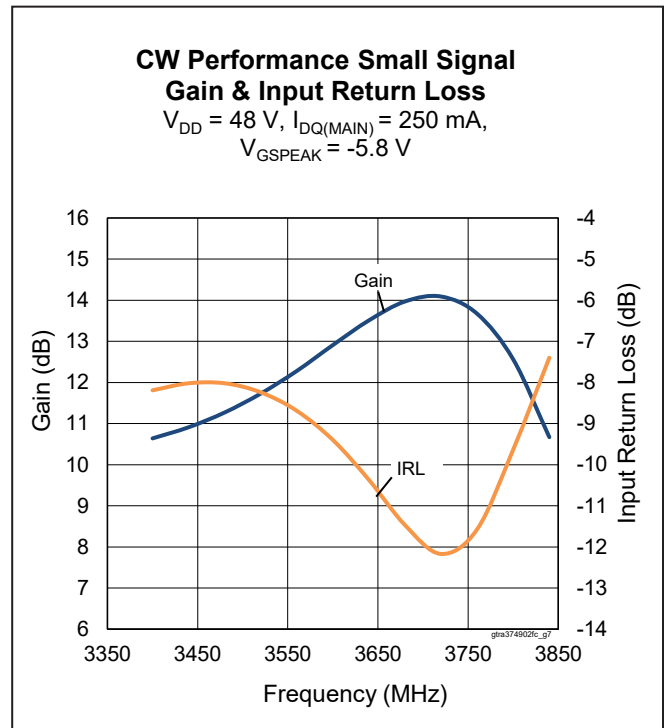
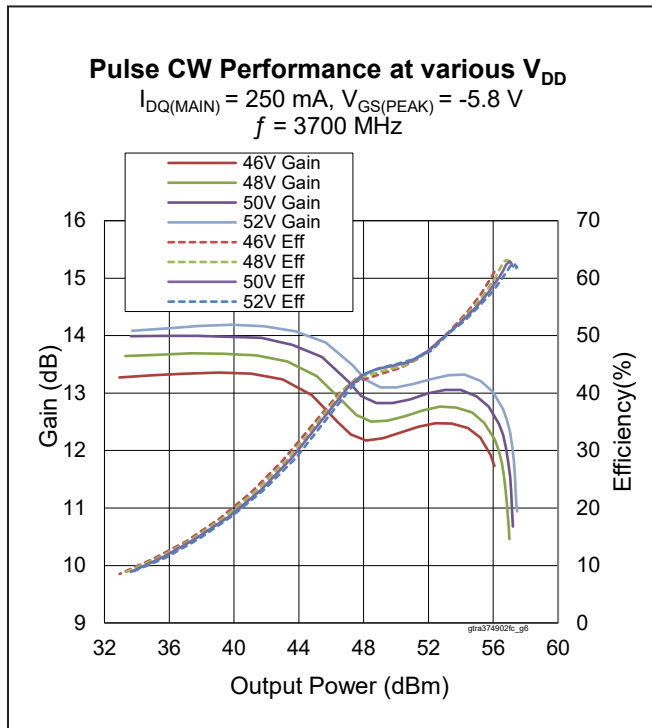
Ordering Information

Type and Version	Order Code	Package Description	Shipping
GTRA374902FC V1 R0	GTRA374902FC-V1-R0	H-37248C-4	Tape & Reel, 50 pcs
GTRA374902FC V1 R2	GTRA374902FC-V1-R2	H-37248C-4	Tape & Reel, 250 pcs

Typical Performance (data taken in test fixture)



Typical Performance (cont.)



