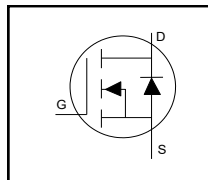


- Logic - Level Gate Drive
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



$V_{DS}$	<b>30V</b>
$R_{DS(on)} \text{ max.}$	<b>0.006Ω</b>
$I_D$	<b>140A</b> ⑤



<b>G</b>	<b>D</b>	<b>S</b>
Gate	Drain	Source

### Description

Fifth Generation HEXFETs utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRL3803PbF	TO-220	Tube	50	IRL3803PbF

### Absolute Maximum Ratings

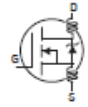
Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	140 ⑤	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	98 ⑤	
$I_{DM}$	Pulsed Drain Current ①	470	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 16	V
$E_{AS}$	Single Pulse Avalanche Energy ②	610	mJ
$I_{AR}$	Avalanche Current ①	71	A
$E_{AR}$	Repetitive Avalanche Energy ①	20	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
$T_J$	Operating Junction and	-55 to + 175	°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)	

### Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.75	°C/W
$R_{\theta JC}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

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

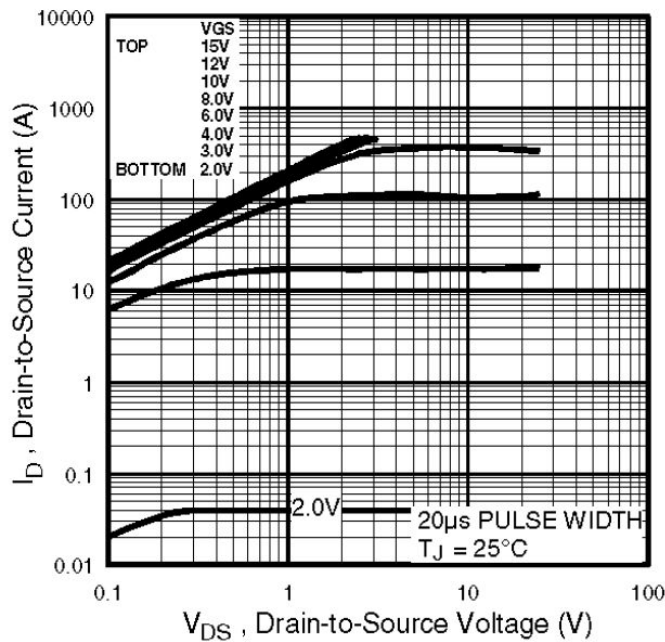
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.052	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.006	$\Omega$	$V_{GS} = 10V, I_D = 71A$ ④
		—	—	0.009		$V_{GS} = 4.5V, I_D = 59A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Trans conductance	55	—	—	S	$V_{DS} = 25V, I_D = 71A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS} = 30V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 24V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -16V$
$Q_g$	Total Gate Charge	—	—	140	nC	$I_D = 71A$
$Q_{gs}$	Gate-to-Source Charge	—	—	41		$V_{DS} = 24V$
$Q_{gd}$	Gate-to-Drain Charge	—	—	78		$V_{GS} = 4.5V$ , See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	14	—	ns	$V_{DD} = 15V$
$t_r$	Rise Time	—	230	—		$I_D = 71A$
$t_{d(off)}$	Turn-Off Delay Time	—	29	—		$R_G = 1.3\Omega$
$t_f$	Fall Time	—	35	—		$R_D = 0.2\Omega$ , See Fig. 10 ④
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
$L_S$	Internal Source Inductance	—	7.5	—		
$C_{iss}$	Input Capacitance	—	5000	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	1800	—		$V_{DS} = 25V$
$C_{rss}$	Reverse Transfer Capacitance	—	880	—		$f = 1.0\text{MHz}$ , See Fig. 5


