

# GTRA362002FC

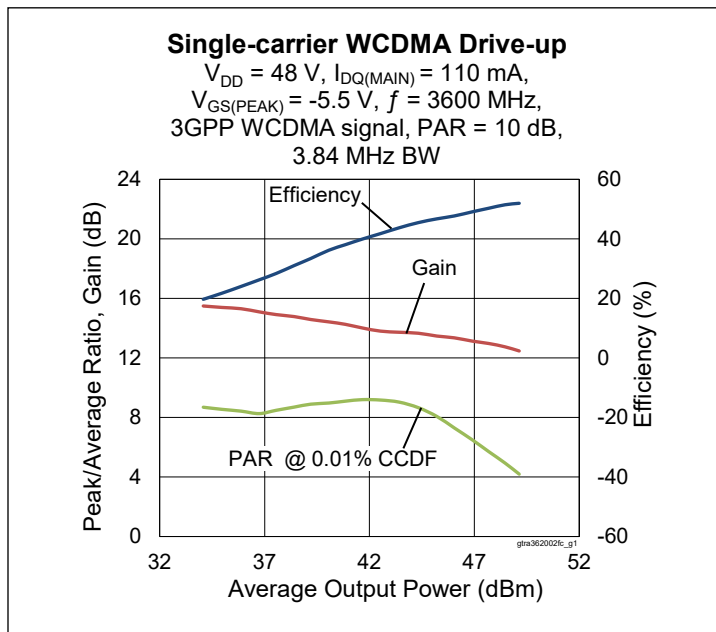
## Thermally-Enhanced High Power RF GaN on SiC Amplifier, 200 W, 48 V, 3400 – 3600 MHz

### Description

The GTRA362002FC is a 200-watt ( $P_{3dB}$ ) GaN on SiC HEMT D-mode amplifier designed for use in multi-standard cellular power amplifier applications. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.



GTRA362002FC  
Package H-37248C-4



### Features

- GaN on SiC HEMT technology
- Input matched
- Asymmetrical Doherty design
  - Main:  $P_{3dB} = 85\text{ W Typ}$
  - Peak:  $P_{3dB} = 115\text{ W Typ}$
- Typical Pulsed CW performance, 3500 MHz, 48 V, combined outputs
  - Output power at  $P_{3dB} = 200\text{ W}$
  - Efficiency = 60%
  - Gain = 12.5 dB
- Capable of handling 10:1 VSWR @ 50 V, 30 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 the Doherty production test fixture)

$V_{DD} = 48\text{ V}$ ,  $I_{DQ} = 110\text{ mA}$ ,  $P_{OUT} = 29\text{ W avg}$ ,  $V_{GS(peak)} = V_{GS} @ I_{DQ} = 140\text{ mA} - 2.0\text{ V}$ ,  $f = 3600\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	$G_{ps}$	12.5	13.5	—	dB
Drain Efficiency	$\eta_D$	38	42	—	%
Adjacent Channel Power Ratio	ACPR	—	-29	-26	dBc
Output PAR @ 0.01% CCDF	OPAR	7	7.7	—	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	$V_{GS} = -8\text{ V}, I_D = 10\text{ mA}$	$V_{(BR)DSS}$	150	—	—	V
Drain-source Leakage Current	$V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$	$I_{DSS}$	—	—	5	mA
Gate Threshold Voltage	(main) $V_{DS} = 10\text{ V}, I_D = 10.8\text{ mA}$	$V_{GS(th)}$	-3.8	-3.0	-2.3	V
	(peak) $V_{DS} = 10\text{ V}, I_D = 14.4\text{ mA}$	$V_{GS(th)}$	-3.8	-3.0	-2.3	V

## Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Voltage		$V_{DD}$	0	—	50	V
Gate Quiescent Voltage	$V_{DS} = 48\text{ V}, I_D = 110\text{ mA}$	$V_{GS(Q)}$	-3.6	-3.0	-2.3	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) $I_G$	10.8	mA
	(peak) $I_G$	14.4	mA
Drain Current	(main) $I_D$	4.1	A
	(peak) $I_D$	5.4	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.