Load Pull Performance

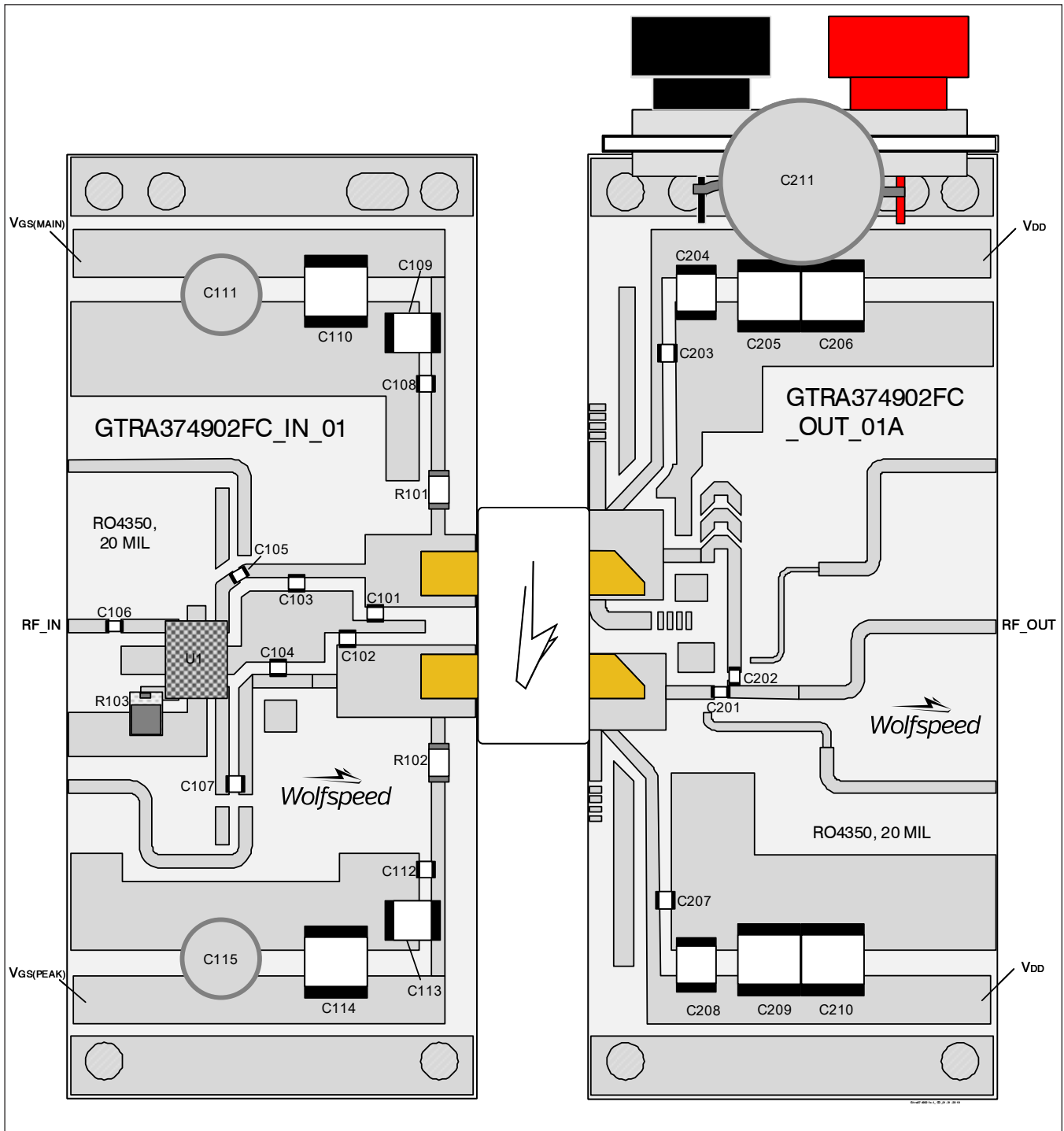
Main Side Load Pull Performance – Pulsed CW signal: 10 μs , 10% duty cycle, 48 V, $I_{DQ} = 250 \text{ mA}$, class AB

Freq [MHz]	Z_s [W]	P_{3dB}									
		Max Output Power					Max Drain Efficiency				
		Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]	Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]
3600	7-j5.7	3.5-j6.7	16.4	54.20	263	61.0	2-j4.4	17.9	52.20	166	71.0
3700	6.2-j9.3	3.7-j6.6	16.2	54.20	263	60.0	1.8-j5.2	17.4	52.30	170	70.0

Peak Side Load Pull Performance – Pulsed CW signal: 10 μs , 10% duty cycle, 48 V, $V_{GSPEAK} = -5 \text{ V}$, class C

