

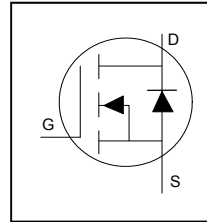
HEXFET® Power MOSFET

Application

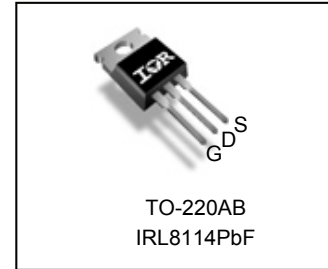
- Optimized for UPS/Inverter Applications
- Low Voltage Power Tools

Benefits

- Low RDS(on) at 4.5V V_{GS}
- Low Gate Charge
- Fully Characterized Capacitance and Avalanche SOA
- Lead-Free



V _{DSS}	30V
R _{DS(on)} typ. max	3.5mΩ
	4.5mΩ
I _D (Silicon Limited)	120A [Ⓢ]
I _D (Package Limited)	90A



G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRL8114PbF	TO-220	Tube	50	IRL8114PbF

Absolute Maximum Rating

Symbol	Parameter	Max.	Units
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)	120 [Ⓢ]	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V (Silicon Limited)	85	
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V (Package Limited)	90	
I _{DM}	Pulsed Drain Current [Ⓢ]	440 [Ⓢ]	
P _D @ T _C = 25°C	Maximum Power Dissipation	115	W
P _D @ T _C = 100°C	Maximum Power Dissipation	58	
	Linear Derating Factor	0.77	W/°C
V _{GS}	Gate-to-Source Voltage	± 20	V
T _J T _{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting Torque, 6-32 or M3 Screw [Ⓢ]	10 lbf·in (1.1 N·m)	

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case [Ⓢ]	—	1.3	°C/W
R _{θCS}	Case-to-Sink, Flat Greased Surface	0.50	—	
R _{θJA}	Junction-to-Ambient	—	62	

Notes [Ⓢ] through [Ⓢ] are on page 7

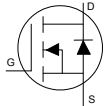
Static @ T_J = 25°C (unless otherwise specified)