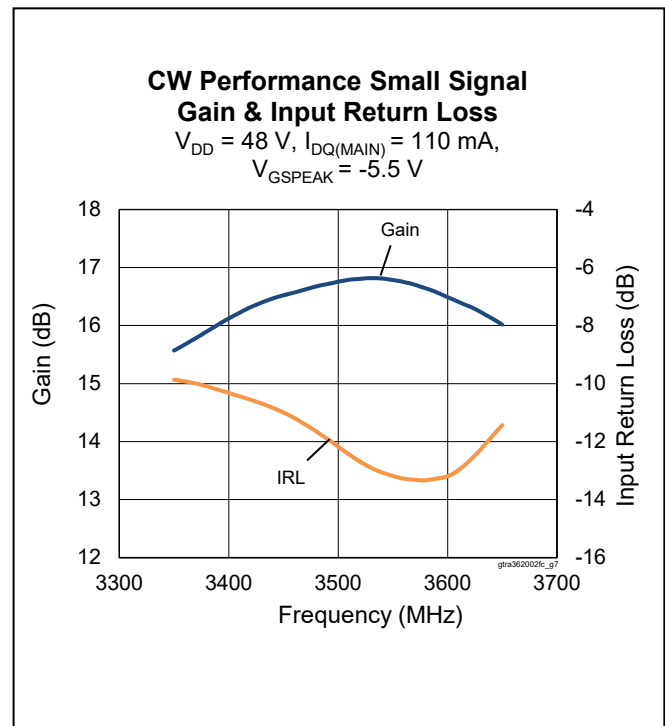
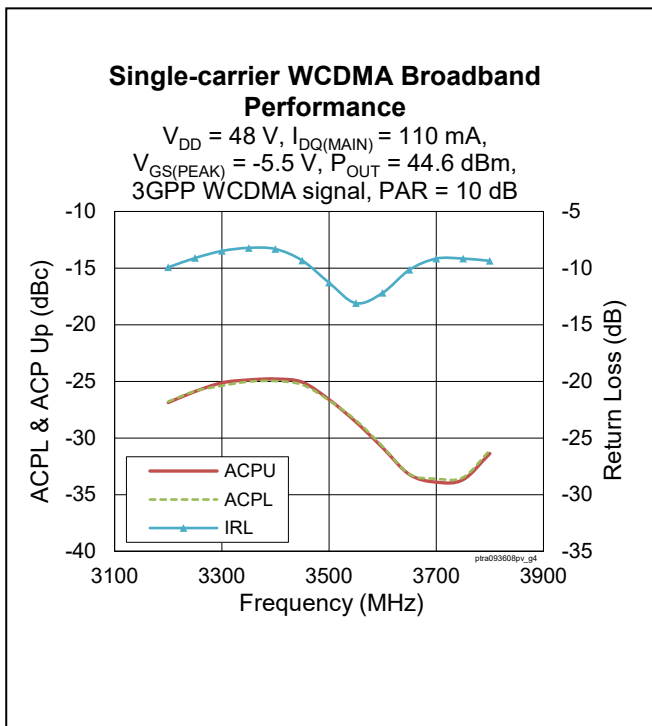
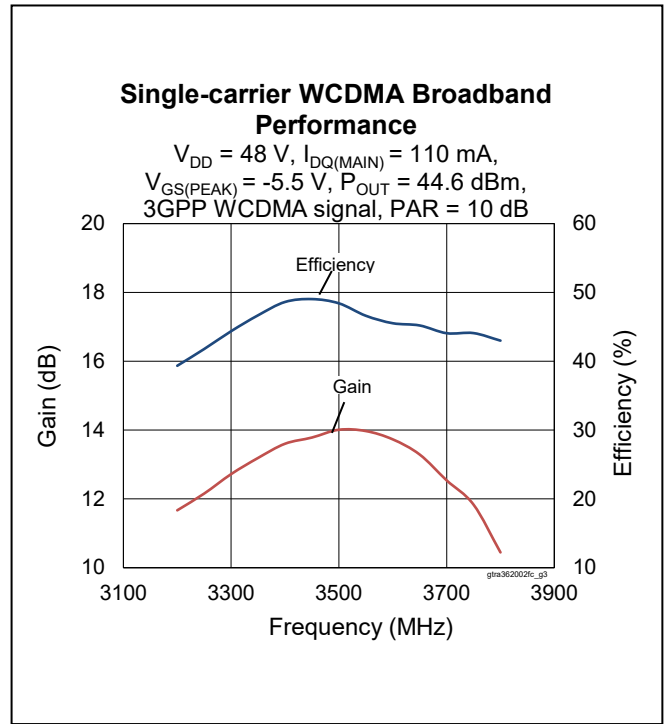
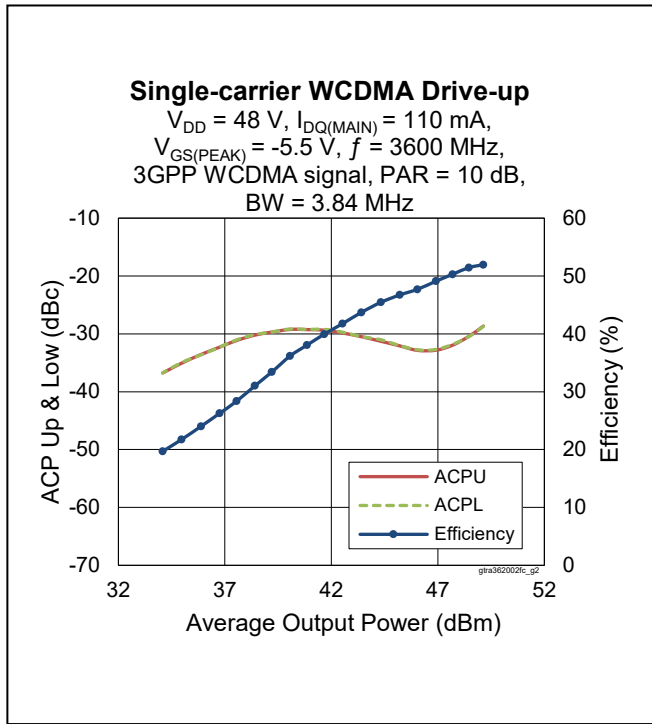
## Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance	(main, $T_{CASE} = 70\text{ °C}, 53\text{ W DC}$ ) $R_{\theta JC}$	2.8	°C/W
	(peak, $T_{CASE} = 70\text{ °C}, 73\text{ W DC}$ ) $R_{\theta JC}$	2.1	°C/W

