

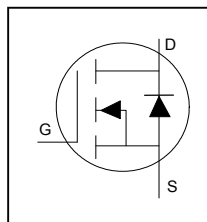
Application

- Brushed Motor drive applications
- BLDC Motor drive applications
- Battery powered circuits
- Half-bridge and full-bridge topologies
- Synchronous rectifier applications
- Resonant mode power supplies
- OR-ing and redundant power switches
- DC/DC and AC/DC converters
- DC/AC Inverters

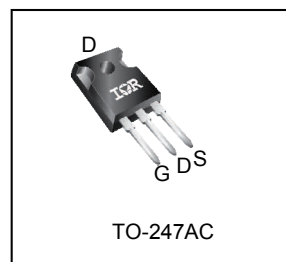
Benefits

- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche SOA
- Enhanced body diode dV/dt and dI/dt Capability
- Lead-Free, RoHS Compliant

HEXFET® Power MOSFET



V_{DSS}	75V
R_{DS(on)} typ.	1.45mΩ
max	1.80mΩ
I_D (Silicon Limited)	355A①
I_D (Package Limited)	195A



G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFP7718PbF	TO-247	Tube	25	IRFP7718PbF

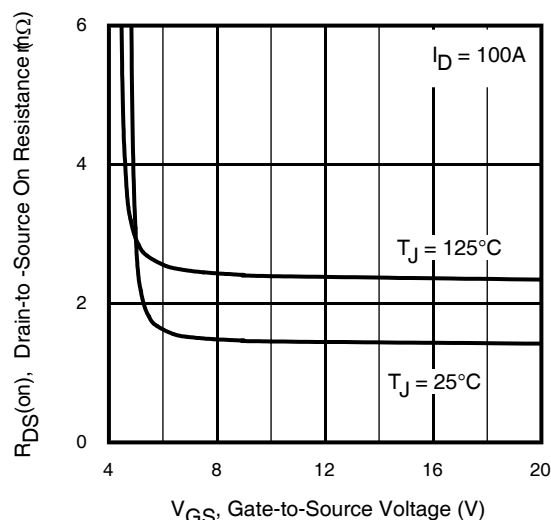


Fig 1. Typical On-Resistance vs. Gate Voltage

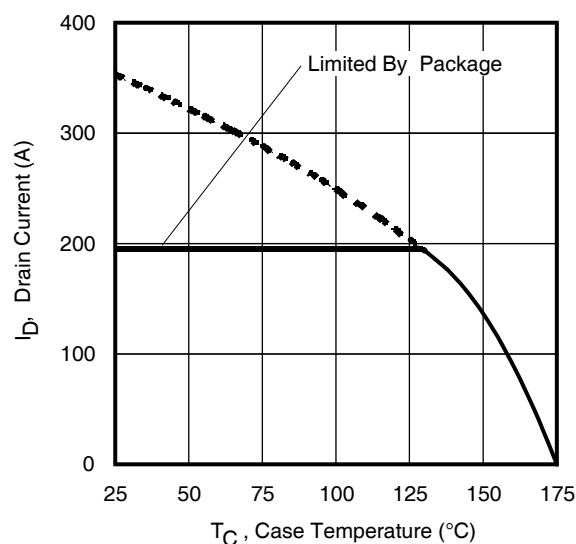


Fig 2. Maximum Drain Current vs. Case Temperature

Absolute Maximum Rating

Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited)	355 ^①	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited)	250 ^①	
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Wire Bond Limited)	195	
I_{DM}	Pulsed Drain Current ^②	1590 ^⑩	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	517	W
	Linear Derating Factor	3.5	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 20	V
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	$^\circ\text{C}$
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting Torque, 6-32 or M3 Screw	10 lbf·in (1.1 N·m)	

Avalanche Characteristics

E_{AS} (Thermally limited)	Single Pulse Avalanche Energy ^③	1160	mJ
E_{AS} (Thermally limited)	Single Pulse Avalanche Energy ^⑨	2004	
I_{AR}	Avalanche Current ^②	See Fig 14, 15, 23a, 23b	A
E_{AR}	Repetitive Avalanche Energy ^②		mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ^⑧	—	0.29	$^\circ\text{C/W}$
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	75	—	—	V	$V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	42	—	mV/ $^\circ\text{C}$	Reference to 25°C , $I_D = 2\text{mA}$ ^②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	1.45	1.80	m Ω	$V_{GS} = 10\text{V}$, $I_D = 100\text{A}$
		—	1.60	—		$V_{GS} = 6\text{V}$, $I_D = 50\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	2.1	—	3.7	V	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 75\text{V}$, $V_{GS} = 0\text{V}$
		—	—	150		$V_{DS} = 75\text{V}$, $V_{GS} = 0\text{V}$, $T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20\text{V}$
R_G	Gate Resistance	—	0.9	—	Ω	