**Source-Drain Ratings and Characteristics**

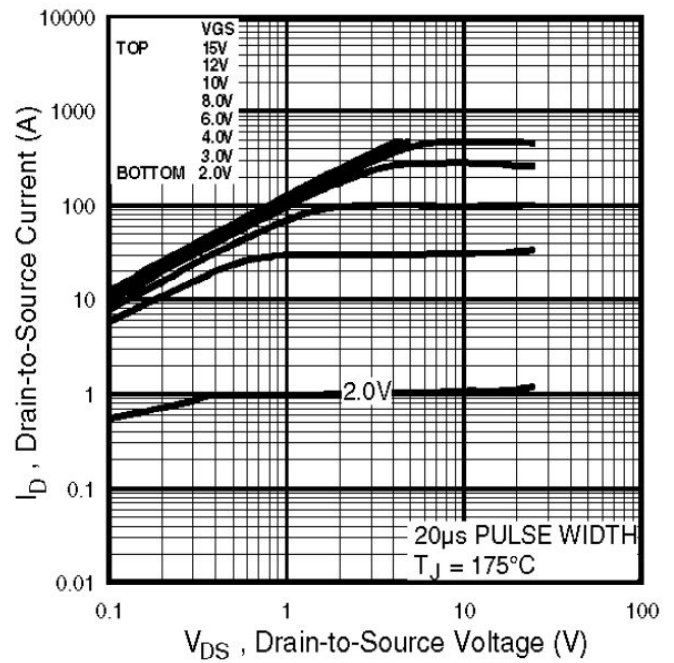
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	140	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	470		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 71A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	120	180	ns	$T_J = 25^\circ\text{C}, I_F = 71A$
$Q_{rr}$	Reverse Recovery Charge	—	450	680	nC	$di/dt = 100A/\mu s$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

**Notes:**

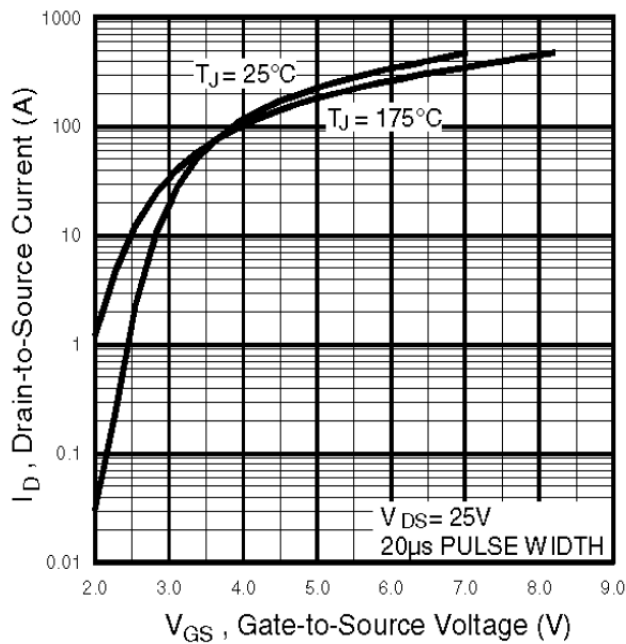
- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig.11)
- ②  $V_{DD} = 15V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 180\mu H$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 20A$ . (See Figure 12)
- ③  $I_{SD} \leq 71A$ ,  $di/dt \leq 130A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ Calculated continuous current based on maximum allowable junction temperature; for recommended current- handling of the package refer to Design TIP # 93-4



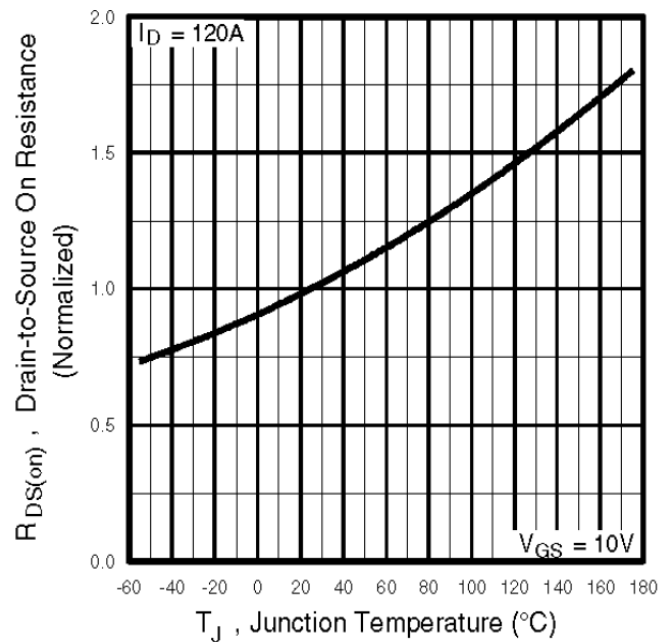
**Fig. 1** Typical Output Characteristics  
 $T_J = 25^\circ\text{C}$



