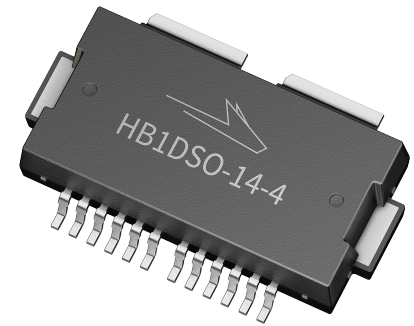


# PTMC210404MD

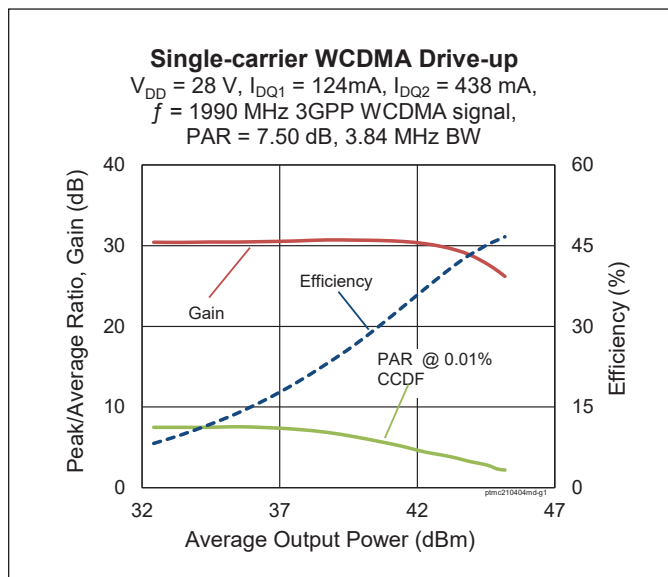
Wideband LDMOS Two-stage Integrated Power Amplifier  
2 x 20 W, 28 V, 1805 – 2200 MHz



Package Types: PG-HB1DSO-14-4 (formed leads)

## Description

The PTMC210204MD is a wideband, two-stage LDMOS integrated amplifier intended for wideband driver applications. It has internal matching for operation from 1805 to 2200 MHz. It features on-chip matching high efficiency, and dual independent outputs with 20 W of output power each. It is available in a 14-lead plastic overmold package with gull wing leads.



## Features

- On-chip matching for broadband operation
- Typical pulsed CW performance, 1990 MHz, 28 V, combined outputs
  - Output power at P1dB = 37 W
  - Linear Gain = 31.5 dB
  - Efficiency = 53.1%
- Capable of handling 10:1 VSWR @28 V, 37 W (CW) output power
- Integrated ESD protection
- Human Body Model Class 1B (per ANSI/ESDA/JEDEC JS-001)
- Integrated temperature compensation
- Pb-free and RoHS compliant

## RF Characteristics

### Single-carrier WCDMA Specifications (tested in WolfSpeed test fixture)

$V_{DD} = 28\text{ V}$ ,  $I_{DQ1(A+B)} = 63\text{ mA}$ ,  $I_{DQ2(A+B)} = 219\text{ mA}$ ,  $P_{OUT} = 5\text{ W avg}$ ,  $f = 1990\text{ MHz}$ , 3GPP WCDMA signal, channel bandwidth = 3.84 MHz, peak/average = 7.5 dB @ 0.01% CCDF

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Linear Gain	$G_{ps}$	29	30	—	dB
Power Added Efficiency	PAE	17.5	18.5	—	%
Adjacent Channel Power Ratio	ACPR	—	-49.5	-47.5	dBc
Output PAR @ 0.01% CCDF	OPAR	7.0	7.2	—	dB

Note:

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

ESD: Electrostatic discharge sensitive device—observe handling precautions!





## DC Characteristics

Stage 1	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain Leakage Current	$I_{DSS}$	—	—	0.1	$\mu\text{A}$	$V_{DS} = 28\text{ V}, V_{GS} = 0\text{ V}$
		—	—	1.0		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$
Gate Leakage Current	$I_{GSS}$	—	—	0.1		$V_{GS} = 1\text{ V}, V_{DS} = 0\text{ V}$
On-State Resistance	$R_{DS(on)}$	—	5	—	$\Omega$	$V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$
Operating Gate Voltage	$V_{GS1}$	—	2.7	—	V	$V_{DS} = 28\text{ V}, I_{DQ1} = 63\text{ mA}$
Fixture Operating Gate Voltage		—	4.9	—		

