

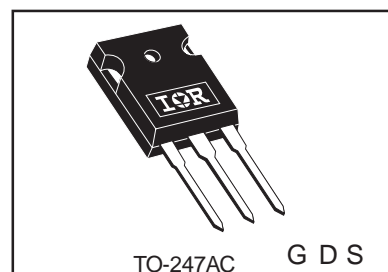
Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptable Power Supply
- High speed power switching

V_{DSS}	$R_{ds(on)}$ max	I_D
500V	0.40 Ω	14A

Benefits

- Low Gate Charge Q_g results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective C_{oss} Specified (See AN 1001)



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	14	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	8.7	
I_{DM}	Pulsed Drain Current ①	56	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	190	W
	Linear Derating Factor	1.5	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	4.1	V/ns
T_J	Operating Junction and	-55 to + 150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Typical SMPS Topologies:

- Two Transistor Forward
- Half Bridge, Full Bridge
- PFC Boost

Notes ① through ⑤ are on page 8

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Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

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	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.58	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$ ⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.40	Ω	$V_{GS} = 10V, I_D = 8.4A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -30V$

Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	7.8	—	—	S	$V_{DS} = 50V, I_D = 8.4A$
Q_g	Total Gate Charge	—	—	64	nC	$I_D = 14A$
Q_{gs}	Gate-to-Source Charge	—	—	16		$V_{DS} = 400V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	26		$V_{GS} = 10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	15	—	ns	$V_{DD} = 250V$
t_r	Rise Time	—	36	—		$I_D = 14A$
$t_{d(off)}$	Turn-Off Delay Time	—	35	—		$R_G = 6.2\Omega$
t_f	Fall Time	—	29	—		$R_D = 17\Omega$, See Fig. 10 ④
C_{iss}	Input Capacitance	—	2038	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	307	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	10	—		$f = 1.0MHz$, See Fig. 5
C_{oss}	Output Capacitance	—	2859	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz$
C_{oss}	Output Capacitance	—	81	—		$V_{GS} = 0V, V_{DS} = 400V, f = 1.0MHz$
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	96	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 400V$ ⑤

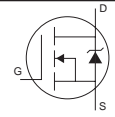
Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	760	mJ
I_{AR}	Avalanche Current①	—	14	A
E_{AR}	Repetitive Avalanche Energy①	—	19	mJ

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.65	$^\circ\text{C/W}$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	14	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	56		
V_{SD}	Diode Forward Voltage	—	—	1.4	V	$T_J = 25^\circ\text{C}, I_S = 14A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	487	731	ns	$T_J = 25^\circ\text{C}, I_F = 14A$
Q_{rr}	Reverse Recovery Charge	—	3.9	5.8	μC	$di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