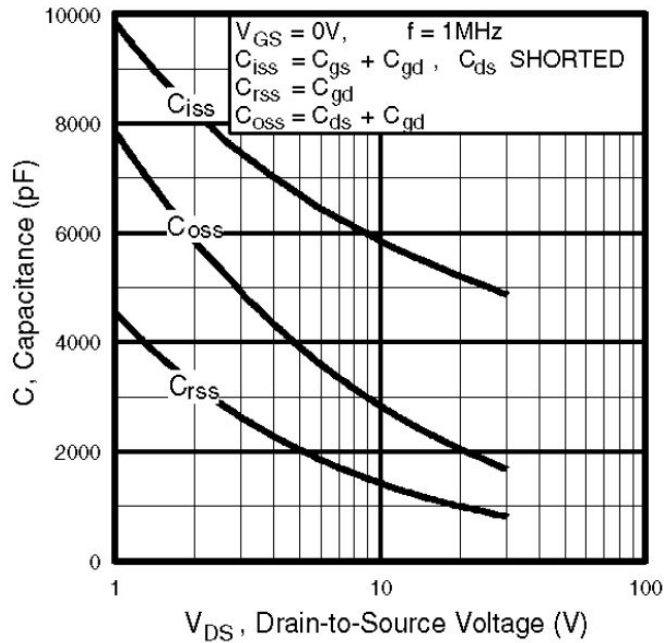
**Fig. 2** Typical Output Characteristics  
 $T_J = 175^\circ\text{C}$



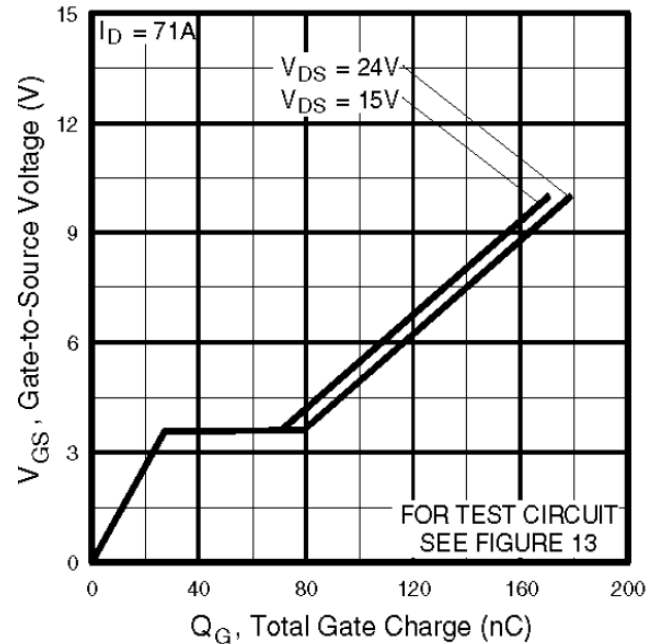
**Fig. 3** Typical Transfer Characteristics