Stage 2	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain-source Breakdown Voltage	$V_{BR(DSS)}$	64	—	—	V	$V_{GS} = 0\text{ V}, I_{DS} = 10\text{ mA}$
Drain Leakage Current	$I_{DSS}$	—	—	0.1	$\mu\text{A}$	$V_{DS} = 28\text{ V}, V_{GS} = 0\text{ V}$
		—	—	1.0		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$
Gate Leakage Current	$I_{GSS}$	—	—	0.1		$V_{GS} = 1\text{ V}, V_{DS} = 0\text{ V}$
On-State Resistance	$R_{DS(on)}$	—	1.5	—	$\Omega$	$V_{GS} = 10\text{ V}, V_{DS} = 0.1\text{ V}$
Operating Gate Voltage	$V_{GS2}$	—	2.7	—	V	$V_{DS} = 28\text{ V}, I_{DQ2} = 219\text{ mA}$
Fixture Operating Gate Voltage		—	4.9	—		

## Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	65	V
Gate-Source Voltage	$V_{GS}$	-6 to +10	
Junction Temperature	$T_J$	225	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	
Operating Voltage	$V_{DD}$	0 to 32	V

## Thermal Characteristics

Characteristic	Symbol	Value	Unit	Conditions
Thermal Resistance Stage 1	$R_{\theta JC}$	6.7	$^{\circ}\text{C}/\text{W}$	$T_{CASE} = 70^{\circ}\text{C}, 37\text{ W CW}$
Thermal Resistance Stage 2		1.4		$T_{CASE} = 70^{\circ}\text{C}, 37\text{ W CW}$

## Moisture Sensitivity Level

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

### Ordering Information

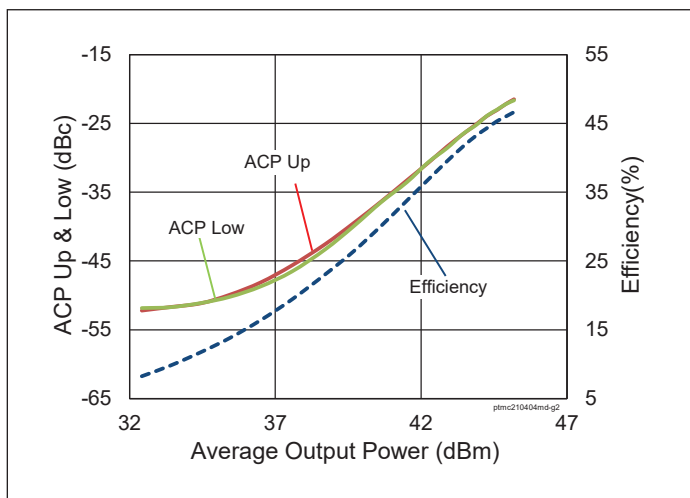
Type and Version	Order Code	Package Description	Shipping
PTMC210404MD V2 R5	PTMC210404MD-V2-R5	PG-HB1DSO-14-4, 14-lead, overmold	Tape & Reel, 500 pcs

### Evaluation Boards

Order Code	Frequency	Description
LTN/PTMC210404MD-V2	1805 – 2200 MHz	Class AB with combined outputs, R04350, 0.508 mm thick

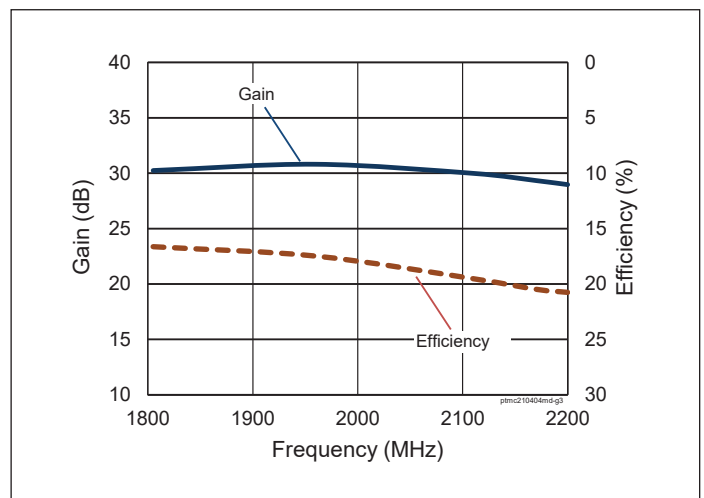
Find Gerber files for these reference fixtures on the Wolfspeed Web site at [www.wolfspeed.com/RF](http://www.wolfspeed.com/RF)