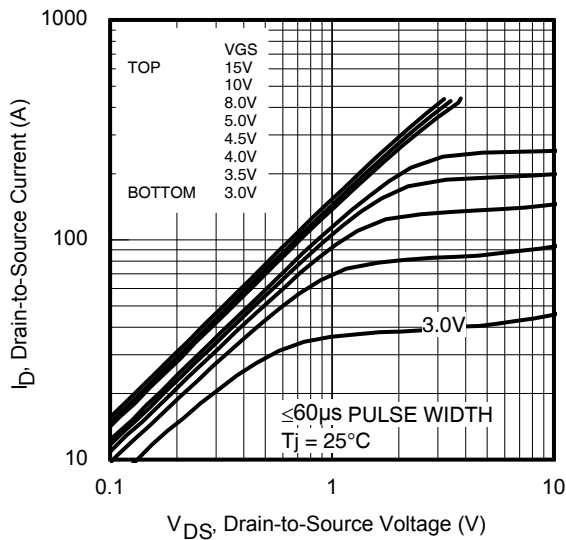
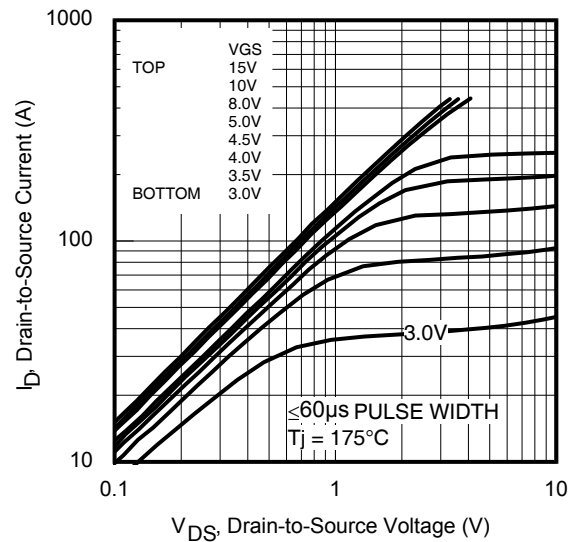
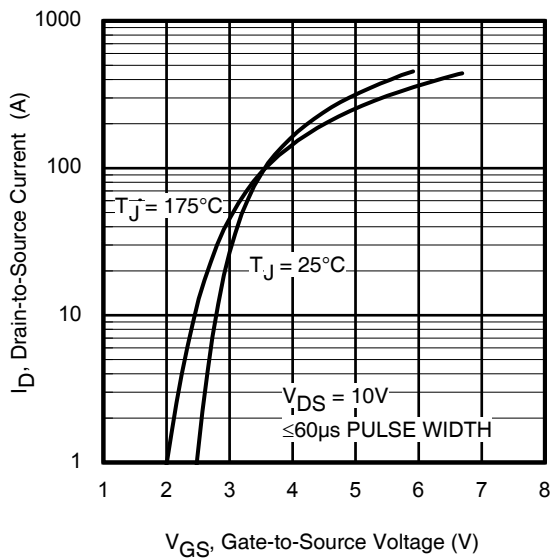
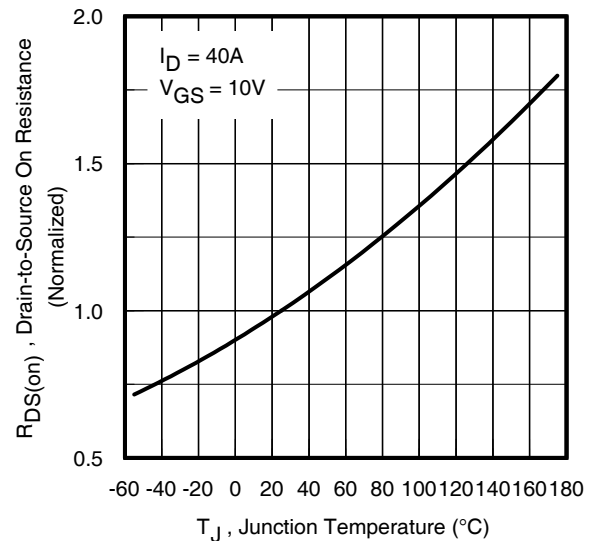
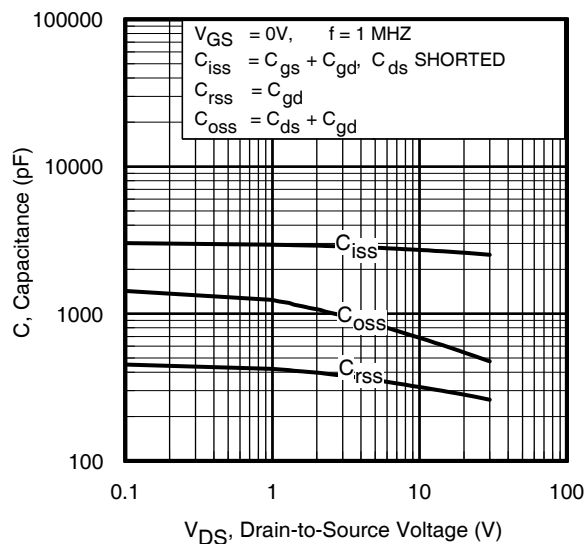
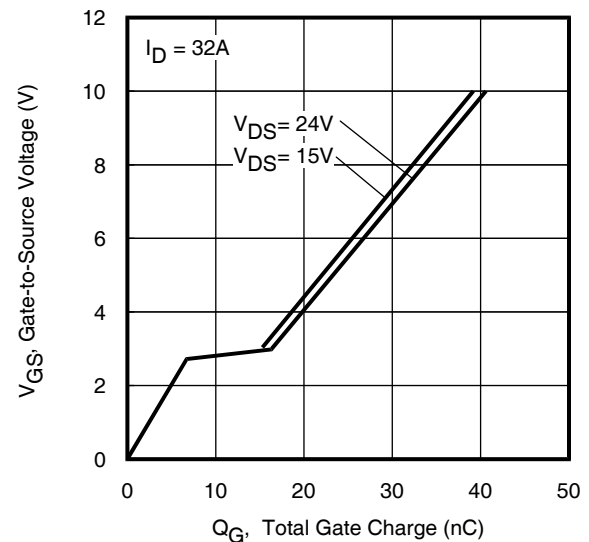
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	30	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.017	—	mV/°C	Reference to 25°C, I _D = 1mA ②
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	3.5	4.5	mΩ	V _{GS} = 10V, I _D = 40A ④
		—	4.6	5.8		V _{GS} = 4.5V, I _D = 32A ④
V _{GS(th)}	Gate Threshold Voltage	1.35	—	2.25	V	V _{DS} = V _{GS} , I _D = 250μA
ΔV _{GS(th)} /ΔT _J	Gate Threshold Voltage Temp. Coefficient	—	-6.7	—		
I _{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	V _{DS} = 24V, V _{GS} = 0V
		—	—	150		V _{DS} = 24V, 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