Freq [MHz]	Z_s [W]	P_{3dB}									
		Max Output Power					Max Drain Efficiency				
		Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]	Z_L [W]	Gain [dB]	P_{3dB} [dBm]	P_{3dB} [W]	η_D [%]
3600	15-j11.3	3.2-j8.4	11.8	55.60	363	58.6	2.9-j7.1	12.4	55.10	324	66.7
3700	10.8-j8.8	3.2-j8.7	11.3	55.40	347	55.0	2.4-j7	12.2	54.80	302	68.4

Reference Circuit, 3600 – 3700 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit Assembly

DUT	GTRA374902FC-V1
Test Fixture Part No.	LTA/GTRA374902FC-V1
PCB	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$, $f = 3600 - 3700$ MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

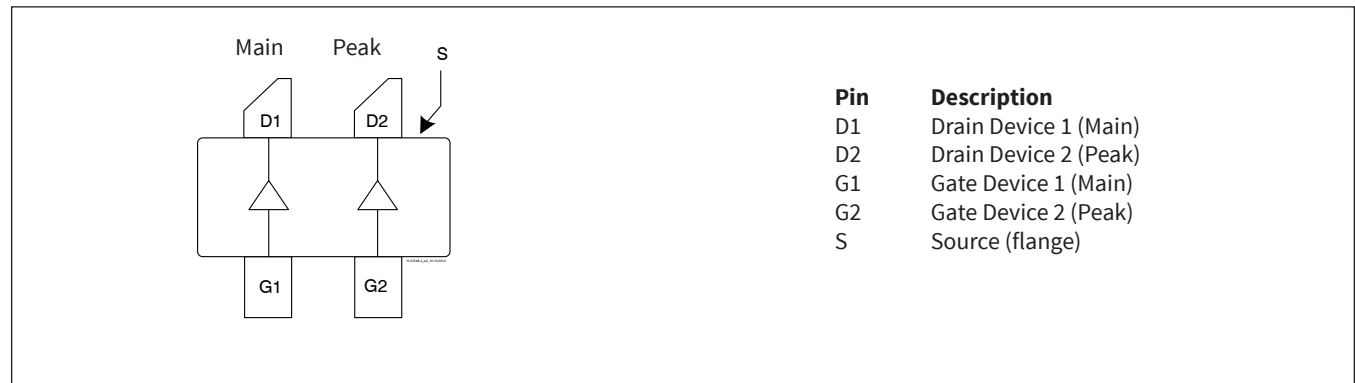


Reference Circuit (cont.)