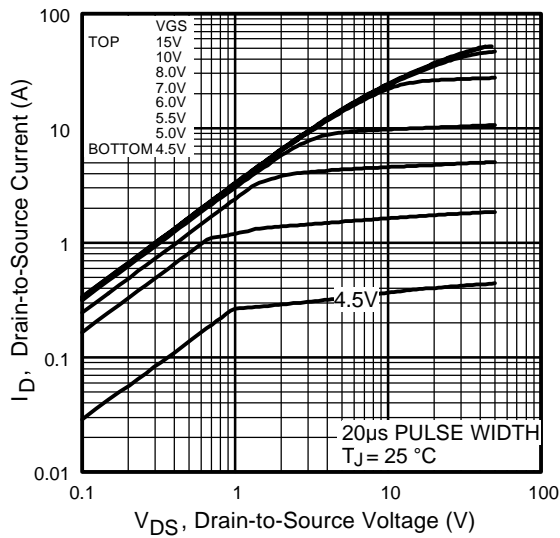


Fig 1. Typical Output Characteristics

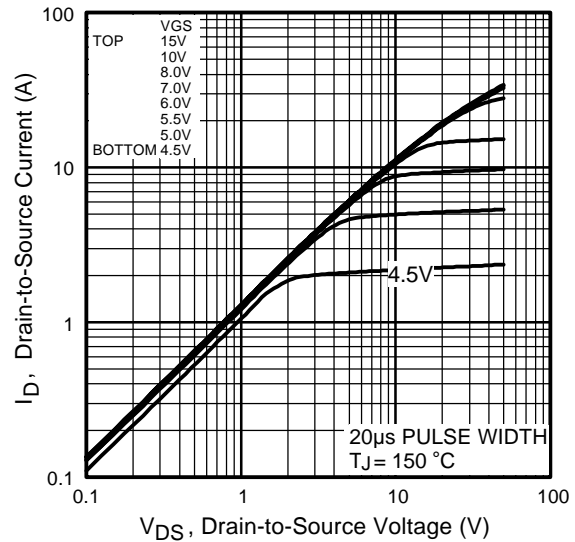


Fig 2. Typical Output Characteristics

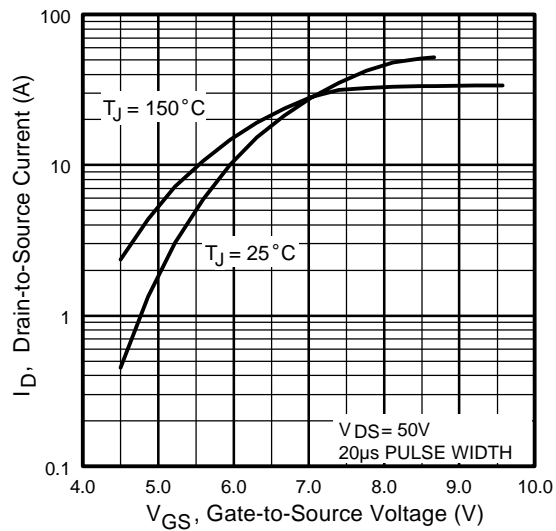


Fig 3. Typical Transfer Characteristics

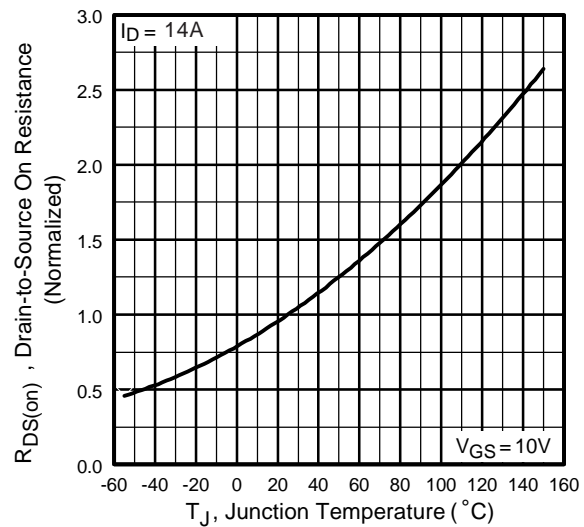


Fig 4. Normalized On-Resistance
Vs. Temperature

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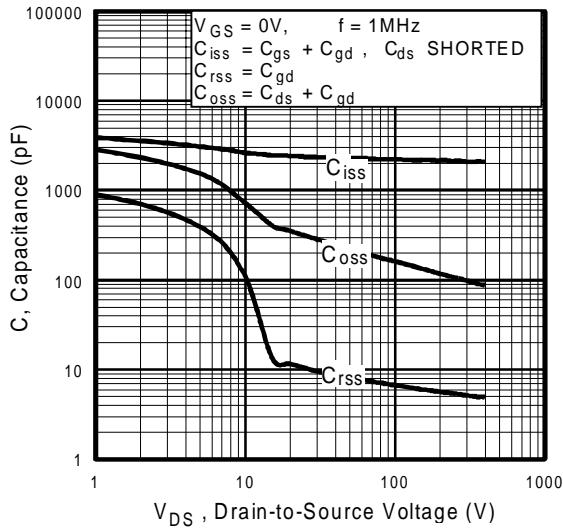