### Typical Performance (data taken in a production test fixture)



**Figure 1.** Single-carrier WCDMA Drive-up

$V_{DD} = 28\text{ V}$ ,  $I_{DQ1} = 124\text{ mA}$ ,  $I_{DQ2} = 438\text{ mA}$ ,  
 $f = 1990\text{ MHz}$ , 3GPP WCDMA signal,  
 PAR = 7.50 dB, BW = 3.84 MHz



**Figure 2.** Single-carrier WCDMA Broadband Performance

$V_{DD} = 28\text{ V}$ ,  $I_{DQ1} = 124\text{ mA}$ ,  $I_{DQ2} = 438\text{ mA}$ ,  
 $P_{OUT} = 37\text{ dBm}$ , 3GPP WCDMA signal,  
 PAR = 7.50 dB



Typical Performance (cont.)

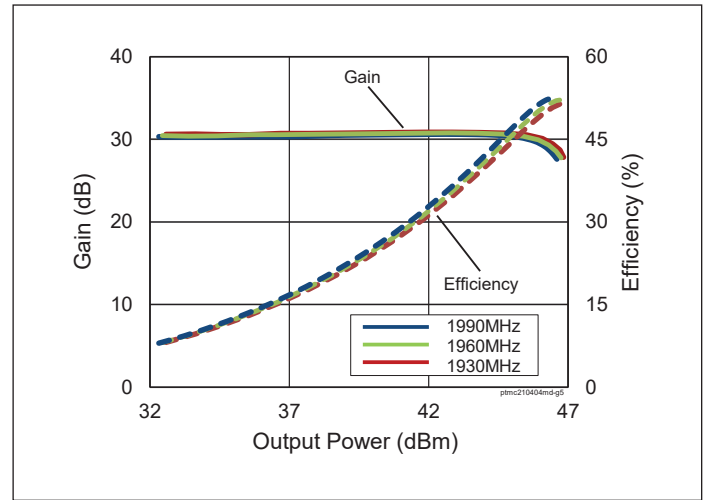
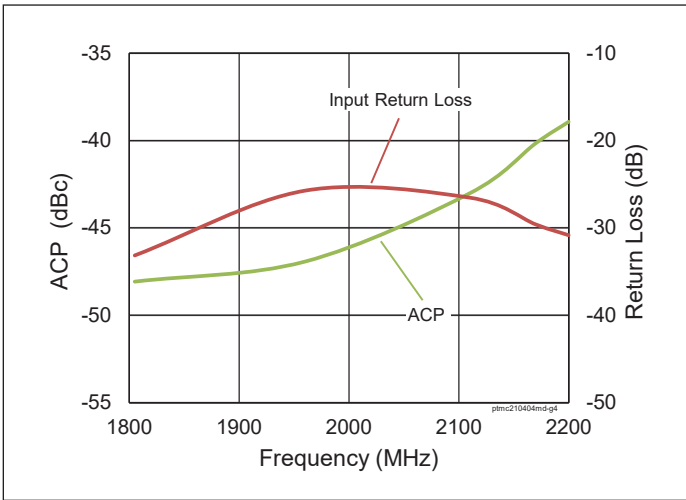


Figure 3. Single-carrier WCDMA Broadband Performance

Figure 4. CW Performance

$V_{DD} = 28\text{ V}$ ,  $I_{DQ1} = 124\text{ mA}$ ,  $I_{DQ2} = 438\text{ mA}$ ,  
 $P_{OUT} = 37\text{ dBm}$ , 3GPP WCDMA signal,  
 PAR = 7.50 dB