g _{fs}	Forward Transconductance	173	—	—	S	V _{DS} = 15V, I _D = 32A
Q _g	Total Gate Charge	—	19	29	nC	V _{DS} = 15V V _{GS} = 4.5V④ I _D = 32A See Fig. 16
Q _{gs1}	Pre-V _{th} Gate-to-Source Charge	—	5.0	—		
Q _{gs2}	Post V _{th} Gate-to-Source Charge	—	3.0	—		
Q _{gd}	Gate-to-Drain Charge	—	6.7	—		
Q _{godr}	Gate Charge Overdrive	—	4.3	—		
Q _{sw}	Switch Charge (Q _{gs2} + Q _{gd})	—	9.7	—		
Q _{oss}	Output Charge	—	15	—	nC	V _{DS} = 16V, V _{GS} = 0V
t _{d(on)}	Turn-On Delay Time	—	27	—	ns	V _{DD} = 15V I _D = 32A R _G = 10Ω V _{GS} = 4.5V ④
t _r	Rise Time	—	103	—		
t _{d(off)}	Turn-Off Delay Time	—	29	—		
t _f	Fall Time	—	45	—		
C _{iss}	Input Capacitance	—	2660	—	pF	V _{GS} = 0V V _{DS} = 15V f = 1.0MHz
C _{oss}	Output Capacitance	—	600	—		
C _{rss}	Reverse Transfer Capacitance	—	300	—		