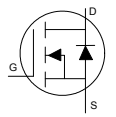
Notes:

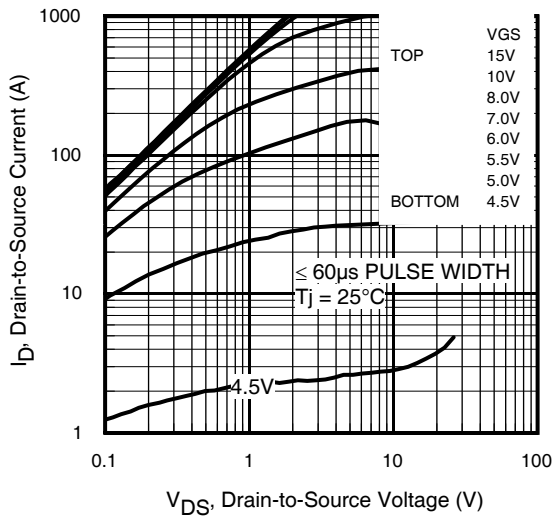
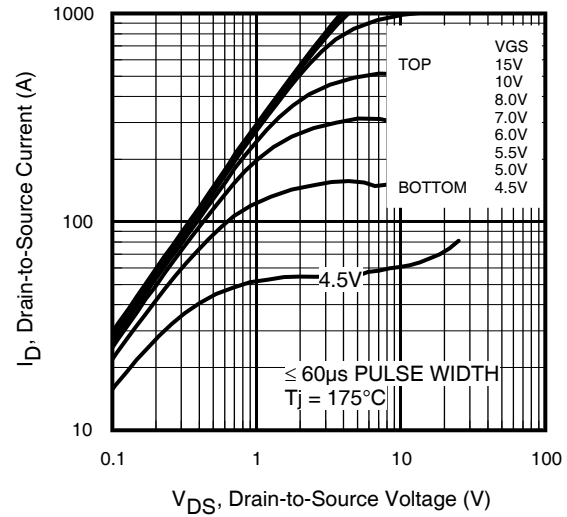
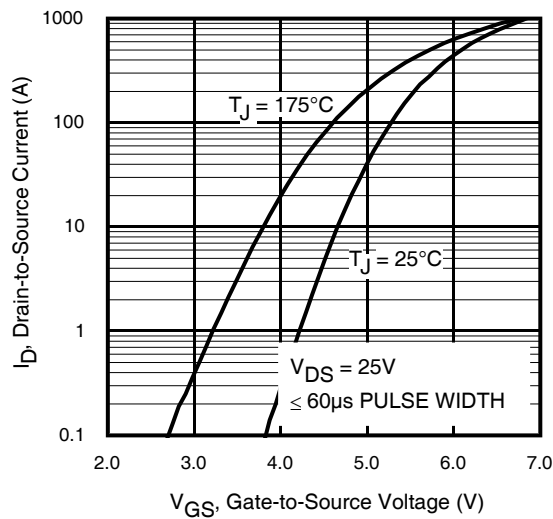
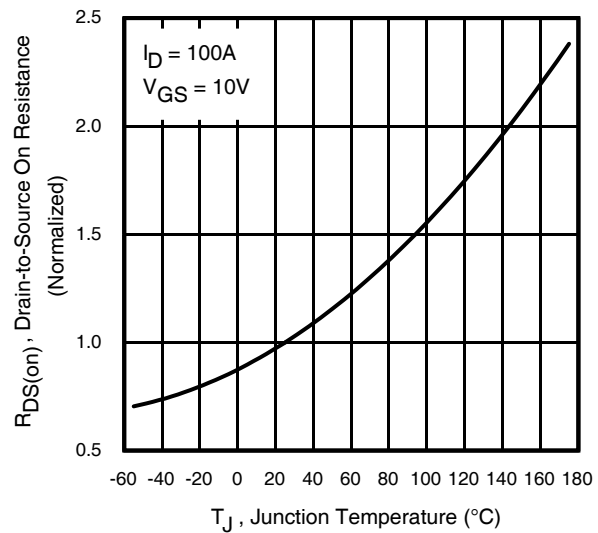
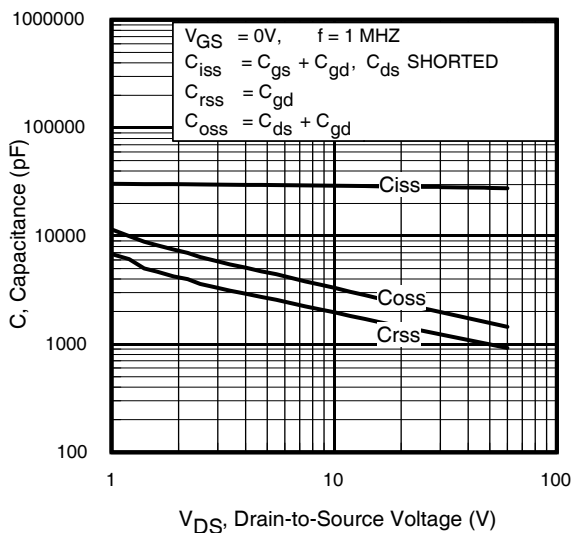
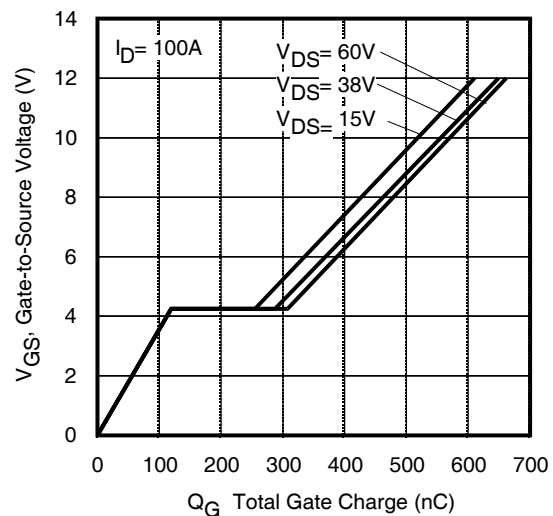
- ① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 195A. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements. (Refer to AN-1140)
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 233\mu\text{H}$, $R_G = 50\Omega$, $I_{AS} = 100\text{A}$, $V_{GS} = 10\text{V}$.
- ④ $I_{SD} \leq 100\text{A}$, $di/dt \leq 1279\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$.
- ⑤ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑧ R_θ is measured at T_J approximately 90°C .
- ⑨ Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 1\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 63\text{A}$, $V_{GS} = 10\text{V}$.
- ⑩ Pulse drain current is limited at 780A by source bonding technology.