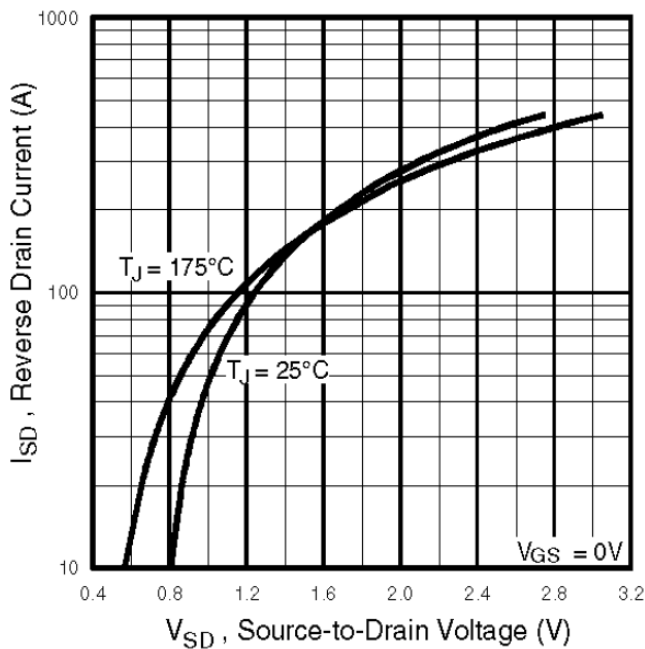
**Fig. 4** Normalized On-Resistance  
vs. Temperature



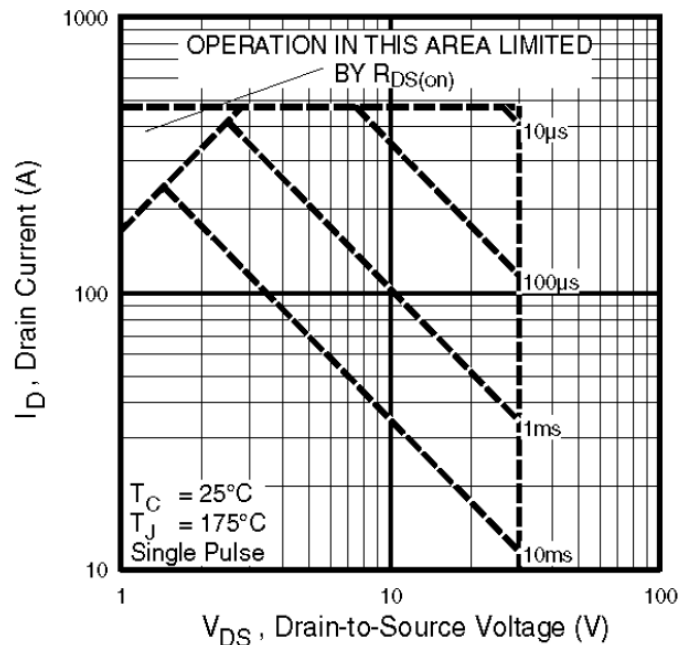
**Fig 5.** Typical Capacitance vs.  
Drain-to-Source Voltage