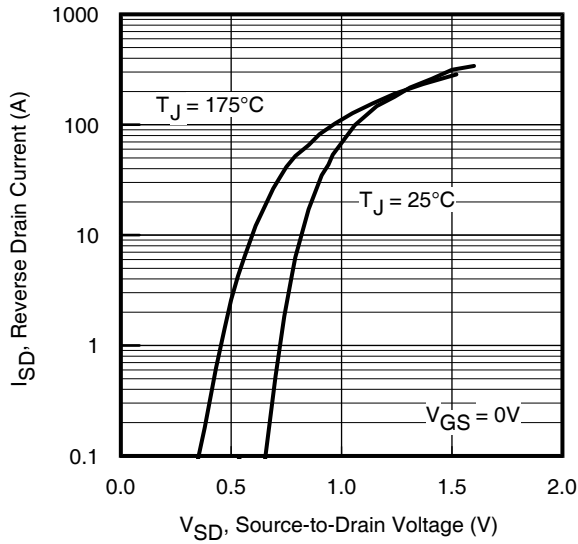
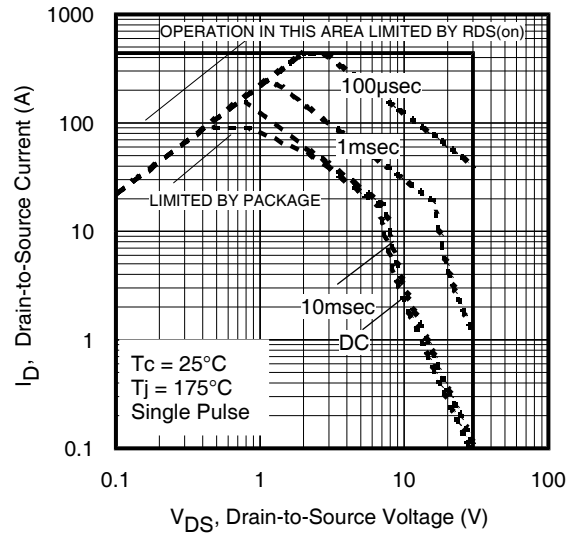
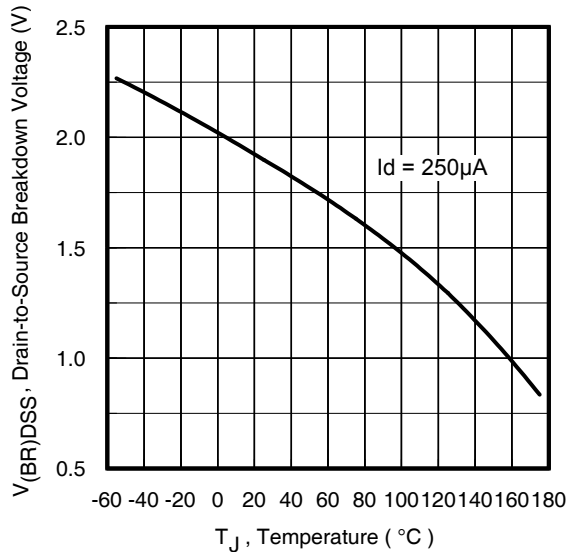
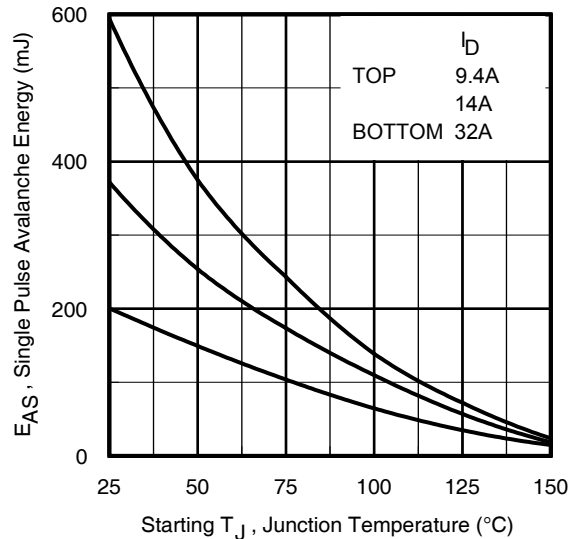
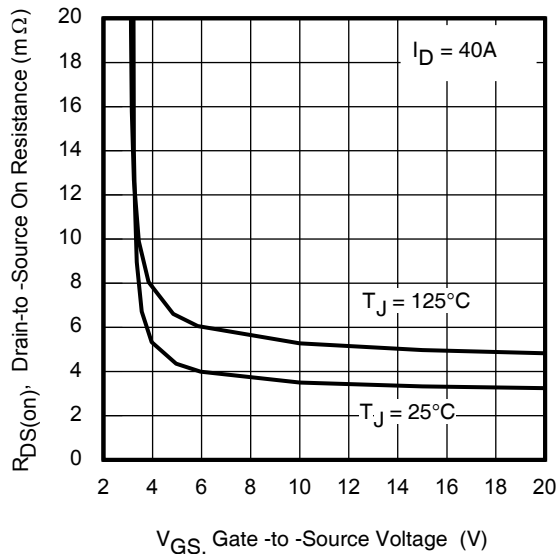
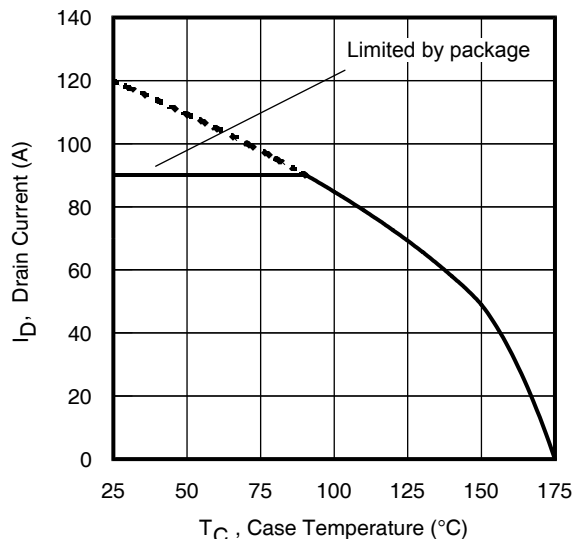
Avalanche Characteristics

