

IRFP90N20D

International
IR Rectifier

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	200	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.24	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.023	Ω	$V_{GS} = 10V, I_D = 56A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 200V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 160V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -30V$

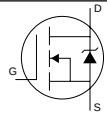
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	39	—	—	S	$V_{DS} = 50V, I_D = 56A$
Q_g	Total Gate Charge	—	180	270	nC	$I_D = 56A$
Q_{gs}	Gate-to-Source Charge	—	45	67		$V_{DS} = 160V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	87	130		$V_{GS} = 10V$, ④
$t_{d(on)}$	Turn-On Delay Time	—	23	—	ns	$V_{DD} = 100V$
t_r	Rise Time	—	160	—		$I_D = 56A$
$t_{d(off)}$	Turn-Off Delay Time	—	43	—		$R_G = 1.2\Omega$
t_f	Fall Time	—	79	—		$V_{GS} = 10V$ ④
C_{iss}	Input Capacitance	—	6040	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1070	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	170	—		$f = 1.0MHz$
C_{oss}	Output Capacitance	—	8350	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz$
C_{oss}	Output Capacitance	—	420	—		$V_{GS} = 0V, V_{DS} = 160V, f = 1.0MHz$
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	870	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 160V$ ⑤

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	1010	mJ
I_{AR}	Avalanche Current①	—	56	A
E_{AR}	Repetitive Avalanche Energy①	—	58	mJ

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	94⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	380		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}, I_S = 56A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	230	340	ns	$T_J = 25^\circ\text{C}, I_F = 56A$
Q_{rr}	Reverse Recovery Charge	—	1.9	2.8	μC	$di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

