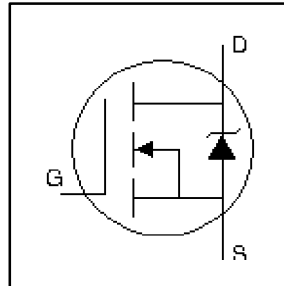


HEXFET® Power MOSFET

- Ultra Low Gate Charge
- Reduced Gate Drive Requirement
- Enhanced 30V V_{GS} Rating
- Reduced C_{ISS} , C_{OSS} , C_{RSS}
- Isolated Central Mounting Hole
- Dynamic dv/dt Rated
- Repetitive Avalanche Rated



$$V_{DSS} = 500V$$

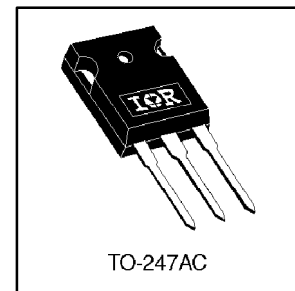
$$R_{DS(on)} = 0.27\Omega$$

$$I_D = 20A$$

Description

This new series of Low Charge HEXFET Power MOSFETs achieve significantly lower gate charge over conventional MOSFETs. Utilizing advanced Hexfet technology the device improvements allow for reduced gate drive requirements, faster switching speeds and increased total system savings. These device improvements combined with the proven ruggedness and reliability of HEXFETs offer the designer a new standard in power transistors for switching applications.

The TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole.



Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	20	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	12	
I_{DM}	Pulsed Drain Current ①	80	
$P_D @ T_C = 25^\circ C$	Power Dissipation	280	W
	Linear Derating Factor	2.2	W/°C
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy ②	960	mJ
I_{AR}	Avalanche Current ③	20	A
E_{AR}	Repetitive Avalanche Energy ①	28	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	V/ns
T_J	Operating Junction and	-55 to + 150	°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 (1.1Nm)	


Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	0.45	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	40	

IRFP460LC



Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	500	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS/ΔT_J}	Breakdown Voltage Temp. Coefficient	—	0.59	—	V/°C	Reference to 25°C, I _D = 1mA
R _{DS(ON)}	Static Drain-to-Source On-Resistance	—	—	0.27	Ω	V _{GS} = 10V, I _D = 12A ④
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	12	—	—	S	V _{DS} = 50V, I _D = 12A
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°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V _{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-100		V _{GS} = -20V
Q _g	Total Gate Charge	—	—	120	nC	I _D = 20A
Q _{gs}	Gate-to-Source Charge	—	—	32		V _{DS} = 400V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	49		V _{GS} = 10V, See Fig. 6 and 13 ④
t _{d(on)}	Turn-On Delay Time	—	18	—		ns
t _r	Rise Time	—	77	—	I _D = 20A	
t _{d(off)}	Turn-Off Delay Time	—	40	—	R _G = 4.3Ω	
t _f	Fall Time	—	43	—	R _D = 12Ω, See Fig. 10 ④	
L _D	Internal Drain Inductance	—	5.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	13	—		
C _{iss}	Input Capacitance	—	3600	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	440	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	39	—		f = 1.0MHz, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	20	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	80		
V _{SD}	Diode Forward Voltage	—	—	1.8	V	T _J = 25°C, I _S = 20A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	570	860	ns	T _J = 25°C, I _F = 20A
Q _{rr}	Reverse Recovery Charge	—	6.6	9.9	μC	di/dt = 100A/μs ④
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L _S +L _D)				

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

③ I_{SD} ≤ 20A, di/dt ≤ 160A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 150°C

② V_{DD} = 25V, starting T_J = 25°C, L = 4.3mH
R_G = 25Ω, I_{AS} = 20A. (See Figure 12)