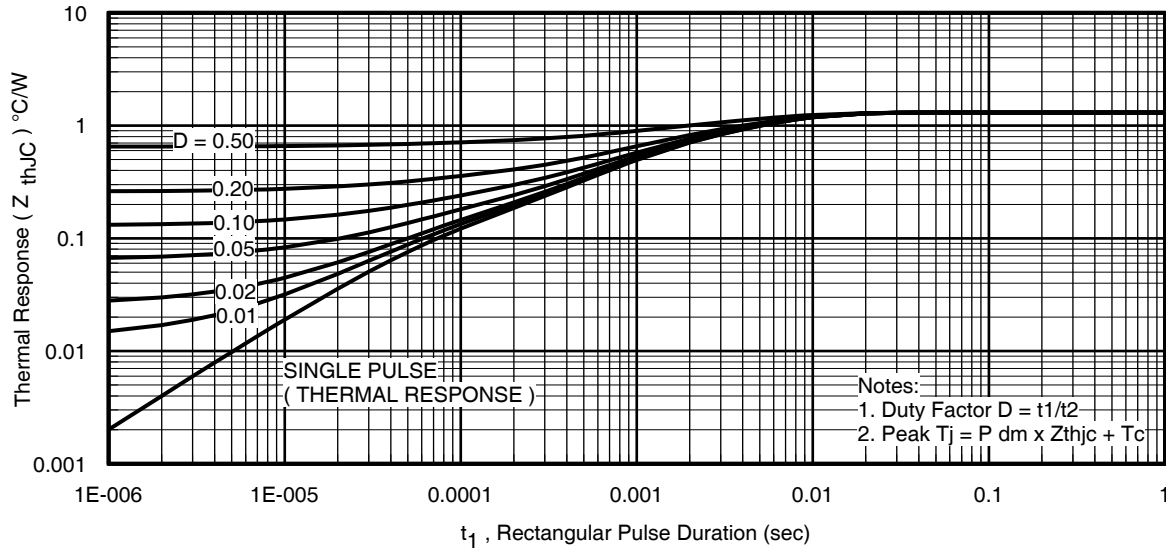
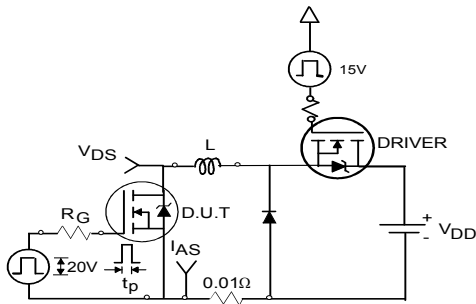
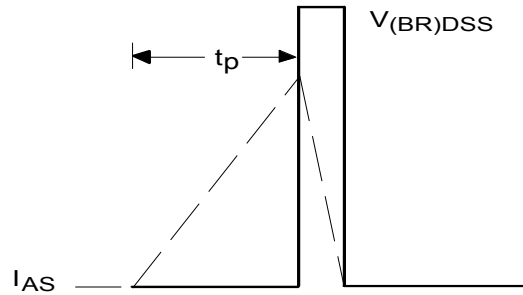
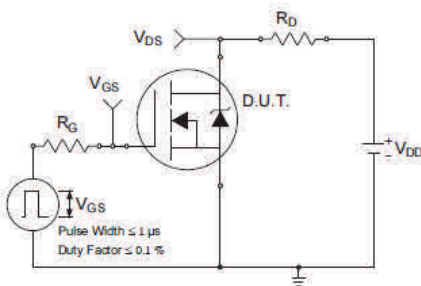
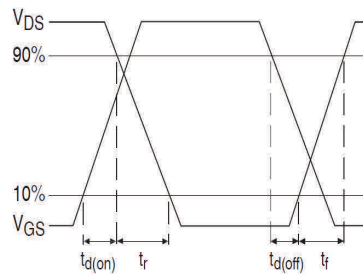
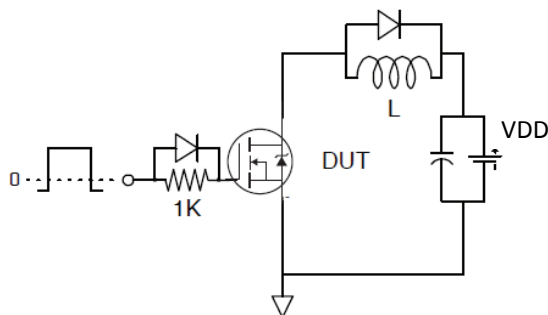
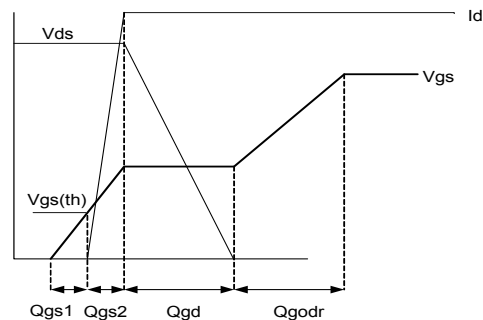
E _{AS} (Thermally limited)	Single Pulse Avalanche Energy ③	200	mJ
I _{AR}	Avalanche Current ②	32	A