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

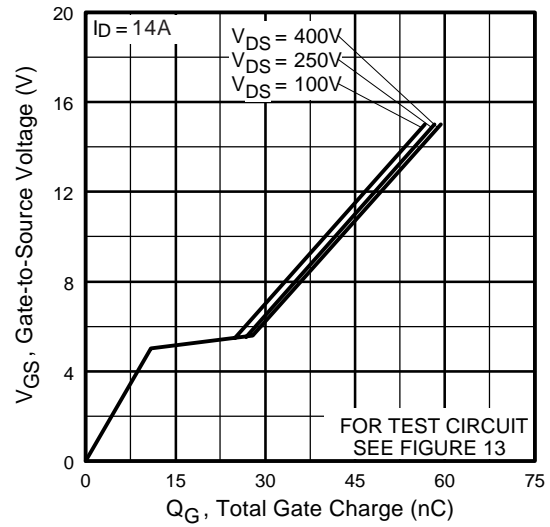


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

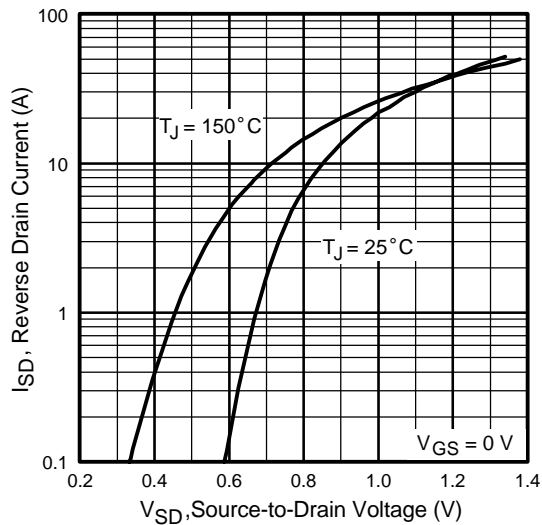


Fig 7. Typical Source-Drain Diode Forward Voltage

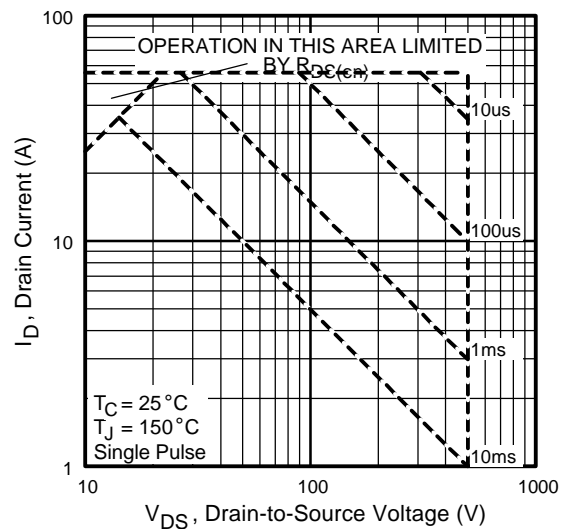


Fig 8. Maximum Safe Operating Area

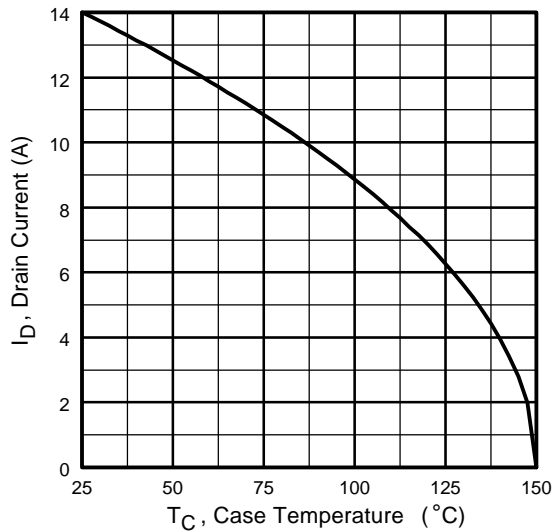