$V_{DD} = 28\text{ V}$ ,  $I_{DQ1} = 124\text{ mA}$ ,  $I_{DQ2} = 438\text{ mA}$

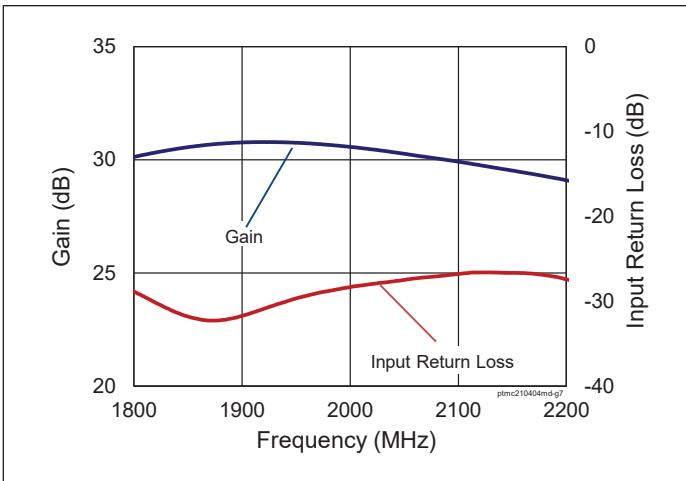


Figure 5. Small Signal CW Gain & Input Return Loss

$V_{DD} = 28\text{ V}$ ,  $I_{DQ1} = 124\text{ mA}$ ,  $I_{DQ2} = 438\text{ mA}$

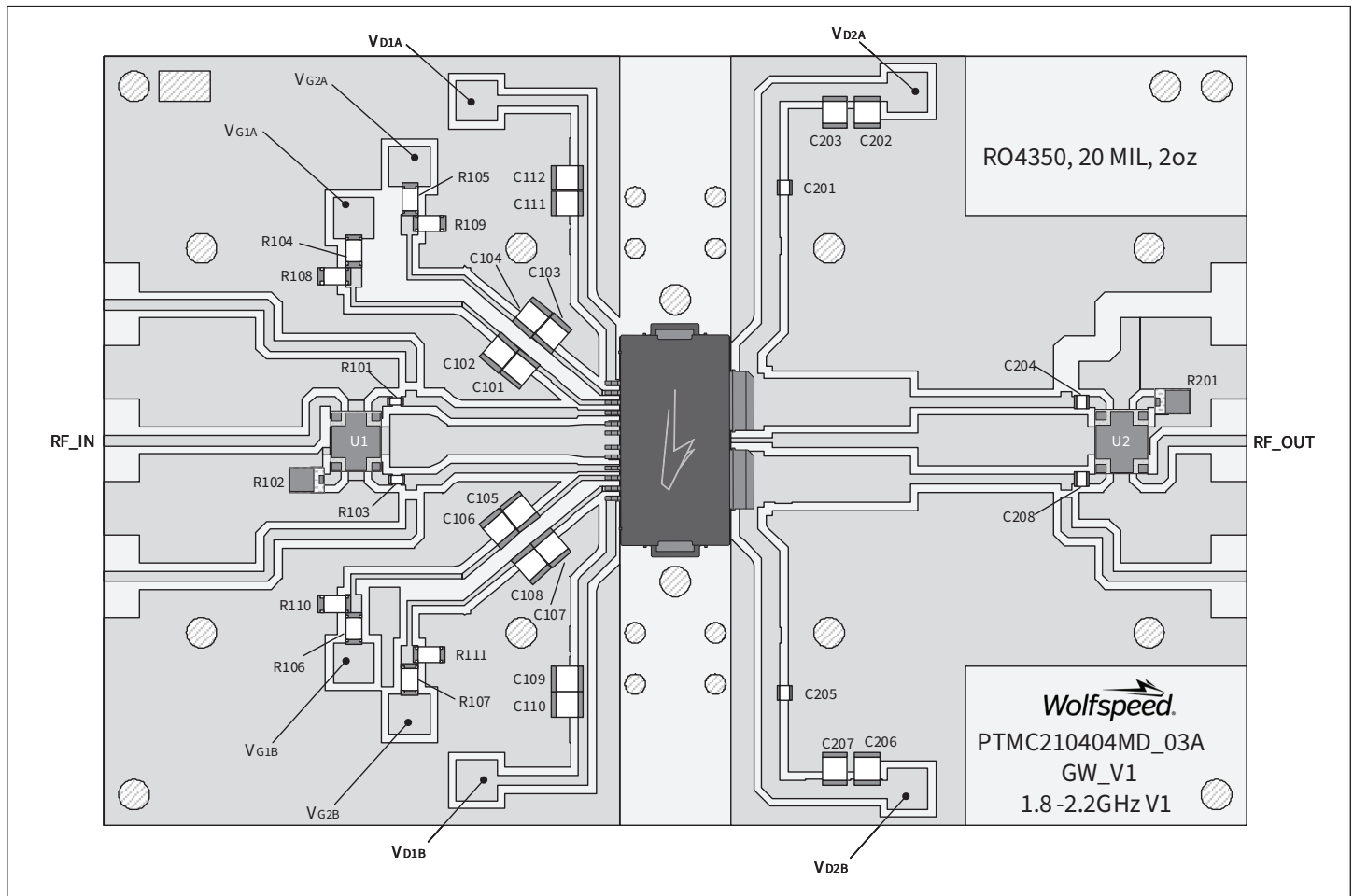


### Load Pull Performance

**Load Pull Performance** – Pulsed CW signal:  $V_{DD} = 28\text{ V}$ ,  $I_{DQ1} = 63\text{ mA}$ ,  $I_{DQ2} = 219\text{ mA}$ , class AB, each side