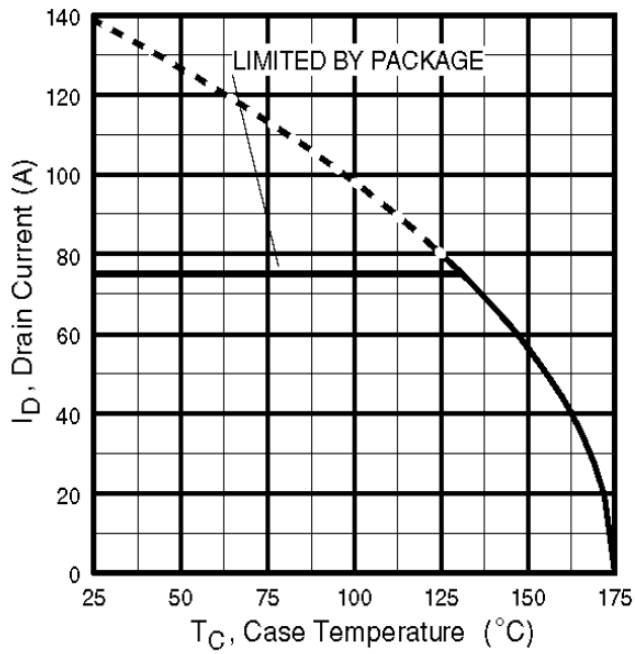
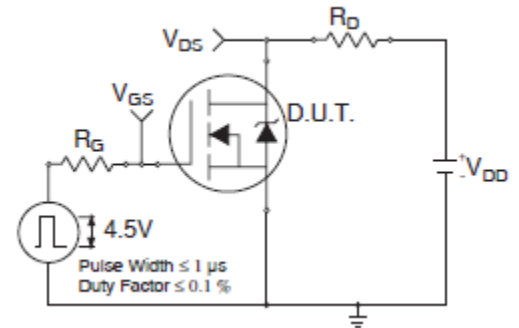
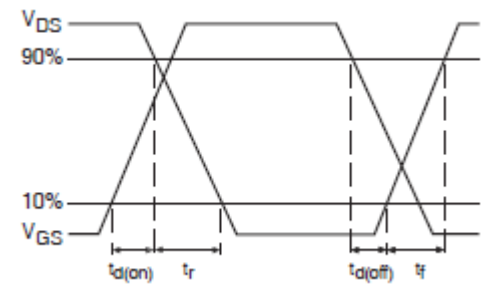
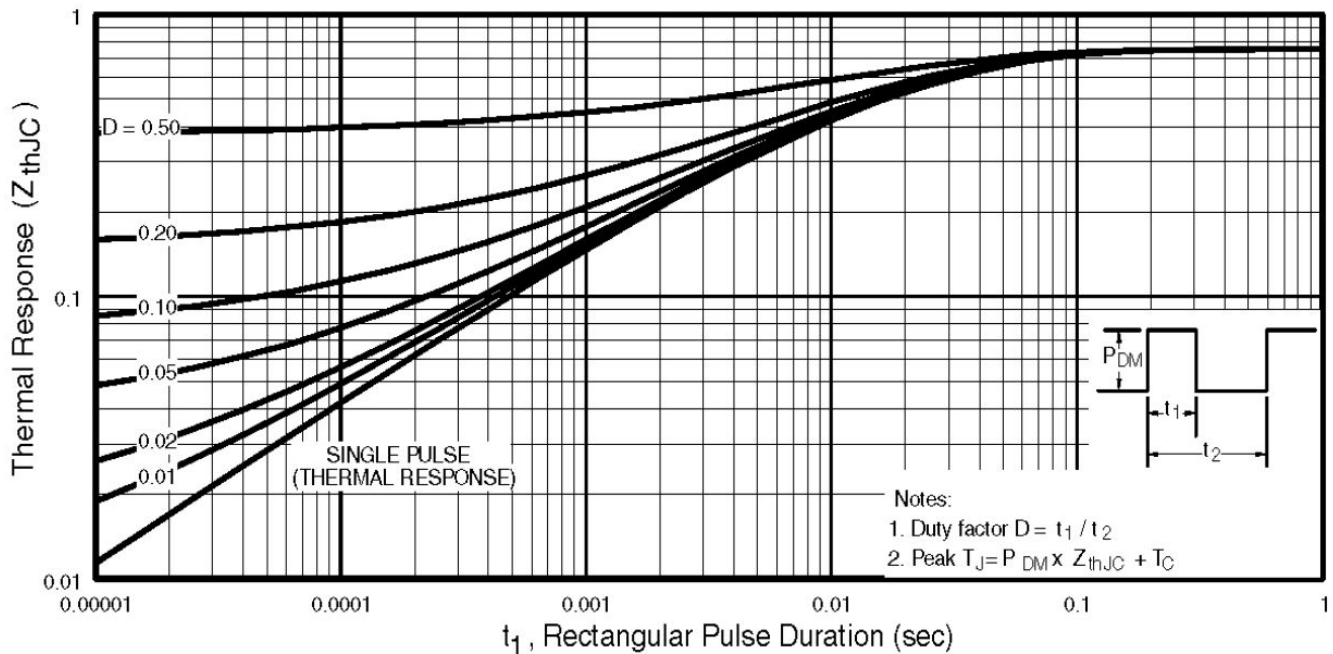
**Fig 6.** Typical Gate Charge vs.  
Gate-to-Source Voltage