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	420	—	—	S	$V_{DS} = 10\text{V}$, $I_D = 100\text{A}$
Q_g	Total Gate Charge	—	552	830	nC	$I_D = 100\text{A}$ $V_{DS} = 38\text{V}$ $V_{GS} = 10\text{V}$
Q_{gs}	Gate-to-Source Charge	—	119	—		
Q_{gd}	Gate-to-Drain Charge	—	168	—		
Q_{sync}	Total Gate Charge Sync. ($Q_g - Q_{gd}$)	—	384	—		
$t_{d(on)}$	Turn-On Delay Time	—	58	—	ns	$V_{DD} = 38\text{V}$ $I_D = 100\text{A}$ $R_G = 2.6\Omega$ $V_{GS} = 10\text{V}^{(5)}$
t_r	Rise Time	—	164	—		
$t_{d(off)}$	Turn-Off Delay Time	—	266	—		
t_f	Fall Time	—	160	—		
C_{iss}	Input Capacitance	—	29550	—	pF	$V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 100\text{KHz}$, See Fig.7
C_{oss}	Output Capacitance	—	2270	—		
C_{rss}	Reverse Transfer Capacitance	—	1395	—		
$C_{oss\text{ eff.}(ER)}$	Effective Output Capacitance (Energy Related)	—	2010	—		$V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V}$ to $60\text{V}^{(7)}$
$C_{oss\text{ eff.}(TR)}$	Output Capacitance (Time Related)	—	2560	—		$V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V}$ to $60\text{V}^{(6)}$

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	355①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ②	—	—	1590⑩		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 100A, V _{GS} = 0V ⑤
dv/dt	Peak Diode Recovery dv/dt④	—	8.6	—	V/ns	T _J = 175°C, I _S = 100A, V _{DS} = 75V
t _{rr}	Reverse Recovery Time	—	75	—	ns	T _J = 25°C V _{DD} = 64V T _J = 125°C I _F = 100A, di/dt = 100A/μs ⑤
		—	80	—		
Q _{rr}	Reverse Recovery Charge	—	208	—	nC	
		—	251	—		T _J = 125°C
I _{RRM}	Reverse Recovery Current	—	4.8	—	A	T _J = 25°C