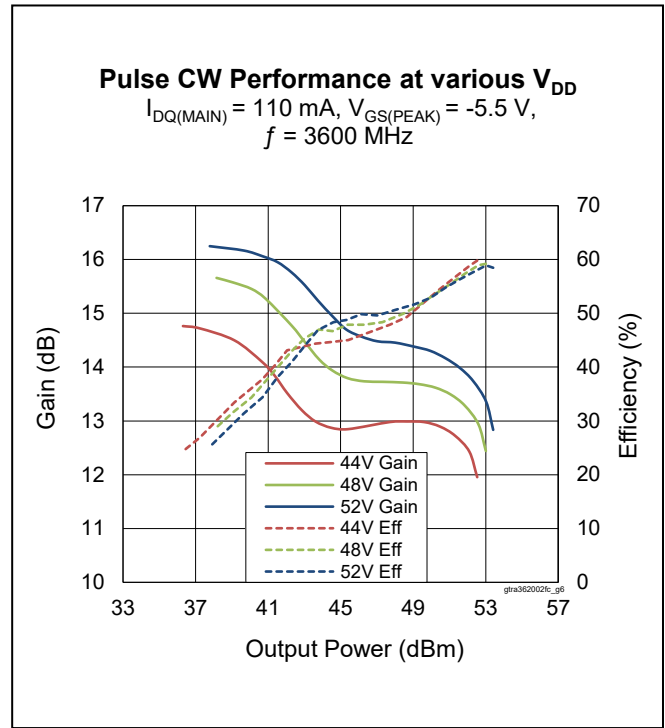
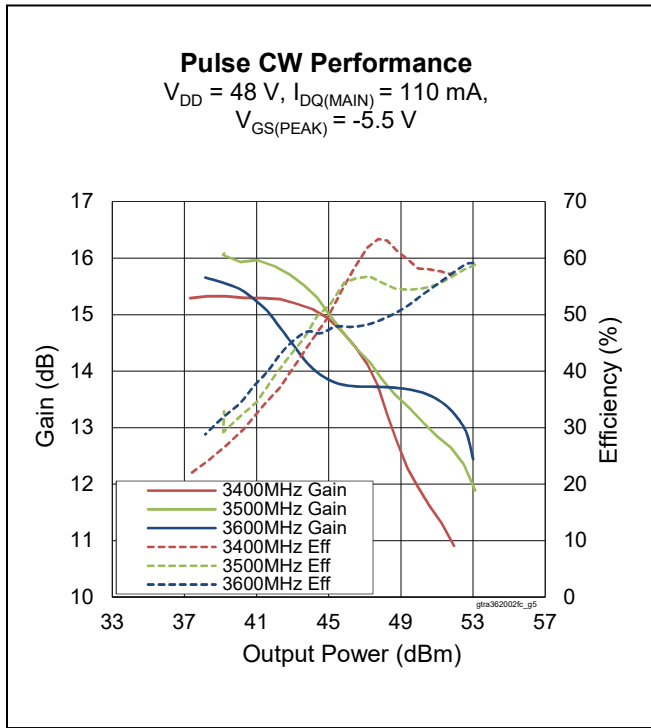
## Ordering Information