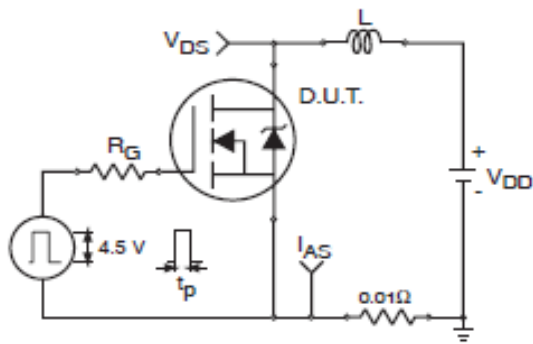
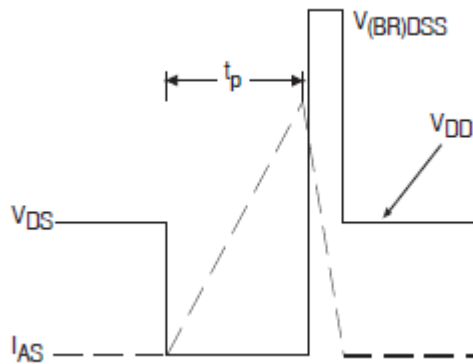
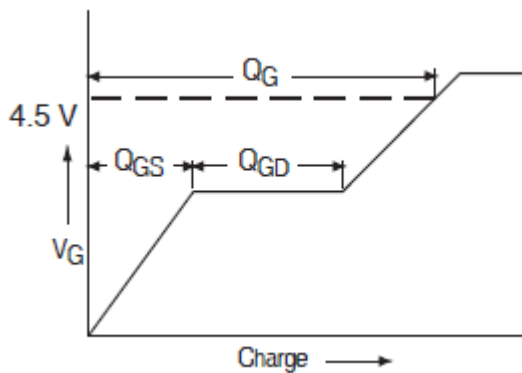
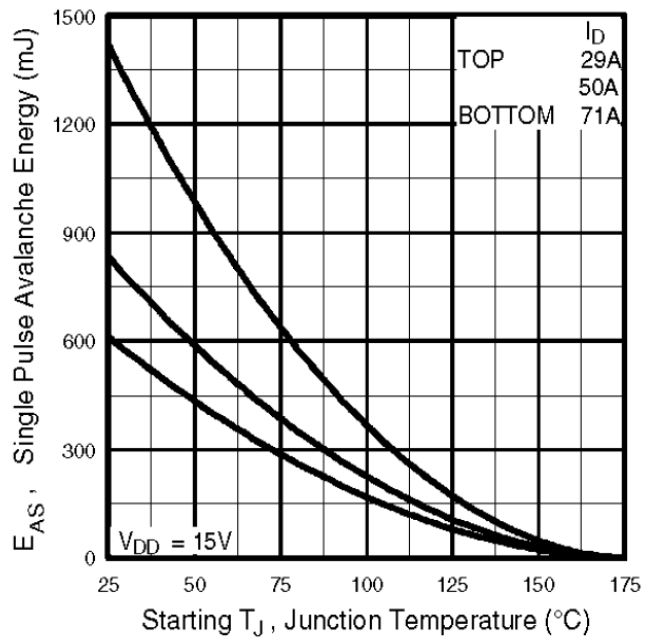
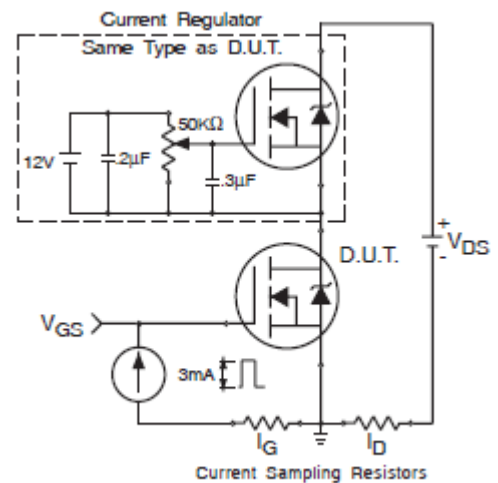