Fig 3. Typical Output Characteristics

Fig 4. Typical Output Characteristics

Fig 5. Typical Transfer Characteristics

Fig 6. Normalized On-Resistance vs. Temperature

Fig 7. Typical Capacitance vs. Drain-to-Source Voltage

Fig 8. Typical Gate Charge vs. Gate-to-Source Voltage

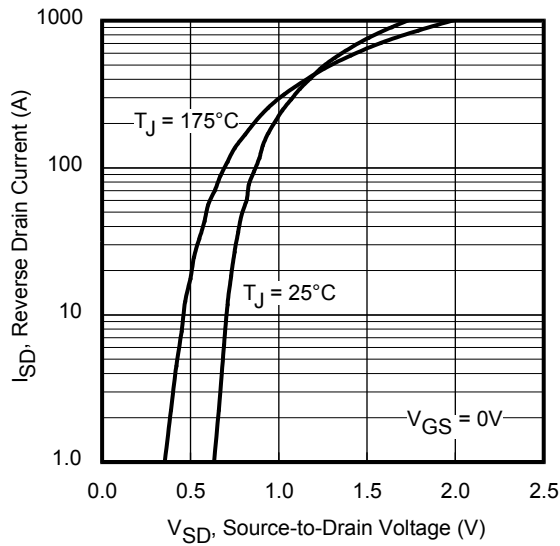


Fig 9. Typical Source-Drain Diode Forward Voltage

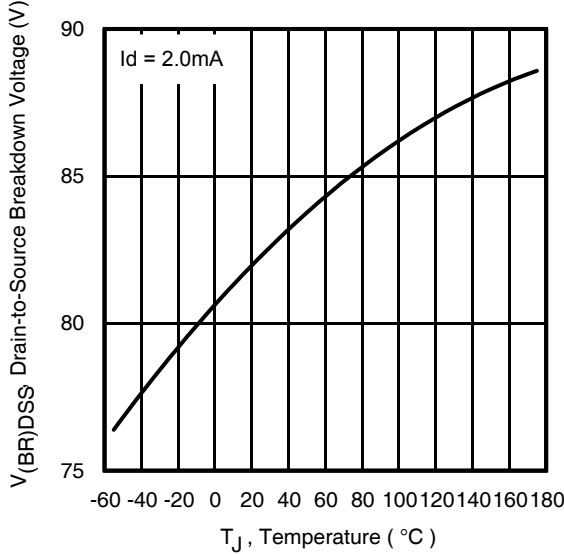


Fig 11. Drain-to-Source Breakdown Voltage

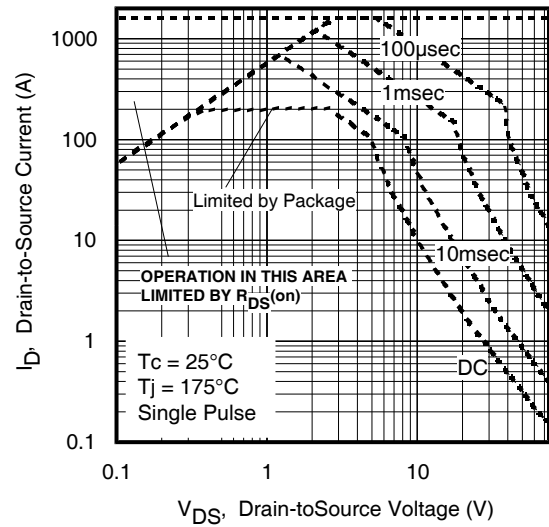


Fig 10. Maximum Safe Operating Area

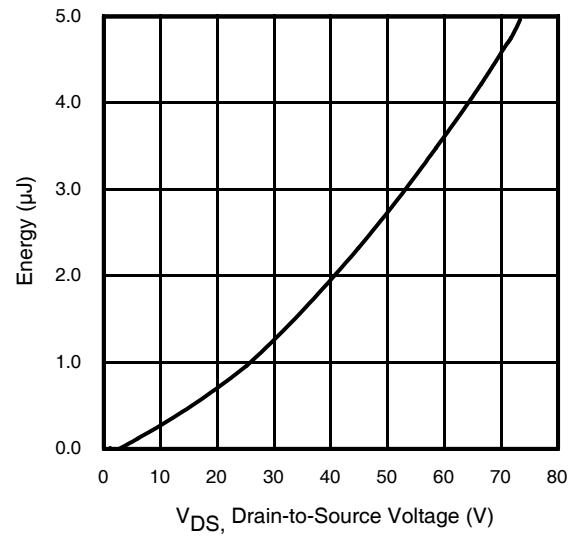


Fig 12. Typical C_{oss} Stored Energy