Class AB		$P_{1dB}$									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	$Z_s [\Omega]$	$Z_l [\Omega]$	Gain [dB]	$P_{OUT} [\text{dBm}]$	$P_{OUT} [\text{W}]$	PAE [%]	$Z_l [\Omega]$	Gain [dB]	$P_{OUT} [\text{dBm}]$	$P_{OUT} [\text{W}]$	PAE [%]
1805	49.8+j2.3	8.8-j6.30	29.8	43.8	23.8	51.2	13.4-j3.7	31.0	42.9	19.4	55.9
1960	49.9-j0.1	8.5-j8.20	29.5	43.8	23.9	50.5	10.9-j2.4	31.0	42.7	18.5	57.0
2170	51.9+j0.2	7.4-j7.60	27.9	43.9	24.3	51.8	7.10-j3.8	29.0	42.9	19.6	56.6
2200	49.3+j1.0	7.7-j7.70	27.6	43.8	23.8	51.5	6.90-j3.7	28.8	42.8	19.0	56.6

### Evaluation Board, 1805 – 2200 MHz



Reference circuit assembly diagram (not to scale)

## Evaluation Board, 1805 – 2200 MHz (cont.)

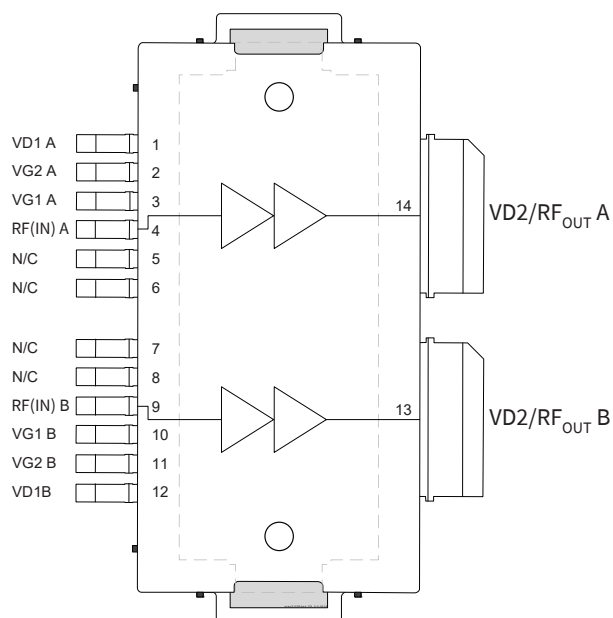
Evaluation Board Part No.	LTN/PTMC210404MD-V2
PCB Information	Rogers 4350B, 0.508 mm [0.020"] thick, 2 oz. copper, $\epsilon_r = 3.66$ , $f = 1805 - 2200$ MHz

Find Gerber files for this test fixture on the Wolfspeed Web site at [www.wolfspeed.com/RF](http://www.wolfspeed.com/RF)

## Components Information

Component	Description	Manufacturer	P/N
<b>Input</b>			
C101, C103, C105, C107, C109, C111, C203, C207	Capacitor, 4.7 $\mu$ F	Murata Electronics North America	GRM32ER71H475KA88L
C102, C104, C106, C108, C110, C112, C202, C206	Capacitor, 10 $\mu$ F	Taiyo Yuden	UMK325C7106MM-T
C201, C204, C205, C208	Capacitor, 10 pF	ATC	ATC800A100JT250T
R101, R103	Resistor, 0.0 ohms	Panasonic Electronic Components	ERJ-3GEY0R00V
R102, R201	Resistor, 50 ohms	Anaren	C8A50Z4A
R104, R105, R106, R107	Resistor, 1K ohms	Panasonic Electronic Components	ERJ-8GEYJ102V
R108, R109, R110, R111	Resistor, 4.3K ohms	Panasonic Electronic Components	ERJ-8GEYJ432V
U1, U2	Hybrid Coupler	Anaren	X3C21P1-03S