Fig 9. Maximum Drain Current Vs. Case Temperature

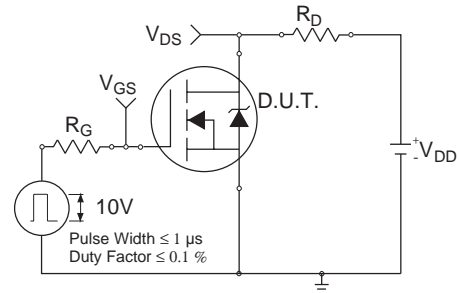


Fig 10a. Switching Time Test Circuit

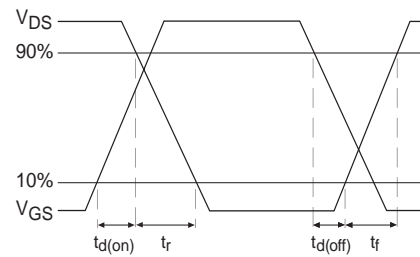


Fig 10b. Switching Time Waveforms

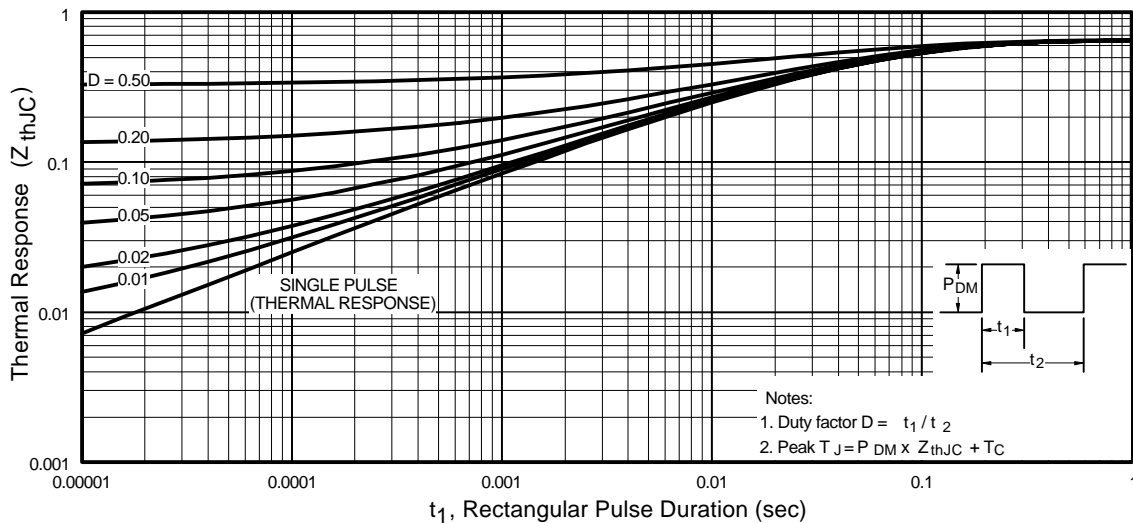


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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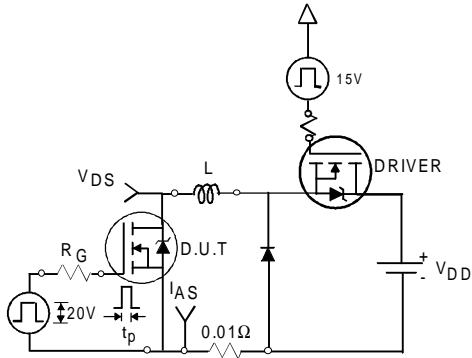