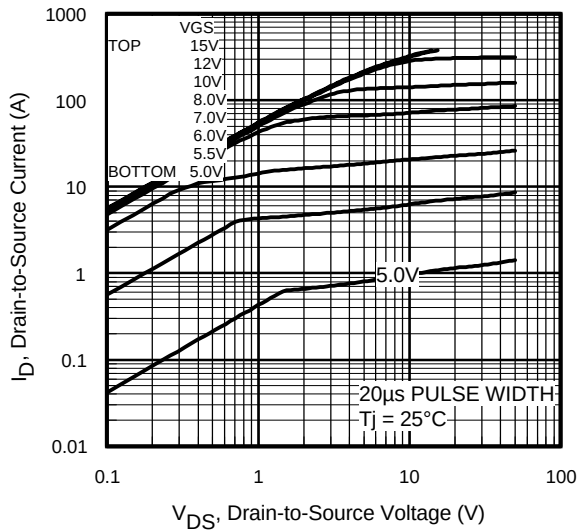


Fig 1. Typical Output Characteristics

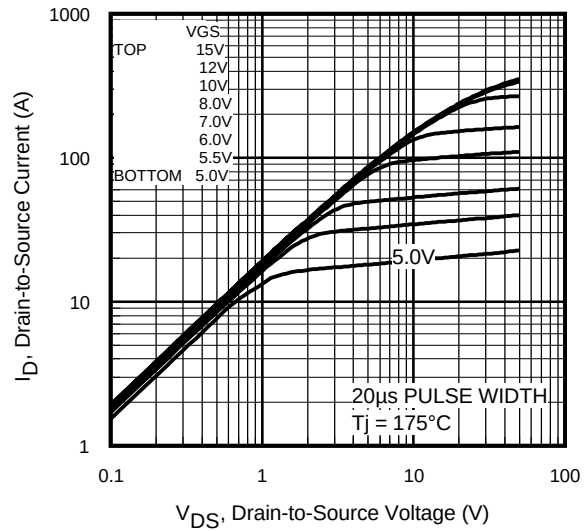


Fig 2. Typical Output Characteristics

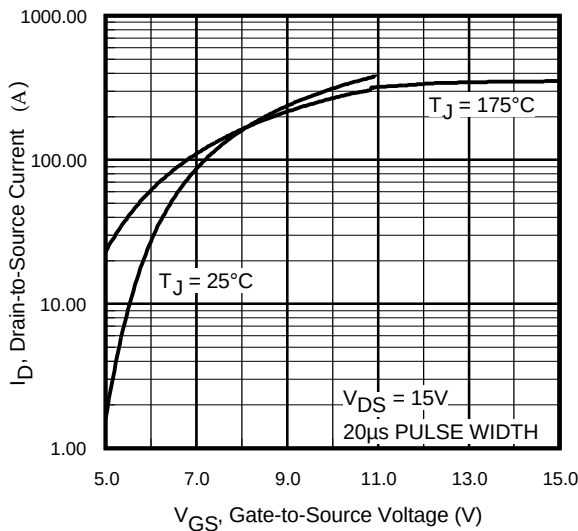