## Pinout Diagram



Source: plated copper heat slug on backside of package

## Package Outline Specifications – Package PG-HB1DSO-14-4

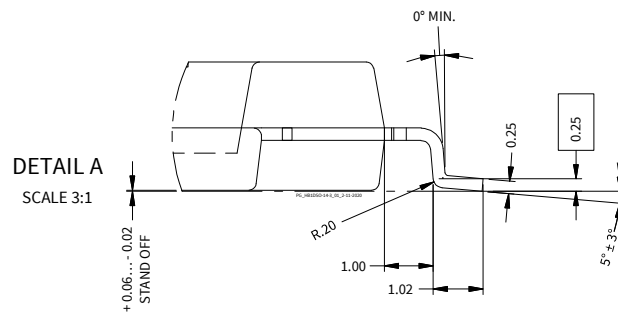
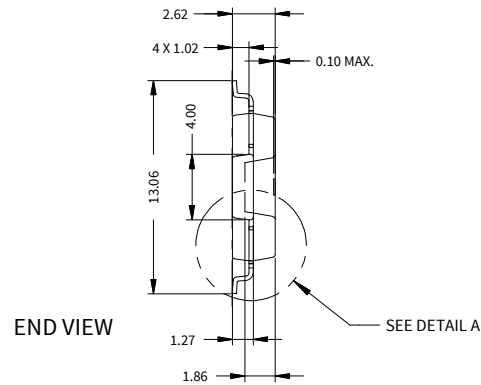
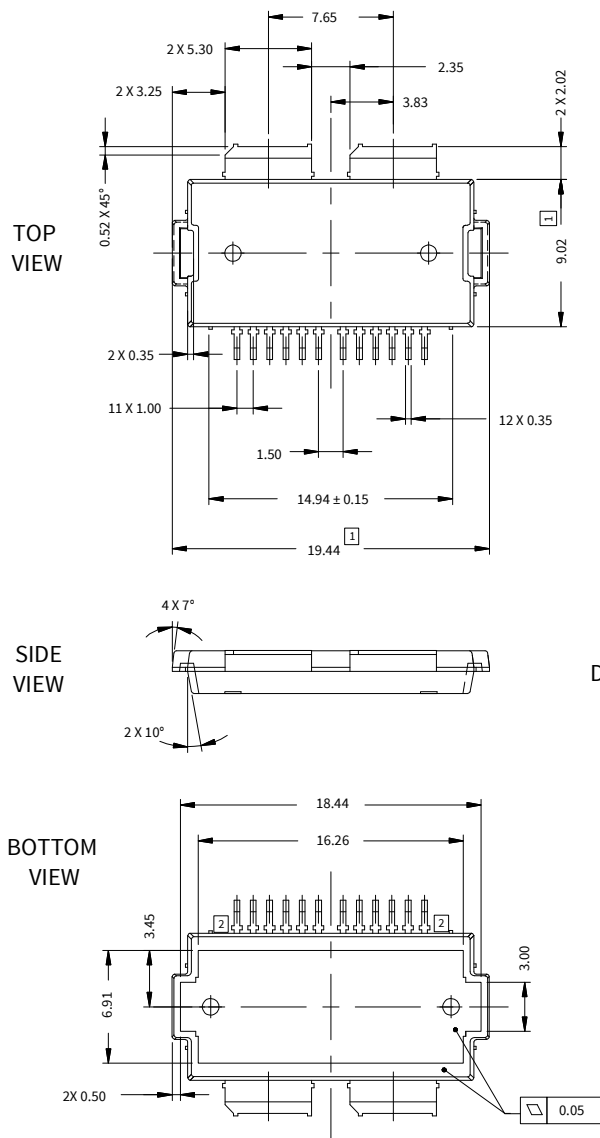


Diagram Notes—unless otherwise specified:

1. Mold/Dam Bar/Metal protrusion of 0.30 mm max per side not included.
2. Metal protrusion are connected to source and shall not exceed 0.10 mm max.
3. Fillets and radii: all radii are 0.3 mm max.
4. Interpret dimensions and tolerances per ISO 8015.
5. Dimensions are mm.
6. All tolerances  $\pm 0.1$  mm unless specified otherwise.
7. All metal surfaces are tin-plated, except area of cut.
8. Lead thickness: 0.25 mm.

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