Fig 12a. Unclamped Inductive Test Circuit

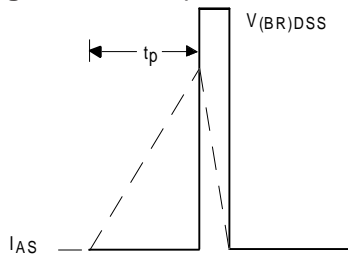


Fig 12b. Unclamped Inductive Waveforms

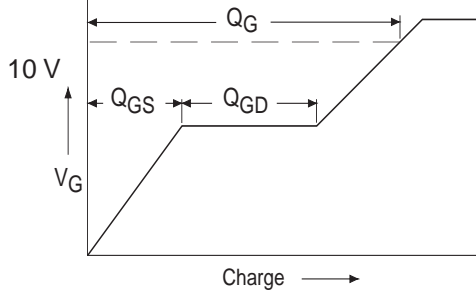


Fig 13a. Basic Gate Charge Waveform

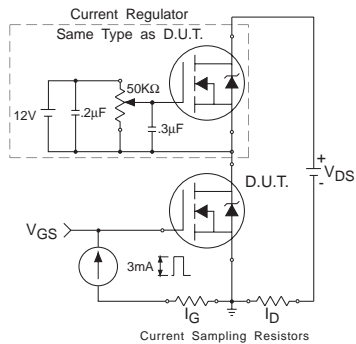


Fig 13b. Gate Charge Test Circuit

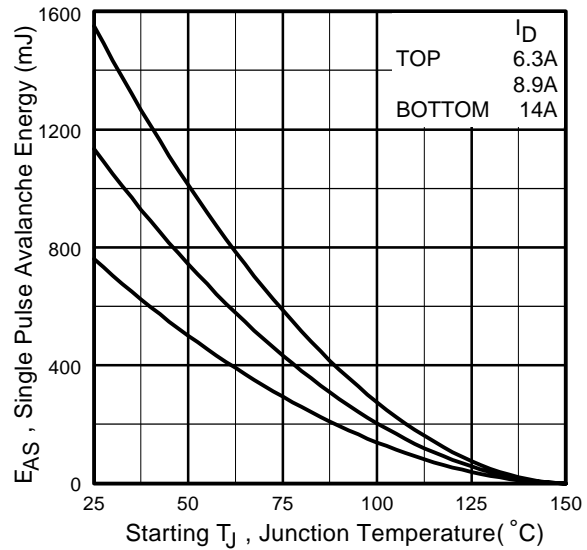


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

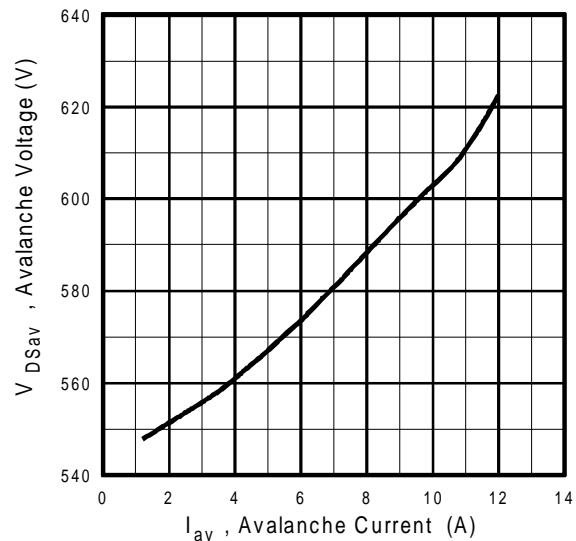


Fig 12d. Typical Drain-to-Source Voltage Vs. Avalanche Current

The diagram shows a Class D amplifier circuit. A square-wave voltage source (1) is connected in series with a resistor R_G to the gate of a MOSFET (D.U.T.). The MOSFET's source is grounded, and its drain is connected to a transformer's primary. The secondary of the transformer is connected to the gate of a second MOSFET (D.U.T.). The second MOSFET's source is grounded, and its drain is connected to a load resistor in series with an inductor. The other end of the inductor is connected to a DC supply V_{DD} . The output voltage is taken across the load resistor. The circuit is annotated with four numbered points for layout considerations: (1) at the input source, (2) at the transformer, (3) at the first MOSFET, and (4) at the output filter components.

Circuit Layout Considerations

- Low Stray Inductance
- Ground Plane
- Low Leakage Inductance

Current Transformer

- dv/dt controlled by R_G
- Driver same type as D.U.T.
- I_{SD} controlled by Duty Factor "D"
- D.U.T. - Device Under Test



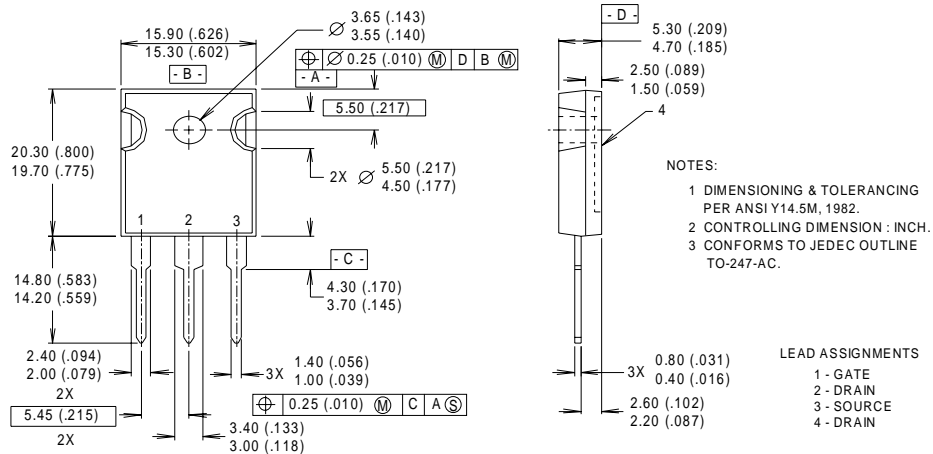
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Package Outline

TO-247AC Outline

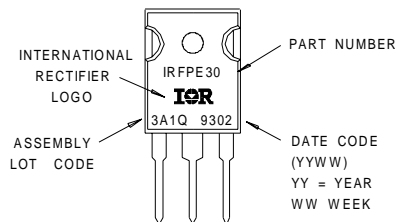
Dimensions are shown in millimeters (inches)



Part Marking Information

TO-247AC

EXAMPLE : THIS IS AN IRFPE30
WITH ASSEMBLY
LOT CODE 3A1Q



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② Starting $T_J = 25^\circ\text{C}$, $L = 7.8\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 14\text{A}$. (See Figure 12)
- ③ $I_{SD} \leq 14\text{A}$, $di/dt \leq 130\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑤ C_{OSS} eff. is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 80% V_{DSS}

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