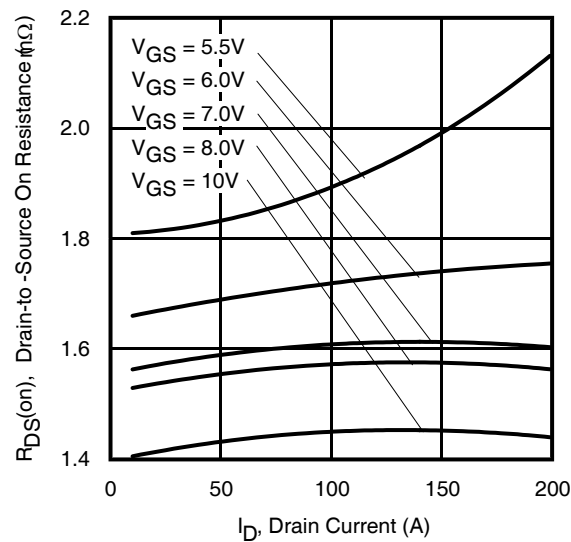


Fig 13. Typical On-Resistance vs. Drain Current

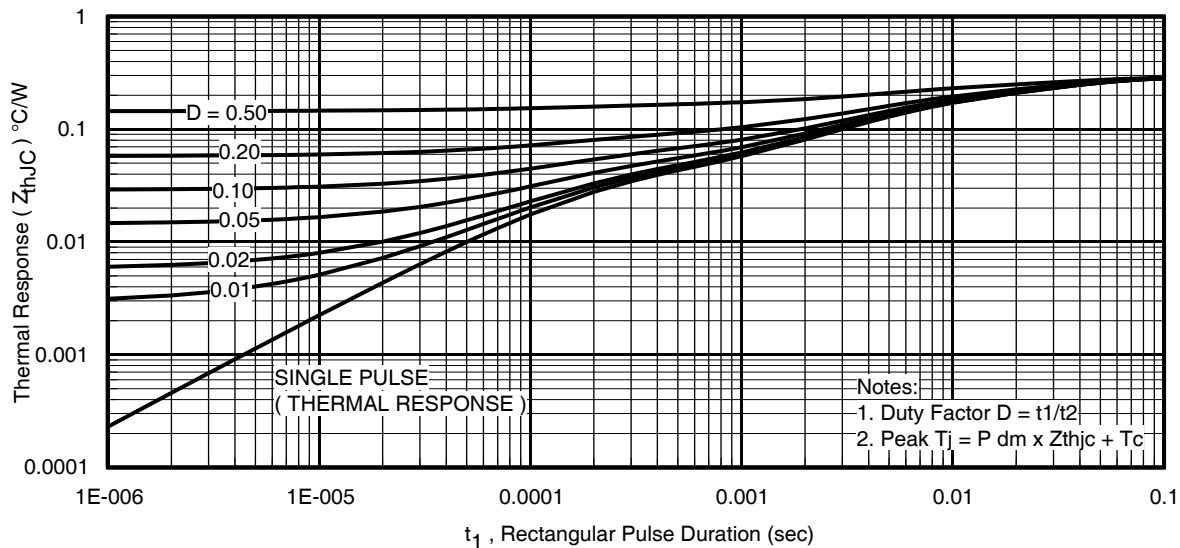


Fig 14. Maximum Effective Transient Thermal Impedance, Junction-to-Case

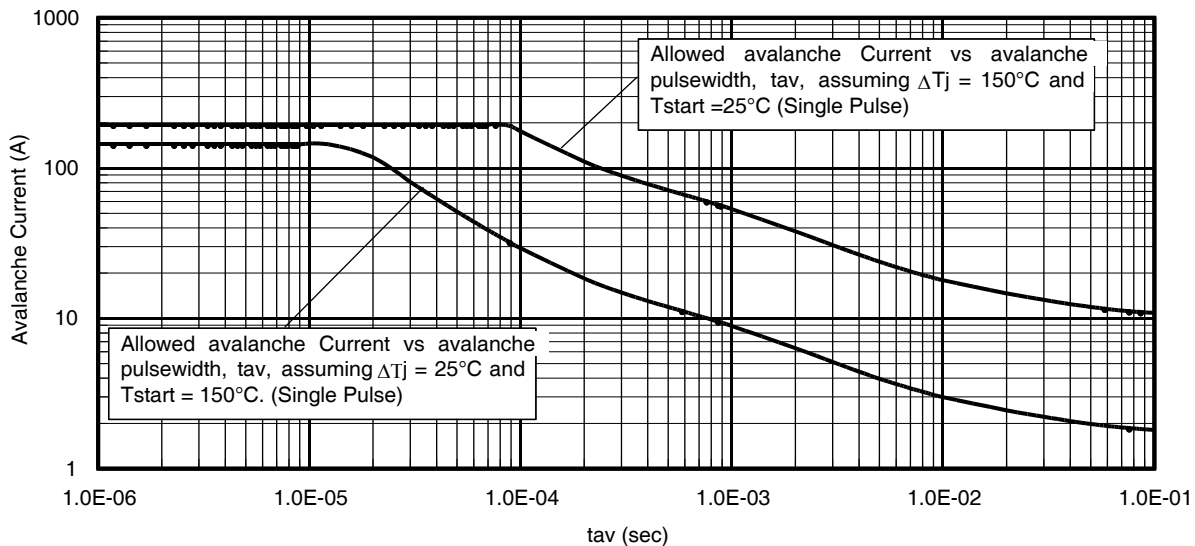
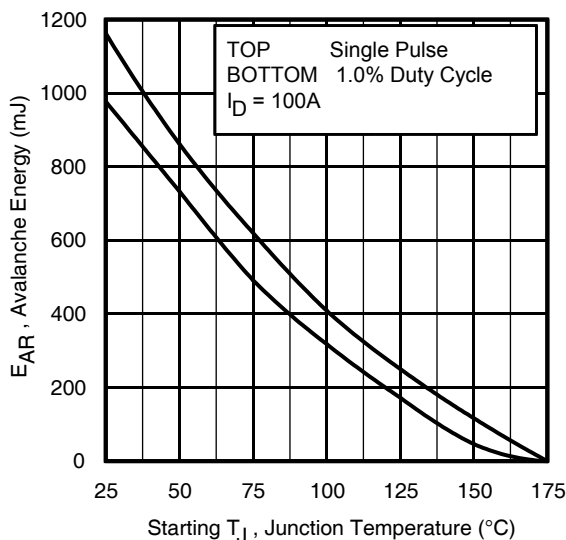


Fig 15. Avalanche Current vs. Pulse width



Notes on Repetitive Avalanche Curves , Figures 15, 16:
(For further info, see AN-1005 at www.irf.com)

1. Avalanche failures assumption:
Purely a thermal phenomenon and failure occurs at a temperature far in excess of T_{jmax} . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as T_{jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 23a, 23b.
4. $P_{D(ave)}$ = Average power dissipation per single avalanche pulse.
5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6. I_{av} = Allowable avalanche current.
7. ΔT = Allowable rise in junction temperature, not to exceed T_{jmax} (assumed as 25°C in Figure 14, 15).
 t_{av} = Average time in avalanche.
 D = Duty cycle in avalanche = $t_{av} \cdot f$
 $Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see Figures 13)
 $P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$
 $I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$
 $E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$