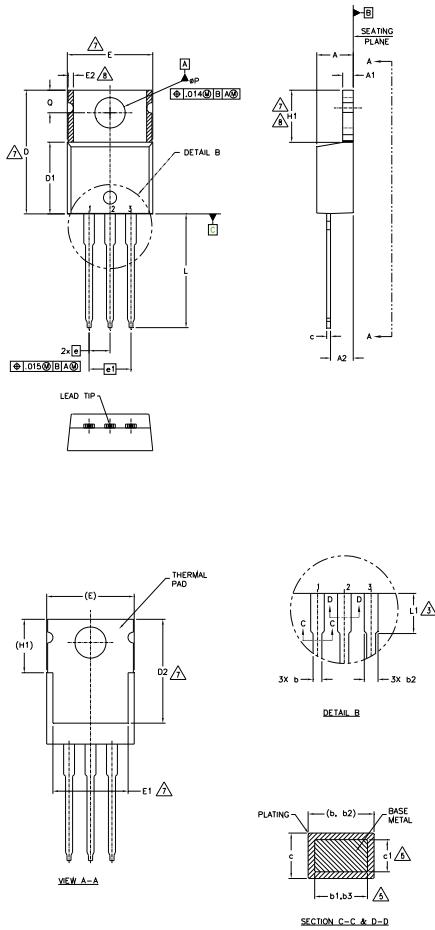
Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	120①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	440⑥		
V _{SD}	Diode Forward Voltage	—	—	1.0	V	T _J = 25°C, I _S = 32A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	22	33	ns	T _J = 25°C, I _F = 32A, V _{DD} = 15V
Q _{rr}	Reverse Recovery Charge	—	13	20	nC	di/dt = 100A/μs ④