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

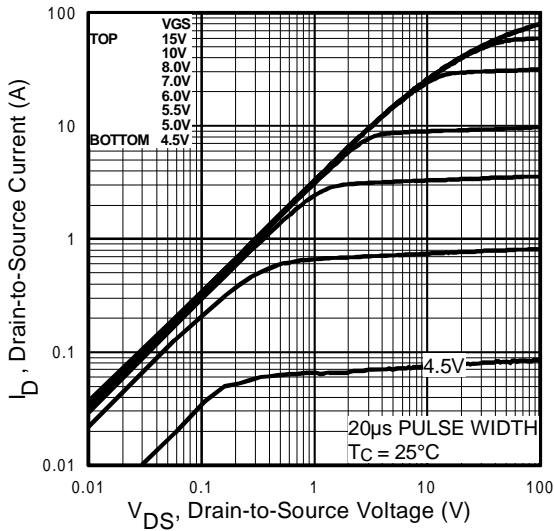


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

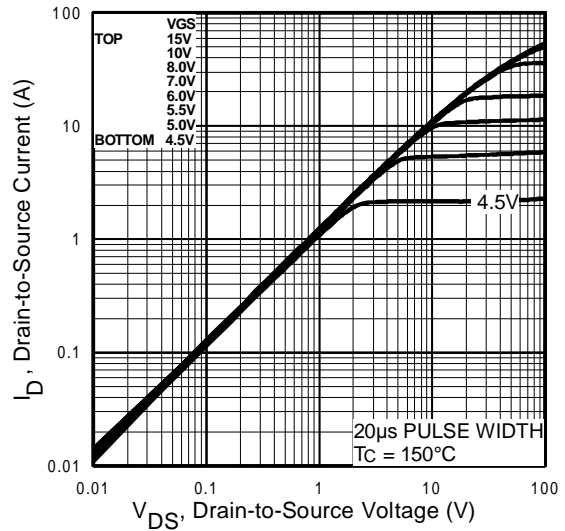


Fig 2. Typical Output Characteristics,
 $T_C = 150^\circ\text{C}$

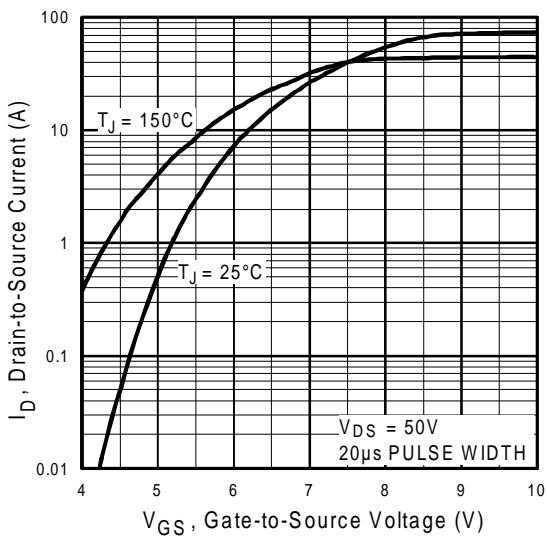


Fig 3. Typical Transfer Characteristics

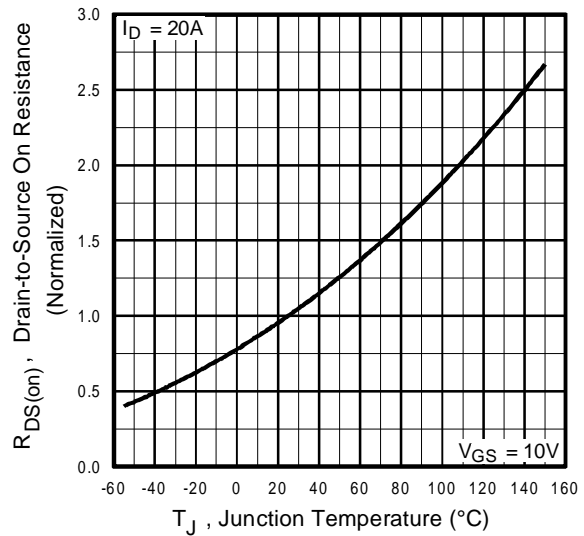