Fig 3. Typical Transfer Characteristics

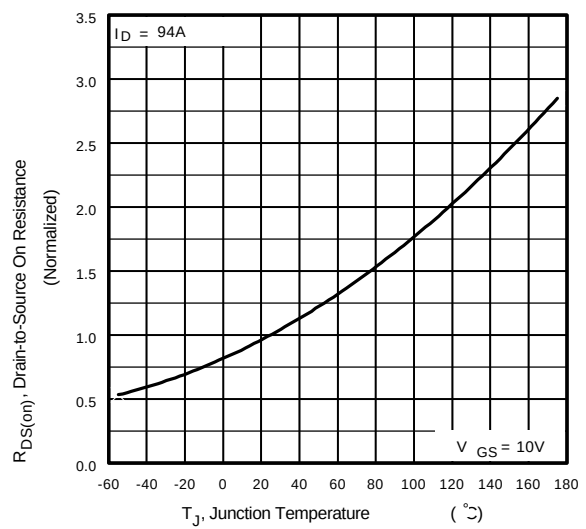
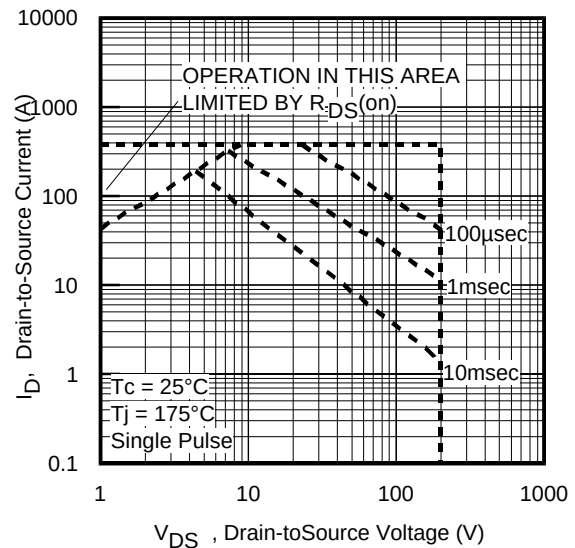
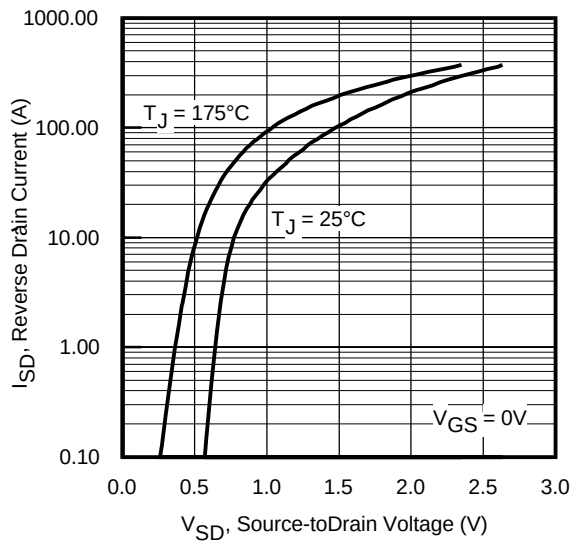
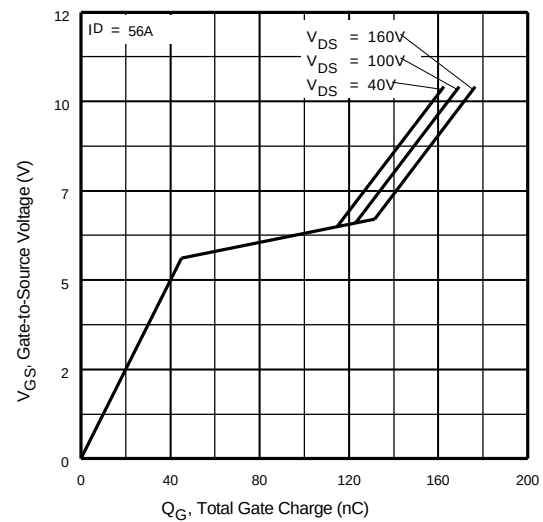
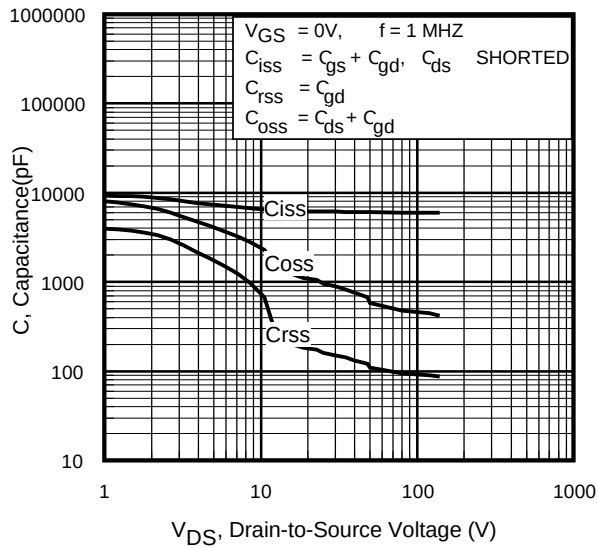