**Fig. 7** Typical Source-to-Drain Diode  
Forward Voltage

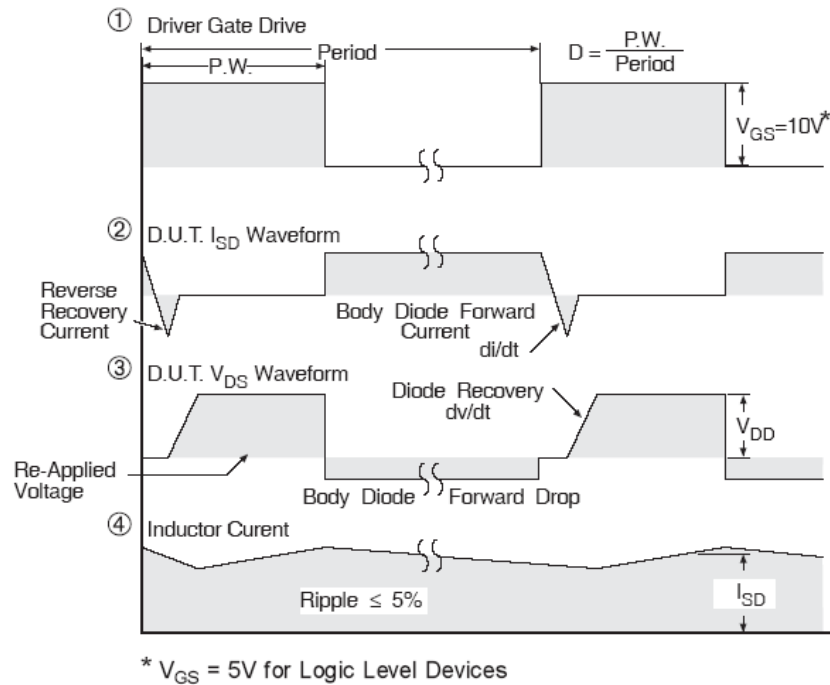
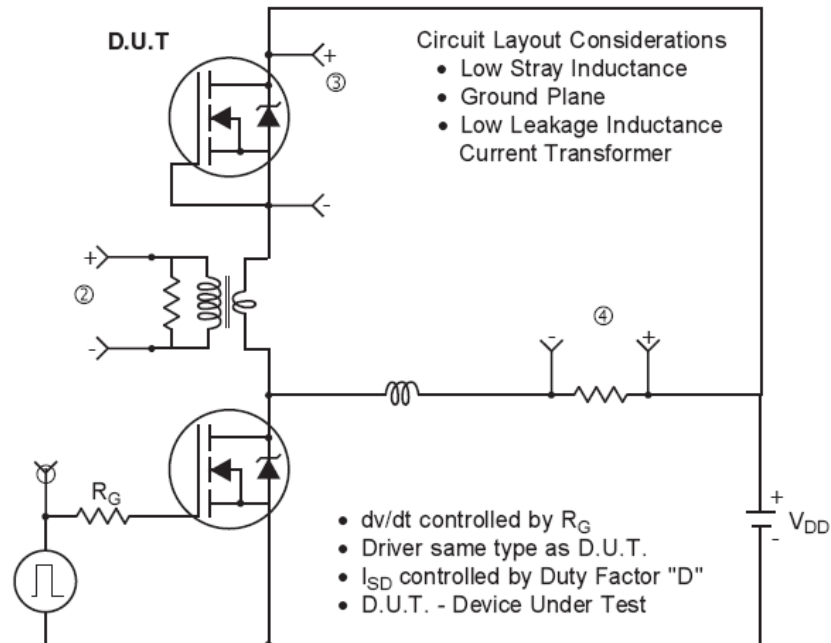