Fig 4. Normalized On-Resistance
Vs. Temperature

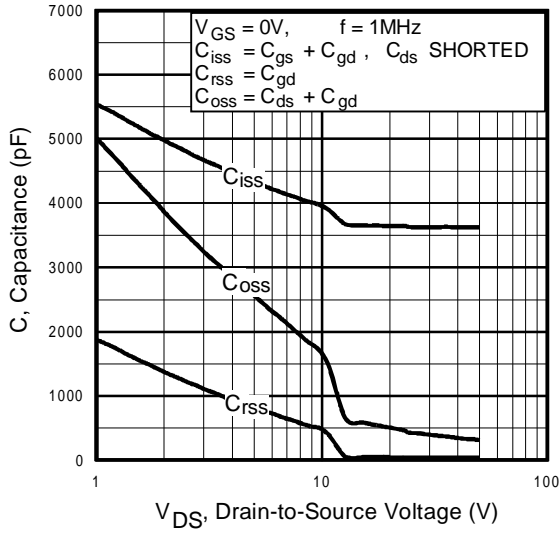


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

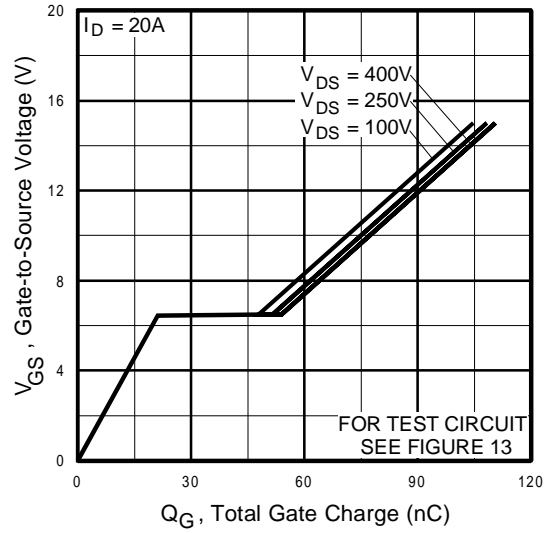


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

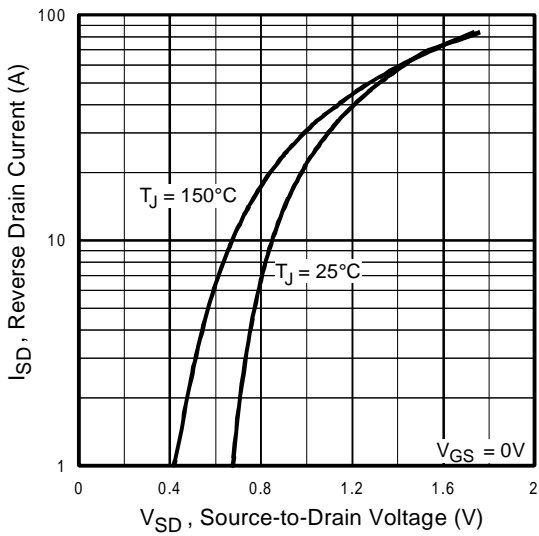


Fig 7. Typical Source-Drain Diode Forward Voltage

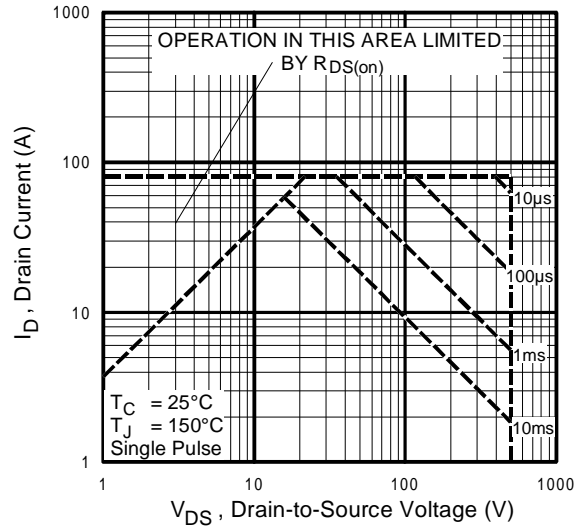