Fig 1. Typical Output Characteristics

Fig 2. Typical Output Characteristics

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. Drain-to-Source Voltage


Fig 7. Typical Source-Drain Diode Forward Voltage

Fig 8. Maximum Safe Operating Area

Fig 9. Threshold Voltage vs. Temperature

Fig 10. Maximum Avalanche Energy Charge vs. Drain Current

Fig 11. Typical On-Resistance vs. Gate Voltage

Fig 12. Maximum Drain Current vs. Case Temperature


Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Fig 14a. Unclamped Inductive Test Circuit

Fig 14b. Unclamped Inductive Waveforms

Fig 15a. Switching Time Test Circuit

Fig 15b. Switching Time Waveforms

Fig 16a. Gate Charge Test Circuit

Fig 16b. Gate Charge Waveform

TO-220AB Package Outline (Dimensions are shown in millimeters (inches))

NOTES:

- 1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
- 2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
- 3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 5.- DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
- 6.- CONTROLLING DIMENSION : INCHES.
- 7.- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
- 8.- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
- 9.- OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	1.14	1.40	.045	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	-	0.76	-	.030	8
e	2.54 BSC		.100 BSC		
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	3.56	4.06	.140	.160	3
ØP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

LEAD ASSIGNMENTS
HEXFET

- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE

IGBTs, CoPACK

- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER

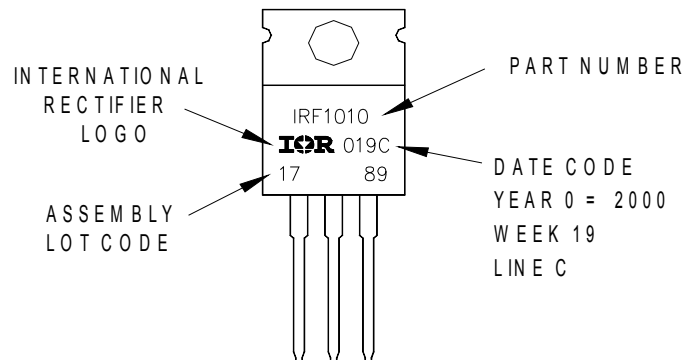
DIODES

- 1.- ANODE
- 2.- CATHODE
- 3.- ANODE

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
 LOT CODE 1789
 ASSEMBLED ON WW 19, 2000
 IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position
 indicates "Lead - Free"



TO-220AB packages are not recommended for Surface Mount Application.

Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

Qualification Information[†]

Qualification Level	Industrial (per JEDEC JESD47F) ^{††}	
Moisture Sensitivity Level	TO-220	N/A
RoHS Compliant	Yes	

† Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability/>

†† Applicable version of JEDEC standard at the time of product release.

Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 90A. Note that current limitation arising from heating the device leads may occur with some lead mounting arrangements. (Refer to AN-1140)
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ Limited by T_{JMAX} , starting $T_J = 25^\circ\text{C}$, $L = 0.39\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 32\text{A}$, $V_{GS} = 10\text{V}$.
- ④ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑤ R_θ is measured at T_J approximately 90°C .
- ⑥ Pulse drain current is limited at 360A by source bond technology.