Fig 4. Normalized On-Resistance
vs. Temperature

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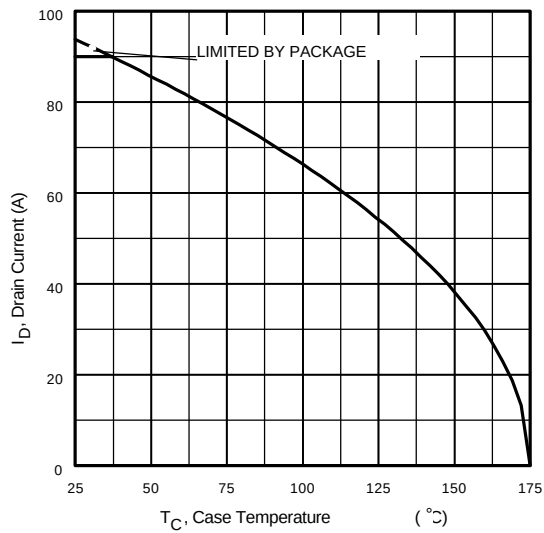


Fig 9. Maximum Drain Current vs. Case Temperature

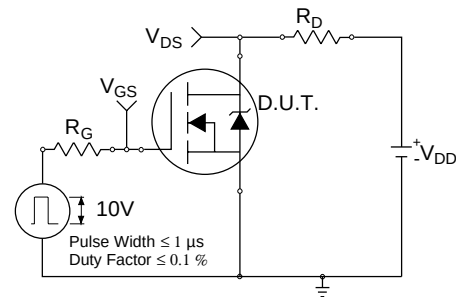


Fig 10a. Switching Time Test Circuit

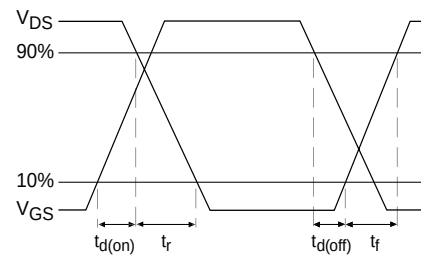


Fig 10b. Switching Time Waveforms

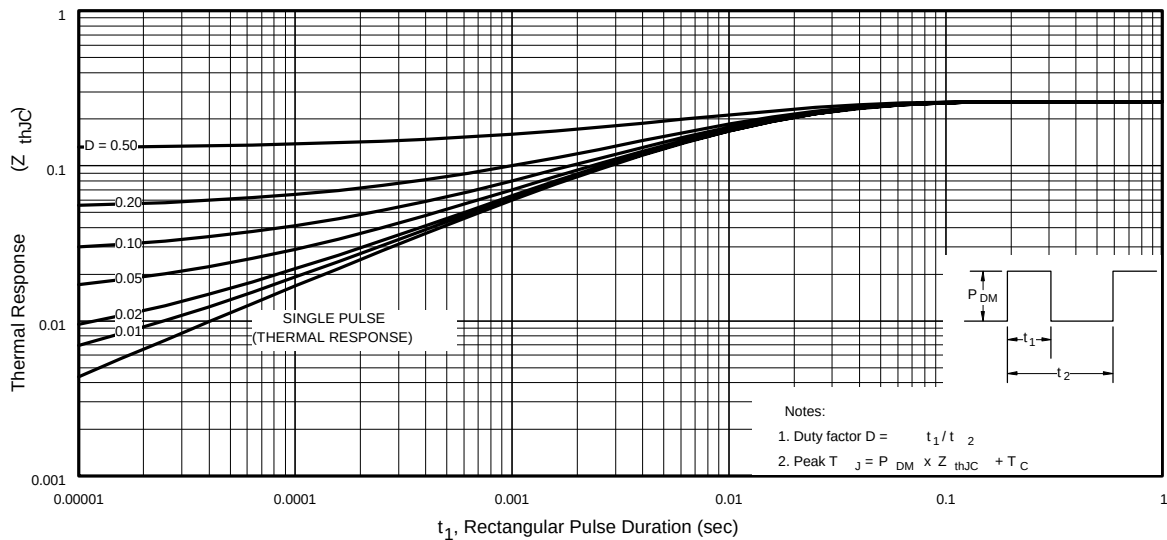


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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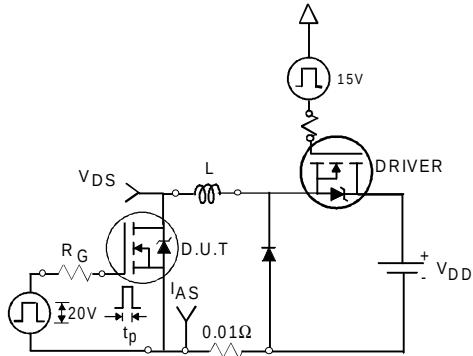