Fig 8. Maximum Safe Operating Area

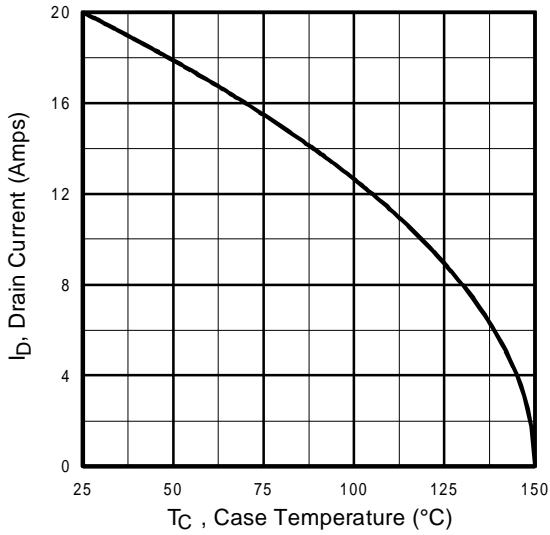


Fig 9. Maximum Drain Current Vs. Case Temperature

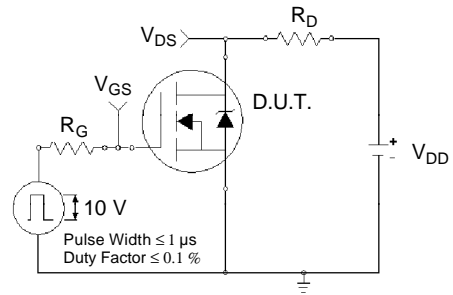


Fig 10a. Switching Time Test Circuit



Fig 10b. Switching Time Waveforms

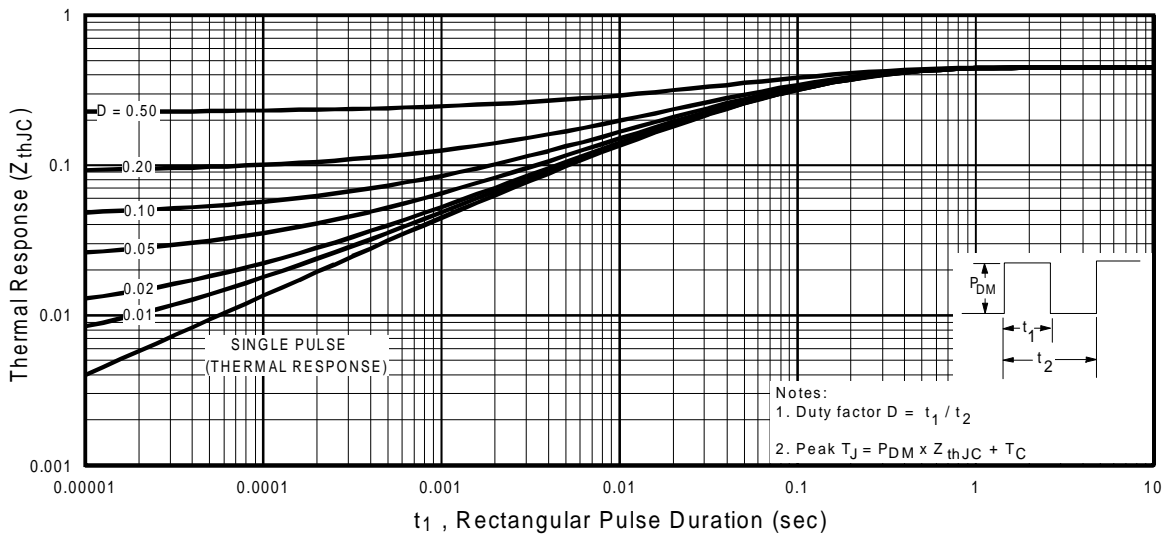


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

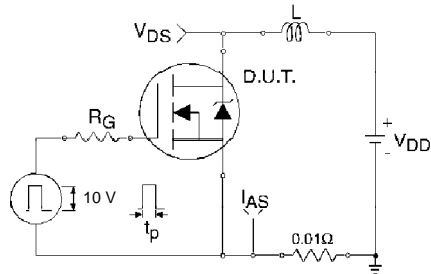