Fig 16. Maximum Avalanche Energy vs. Temperature

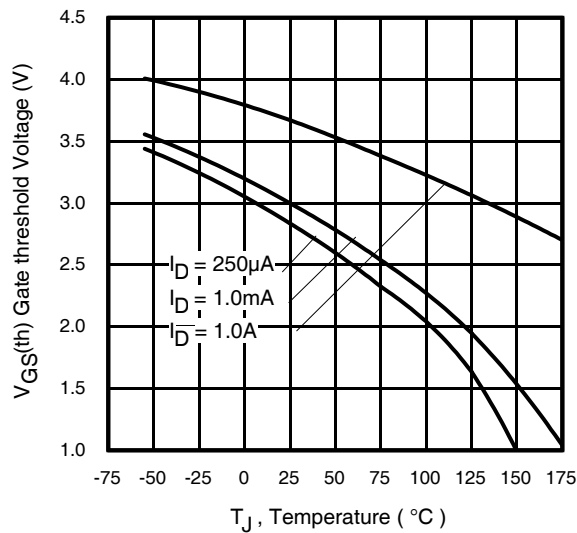


Fig 17. Threshold Voltage vs. Temperature

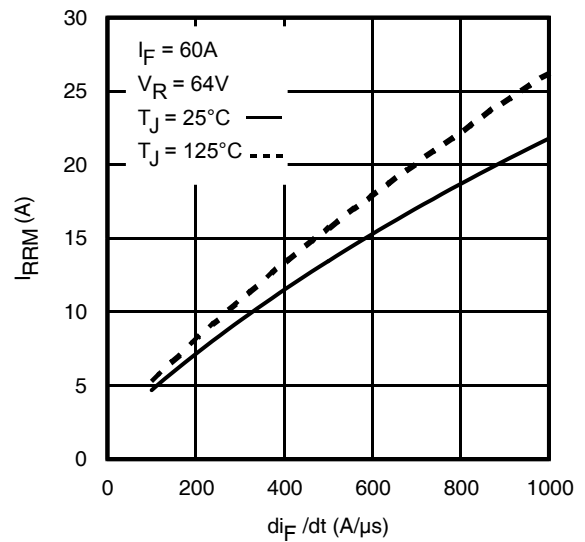


Fig 18. Typical Recovery Current vs. di_F/dt

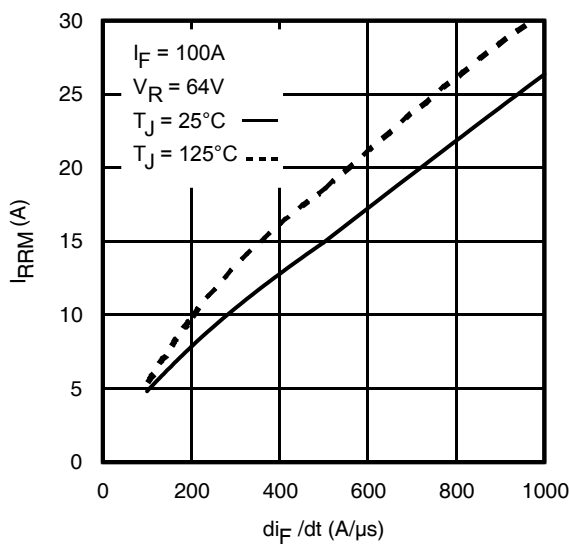


Fig 19. Typical Recovery Current vs. di_F/dt

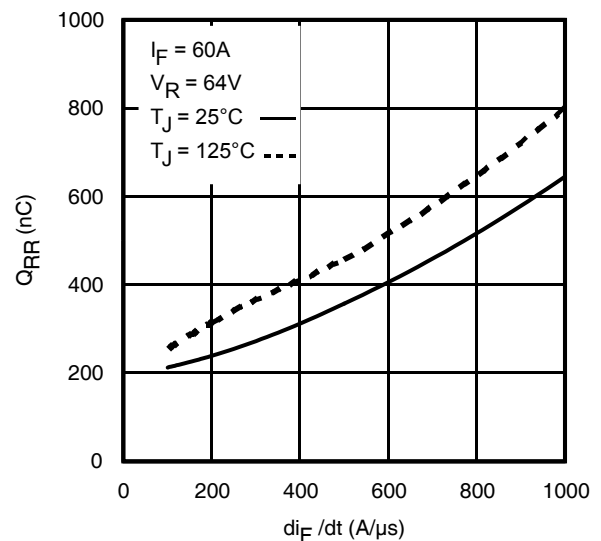


Fig 20. Typical Stored Charge vs. di_F/dt

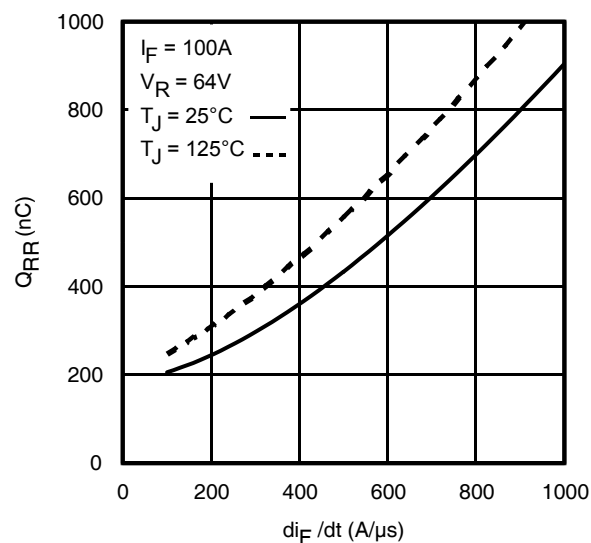


Fig 21. Typical Stored Charge vs. di_F/dt