Components Information

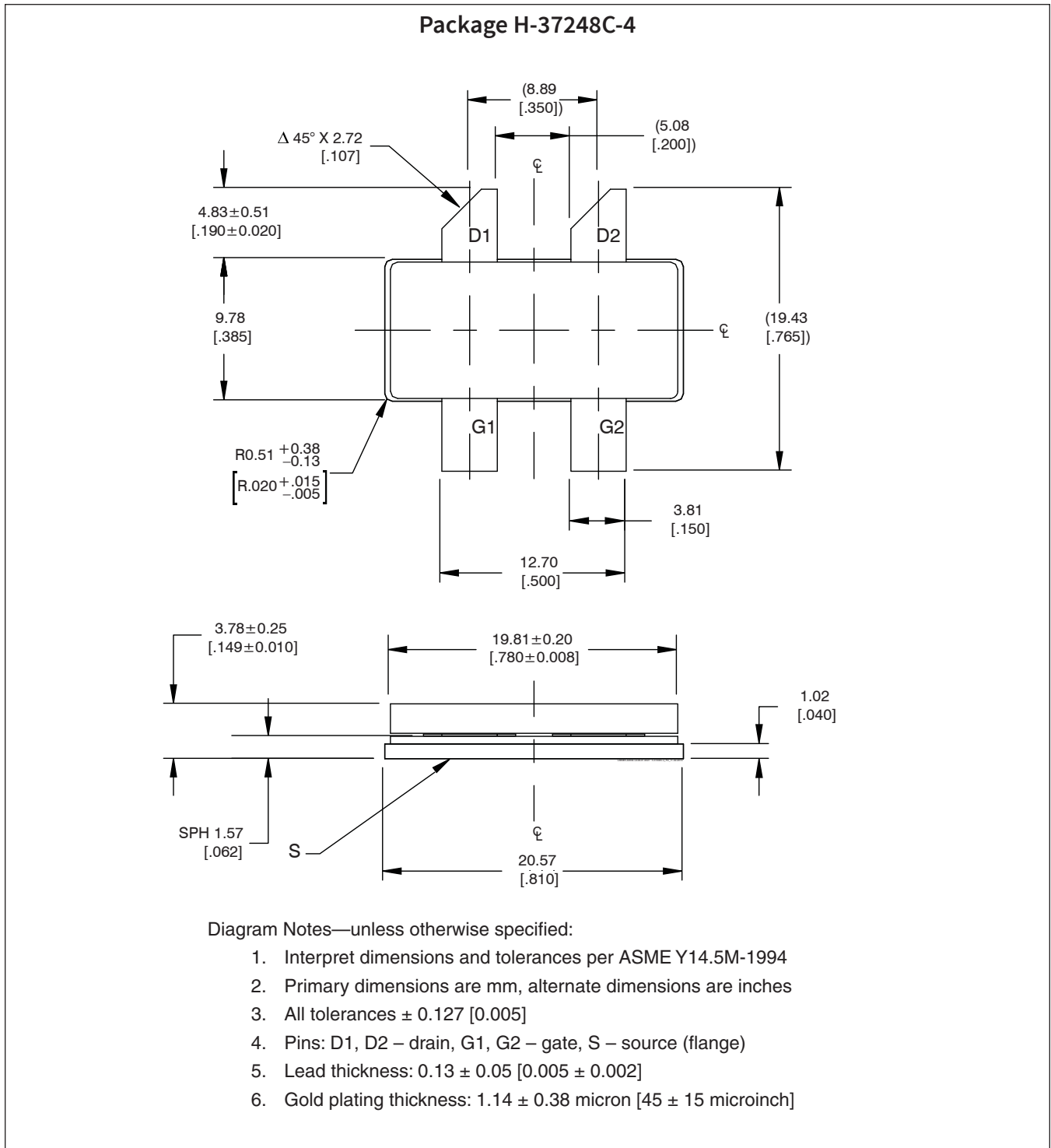
Component	Description	Manufacturer	P/N
Input			
C101, C102	Capacitor, 0.5 pF	ATC	ATC800A0R5CT250XT
C103	Capacitor, 0.9 pF	ATC	ATC800A0R9CT250XT
C104	Capacitor, 1.2 pF	ATC	ATC800A1R2CT250XT
C105, C106, C107, C108, C112	Capacitor, 10 pF	ATC	ATC800A100JT250XT
C109, C113	Capacitor, 1 μ F, 100 V	TDK Corporation	C4532X7R2A105M230KA
C110, C114	Capacitor, 10 μ F, 100 V	TDK Corporation	C5750X7S2A106M230KB
C111, C115	Capacitor, 100 μ F, 35 V	Panasonic Electronic Components	EEE-FT1V101AP
R101, R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103	Resistor, 50 ohms	Richardson	C8A50Z4A
U1	Hybrid Coupler	Anaren	XC3500P-03S
Output			
C201, C202, C203, C207	Capacitor, 10 pF	ATC	ATC800A100JT250XT
C204, C208	Capacitor, 1 μ F, 100 V	TDK Corporation	C4532X7R2A105M230KA
C205, C206, C209, C210	Capacitor, 10 μ F, 100 V	TDK Corporation	C5750X7S2A106M230KB
C211	Capacitor, 220 μ F, 100 V	Panasonic Electronic Components	ECA-2AHG221

Pinout Diagram (top view)



Lead connections for GTRA374902FC

Package Outline Specifications





Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2018-10-29	Advance	All	Data Sheet reflects advance specification for product development
01.1	2018-12-03	Advance	2	Revised max drain operating voltage to 50V, added operating voltage in Max ratings table
02	2019-02-18	Production	All	Data Sheet reflects released product specification
02.1	2019-04-26	Production	1	Added VSWR statement

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Notes

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