Type and Version	Order Code	Package	Shipping
GTRA362002FC V1 R0	GTRA362002FC-V1-R0	H-37248C-4	Tape & Reel, 50 pcs
GTRA362002FC V1 R2	GTRA362002FC-V1-R2	H-37248C-4	Tape & Reel, 250 pcs

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



**Typical Performance** (cont.)



**Load Pull**

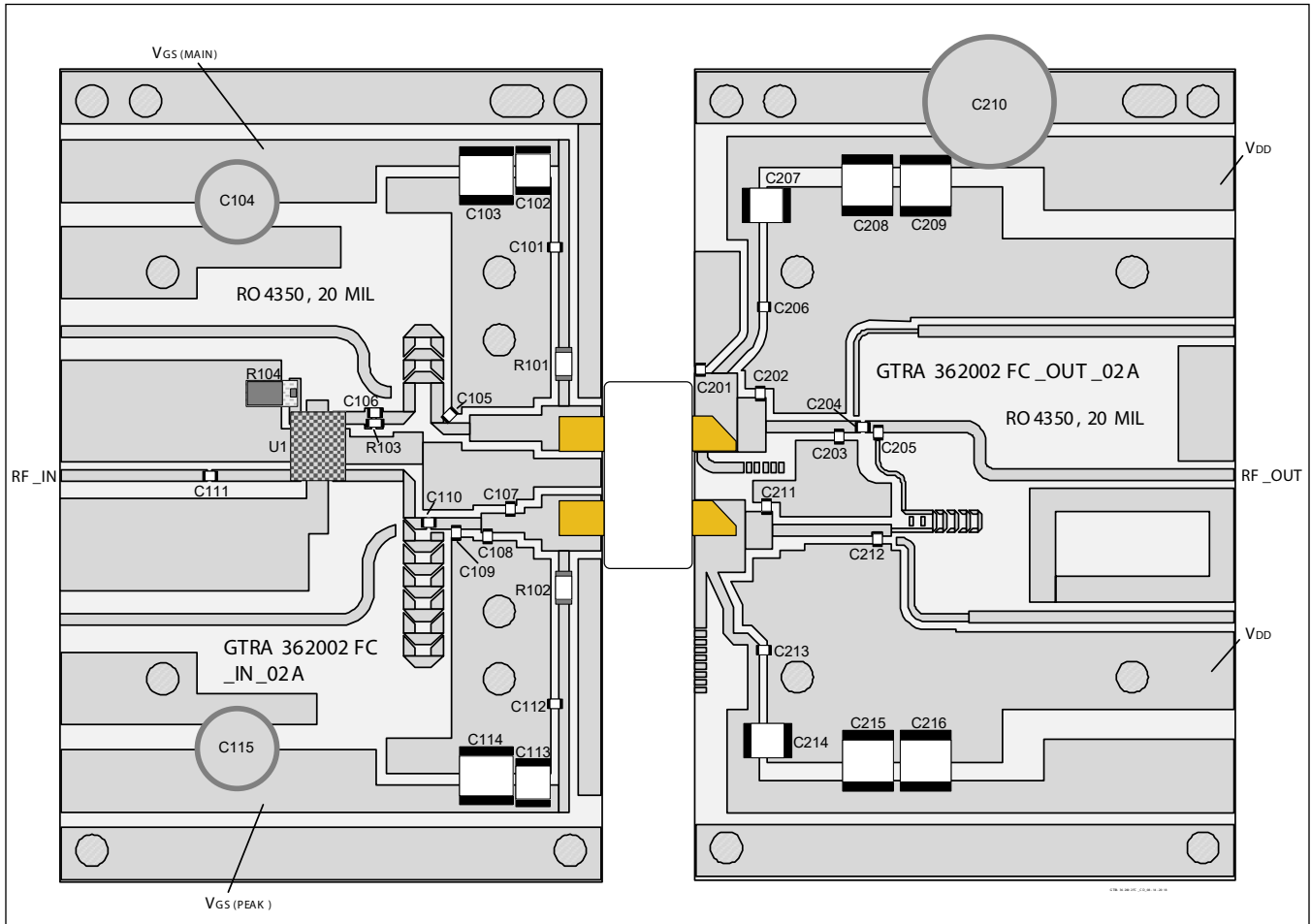
**Main Side Load Pull Performance** – Pulsed CW signal: 10  $\mu\text{s}$ , 10% duty cycle, 48 V,  $I_{DQ} = 110\text{ mA}$ , class AB

Freq [MHz]	$Z_s$ [ $\Omega$ ]	$P_{3dB}$					$P_{3dB}$				
		$Z_L$ [ $\Omega$ ]	Gain [dB]	$P_{3dB}$ [dBm]	$P_{3dB}$ [W]	$\eta_D$ [%]	$Z_L$ [ $\Omega$ ]	Gain [dB]	$P_{3dB}$ [dBm]	$P_{3dB}$ [W]	$\eta_D$ [%]
3400	21+j11	8.9-j7.7	15.5	51.31	135	70.0	5.2-j6.6	16.7	50.10	102	76.5
3500	14+j4	9.6-j9.2	15.3	51.23	133	68.6	4.9-j6.9	16.6	49.60	91	77.7
3600	11+j0	10.1-j10.4	15.1	51.33	136	68.1	5.5-j8.2	16.4	50.00	100	77.9

**Peak Side Load Pull Performance** – Pulsed CW signal: 10  $\mu\text{s}$ , 10% duty cycle, 48 V,  $I_{DQ} = 140\text{ mA}$ , class AB

Freq [MHz]	$Z_s$ [ $\Omega$ ]	$P_{3dB}$					$P_{3dB}$				
		$Z_L$ [ $\Omega$ ]	Gain [dB]	$P_{3dB}$ [dBm]	$P_{3dB}$ [W]	$\eta_D$ [%]	$Z_L$ [ $\Omega$ ]	Gain [dB]	$P_{3dB}$ [dBm]	$P_{3dB}$ [W]	$\eta_D$ [%]
3400	30+j8	6.8-j9.8	15.1	52.23	167	61.1	4.4-j7.1	16.8	51.06	127	69.0
3500	21+j3.5	8.0-j10	14.9	52.20	166	61.3	5.4-j6.3	16.2	50.90	123	68.0
3600	17-j0.8	9.1-j9	14.7	52.04	160	60.8	5.3-j7.3	16.2	50.72	118	66.0