Fig 12a. Unclamped Inductive Test Circuit



Fig 12b. Unclamped Inductive Waveforms

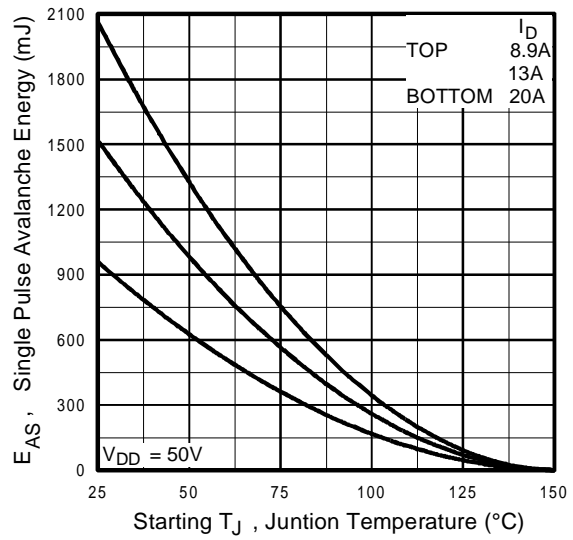


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

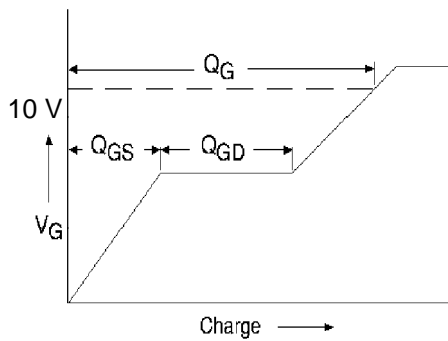


Fig 13a. Basic Gate Charge Waveform

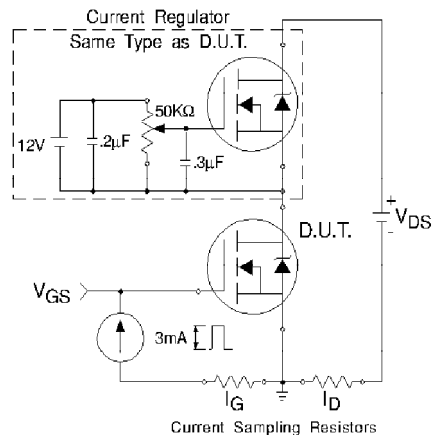
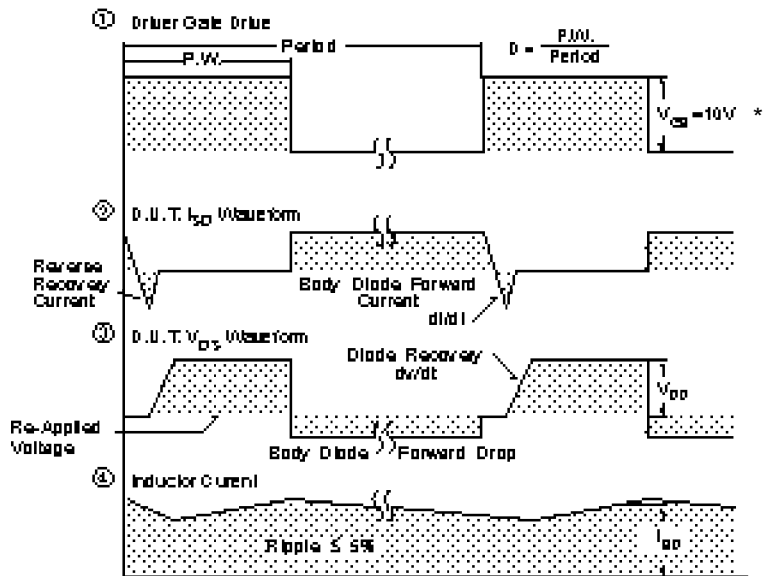
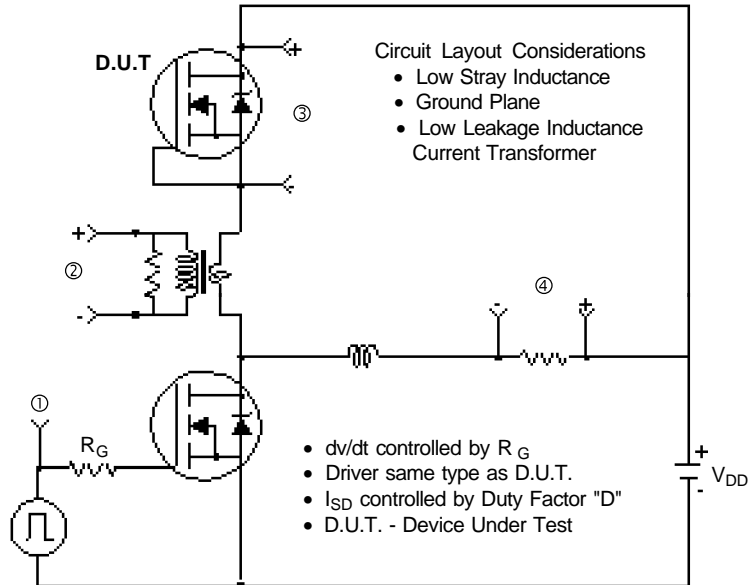