**Fig 8.** Maximum Safe Operating Area


**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

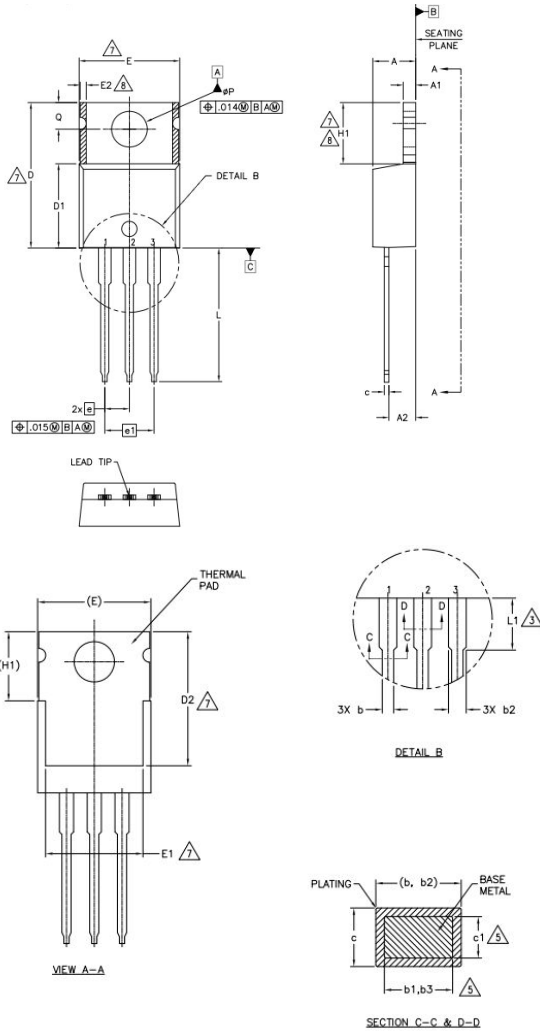

**Fig 12a.** Unclamped Inductive Test Circuit

**Fig 12b.** Unclamped Inductive Waveforms

**Fig 13a.** Gate Charge Waveform

**Fig 12c.** Maximum Avalanche Energy vs. Drain Current

**Fig 13b.** Gate Charge Test Circuit

## Peak Diode Recovery dv/dt Test Circuit



**Fig 14.** Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power



**TO-220 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	5
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	
b2	1.14	1.78	.045	.070	5
b3	1.14	1.73	.045	.068	
c	0.36	0.61	.014	.024	5
c1	0.36	0.56	.014	.022	
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	7
D2	11.68	12.88	.460	.507	
E	9.65	10.67	.380	.420	
E1	6.86	8.89	.270	.350	4,7
E2	—	0.76	—	.030	7
e	2.54 BSC		.100 BSC		8
e1	5.08 BSC		.200 BSC		7,8
H1	5.84	6.86	.230	.270	
L	12.70	14.73	.500	.580	
L1	3.56	4.06	.140	.160	
ØP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	3

**LEAD ASSIGNMENTS**
**HEXFET**

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

**IGBTs, CoPACK**

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

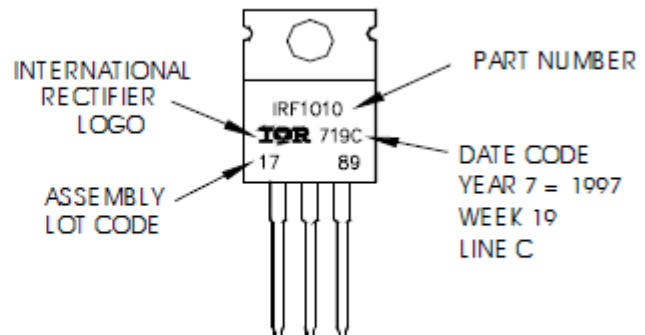
**DIODES**

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

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

**TO-220 Part Marking Information**

**EXAMPLE:** THIS IS AN IRF1010  
 LOT CODE 1789  
 ASSEMBLED ON WW 19, 1997  
 IN THE ASSEMBLY LINE "C"  
**Note:** "P" in assembly line position indicates "Lead-Free"



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



## Revision History

Date	Rev.	Comments
02/25/2021	2.1	<ul style="list-style-type: none"> <li>Changed datasheet with Infineon logo - all pages.</li> <li>Updated datasheet based on IFX template.</li> <li>Removed "HEXFET® Power MOSFET" added "IR MOSFET™" -page1</li> <li>Corrected TO-220 Package outline on page 8.</li> <li>Added disclaimer on last page.</li> </ul>

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