**Reference Circuit, 3400 – 3600 MHz**



Reference circuit assembly diagram (not to scale)

**Reference Circuit Assembly**

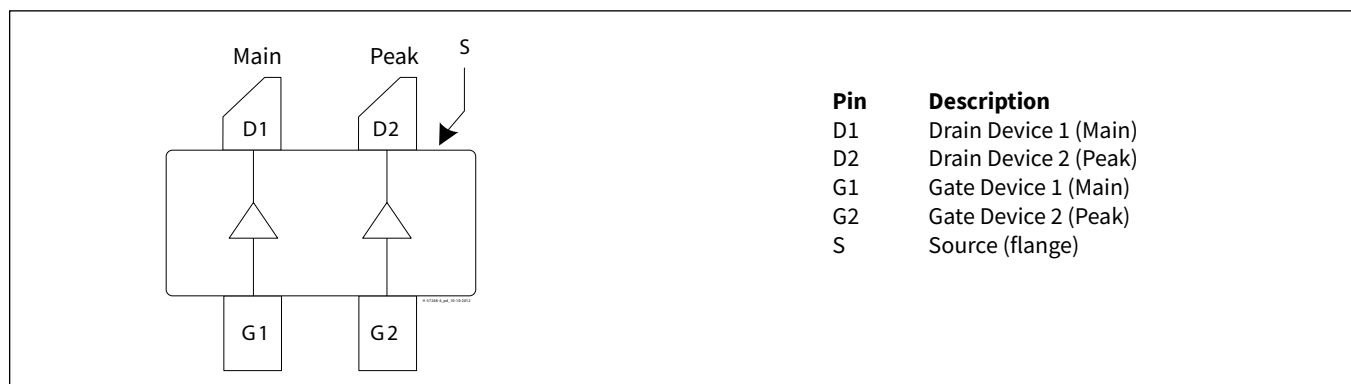
DUT	GTRA362002FC V1
Test Fixture Part No.	LTA/GTRA362002FC V1
PCB	Rogers 4350, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$