Fig 12a. Unclamped Inductive Test Circuit

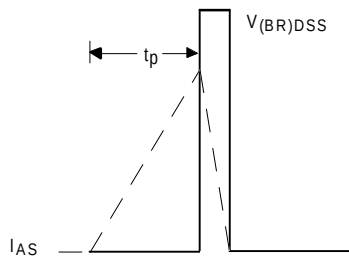


Fig 12b. Unclamped Inductive Waveforms

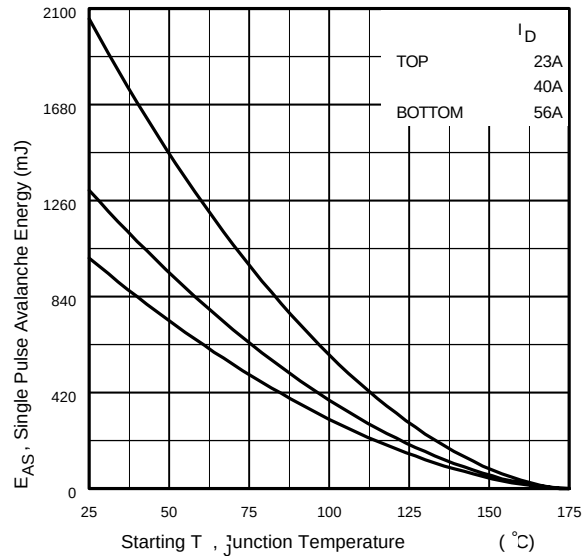


Fig 12c. Maximum Avalanche Energy vs. Drain Current

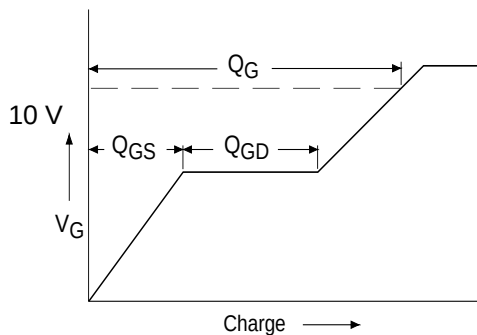


Fig 13a. Basic Gate Charge Waveform

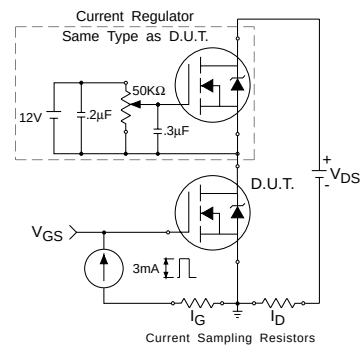
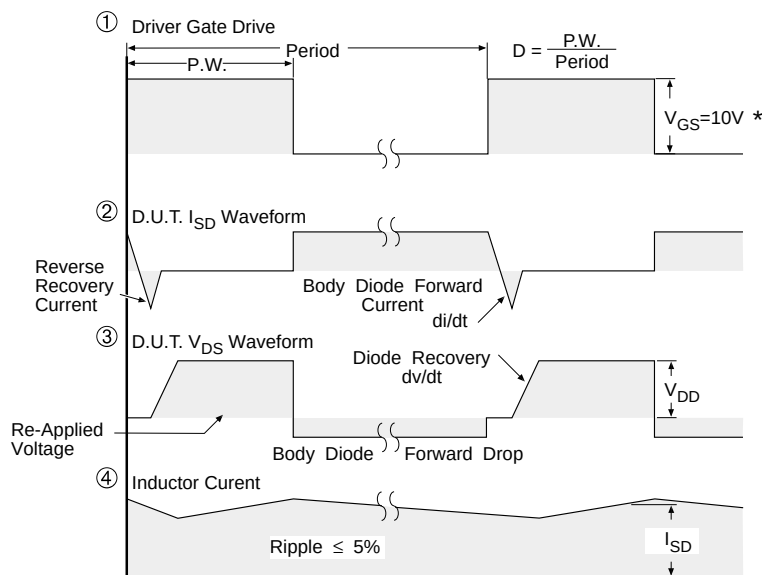
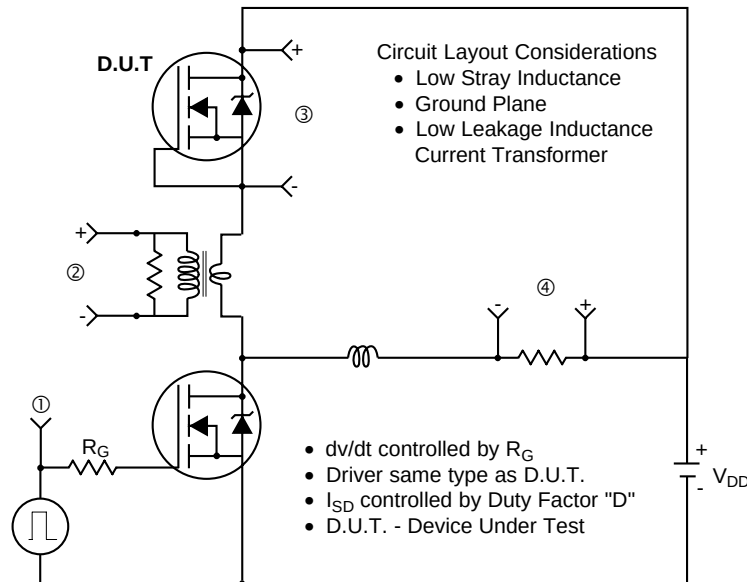


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

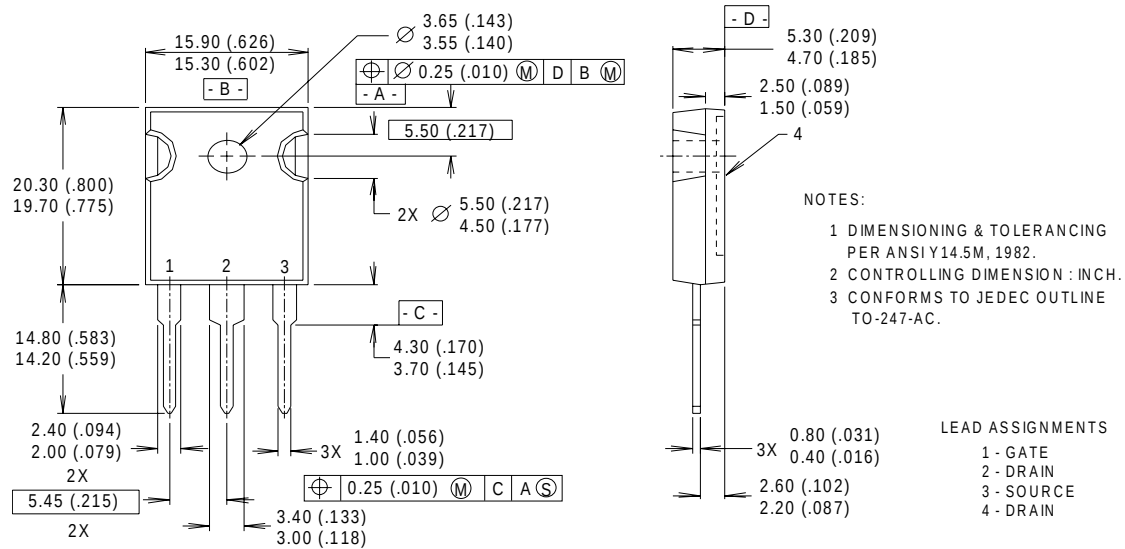
Fig 14. For N-Channel HEXFET® Power MOSFETs

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TO - 247 Package Outline

Dimensions are shown in millimeters (inches)



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.64\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 56\text{A}$.
- ③ $I_{SD} \leq 56\text{A}$, $di/dt \leq 470\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$
- 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}
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 90A.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

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