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



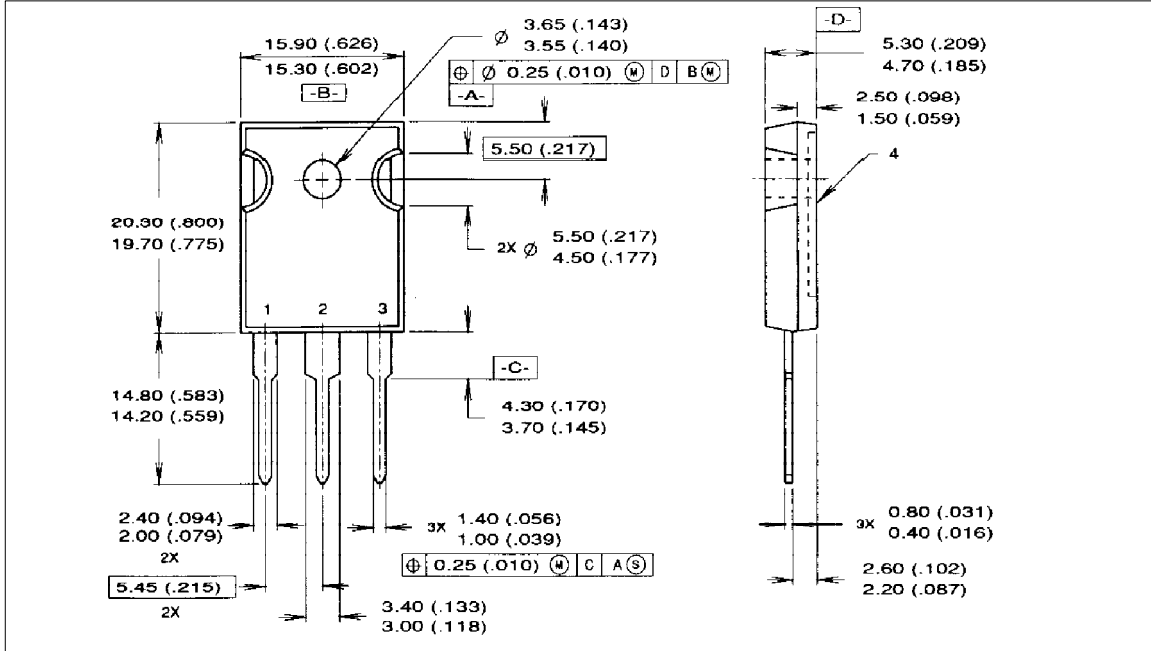
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

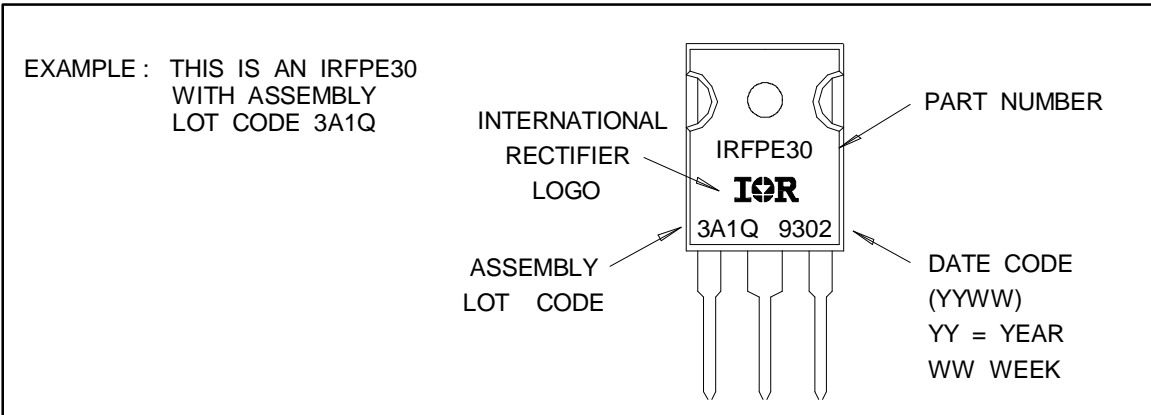
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Package Outline TO-247AC



Part Marking Information TO-247AC



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IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: (39) 1145 10111
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Data and specifications subject to change without notice.