## Reference Circuit (cont.)

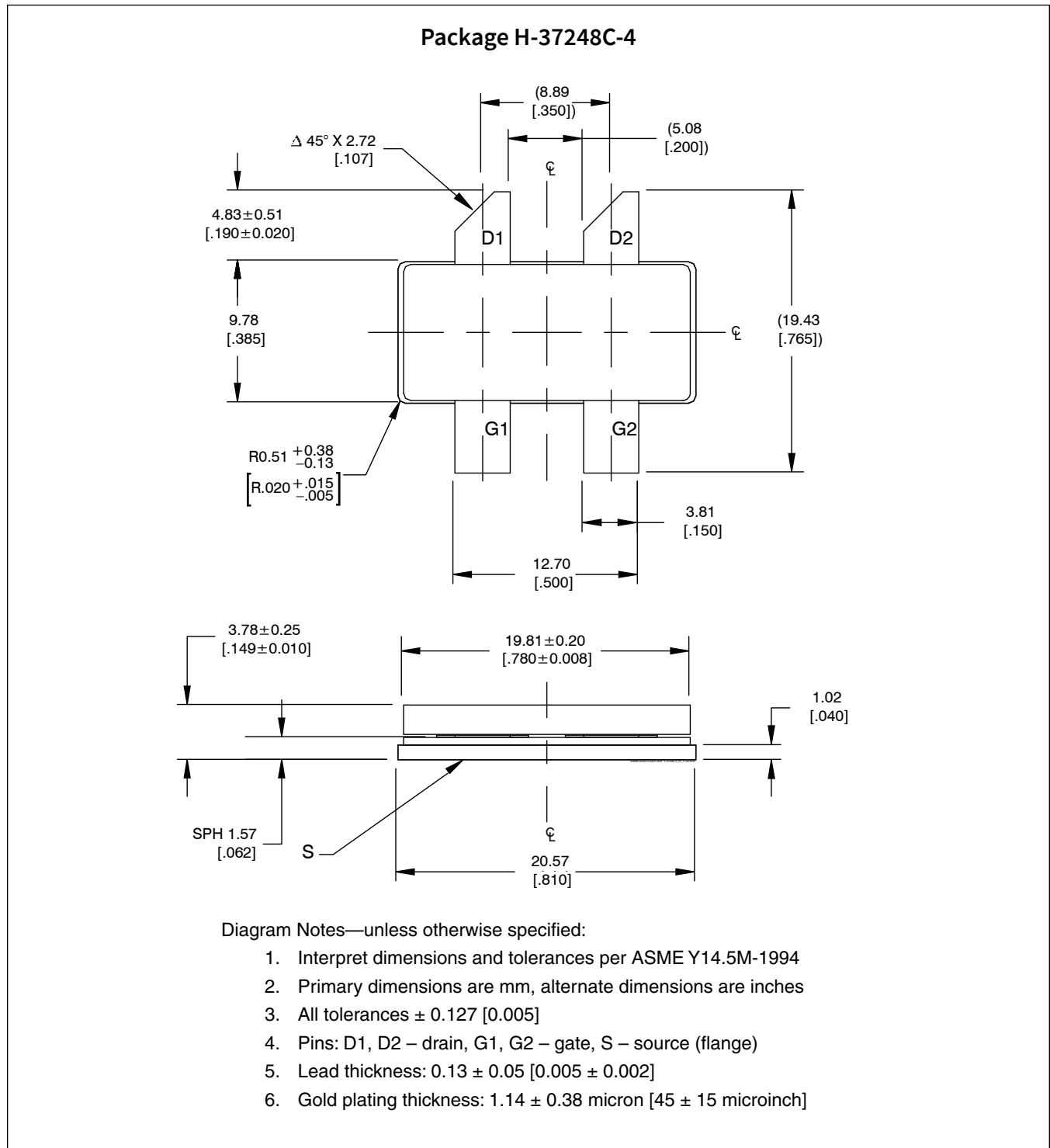
### Components Information

Component	Description	Manufacturer	P/N
<b>Input</b>			
C101, C106, C110, C111, C112	Capacitor, 12 pF	ATC	ATC800A120JT250T
C102, C113	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
C103, C114	Capacitor, 100 V, 10 $\mu$ F	TDK Corporation	C5750X7S2A106M230KB
C104, C115	Capacitor, 100 $\mu$ F	Panasonic Electronic Components	EEE-FP1H101AP
C105	Capacitor, 0.7 pF	ATC	ATC800A0R7CT250T
C107	Capacitor, 0.5 pF	ATC	ATC800A0R5CT250T
C108	Capacitor, 1.5 pF	ATC	ATC800A1R5CT250T
C109	Capacitor, 0.9 pF	ATC	ATC800A0R9CT250T
R101, R102	Resistor, 5.6 ohms	Panasonic Electronic Components	ERJ-8RQJ5R6V
R103	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-3GEYJ100V
R104	Resistor, 50 ohms	Richardson	C16A50Z4
U1	Hybrid coupler	Anaren	XC3500P-03S
<b>Output</b>			
C201, C202	Capacitor, 0.7 pF	ATC	ATC800A0R7CT250T
C203, C211, C212	Capacitor, 0.3 pF	ATC	ATC800A0R3CT250T
C204, C205, C206, C213	Capacitor, 12 pF	ATC	ATC800A120JT250T
C207, C214	Capacitor, 1 $\mu$ F	TDK Corporation	C4532X7R2A105M230KA
C208, C209, C215, C216	Capacitor, 100 V, 10 $\mu$ F	TDK Corporation	C5750X7S2A106M230KB
C210	Capacitor, 220 $\mu$ F	Panasonic Electronic Components	ECA-2AHG221

### Pinout Diagram (top view)



## Package Outline Specifications



#### Notes & Disclaimer

---

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.