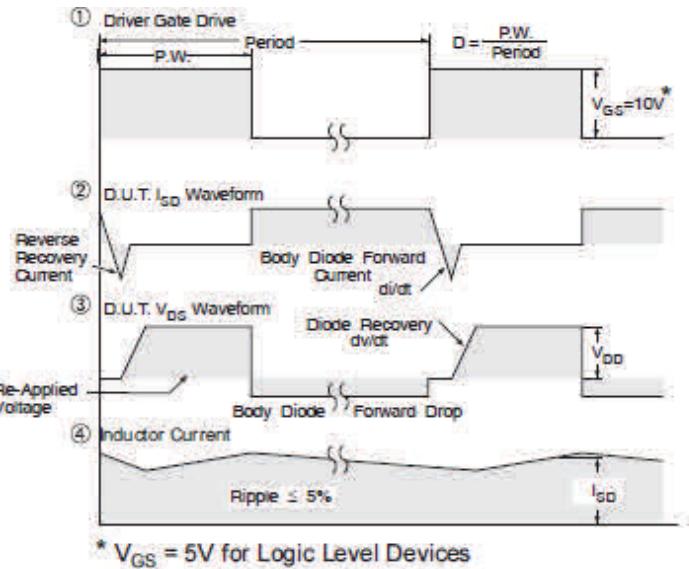
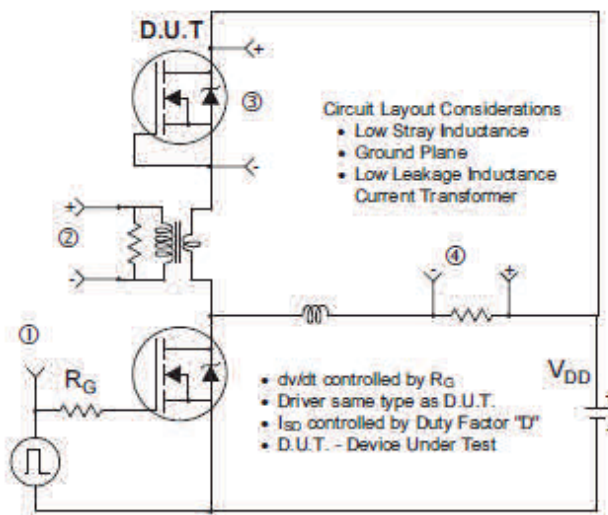


Fig 22. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

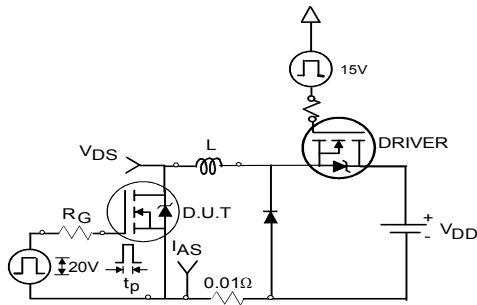


Fig 23a. Unclamped Inductive Test Circuit

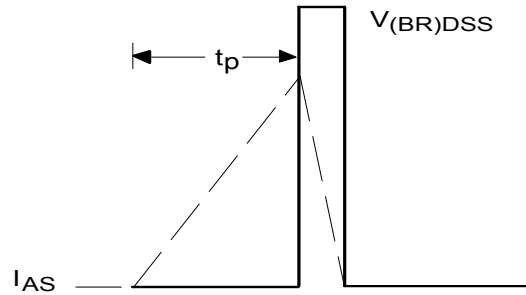


Fig 23b. Unclamped Inductive Waveforms

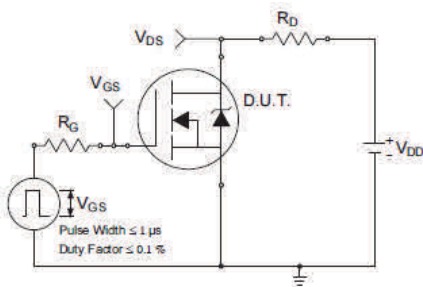


Fig 24a. Switching Time Test Circuit

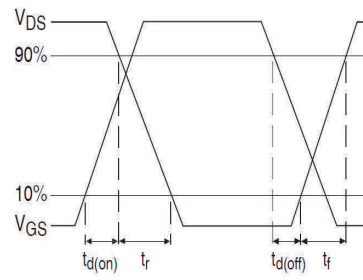


Fig 24b. Switching Time Waveforms

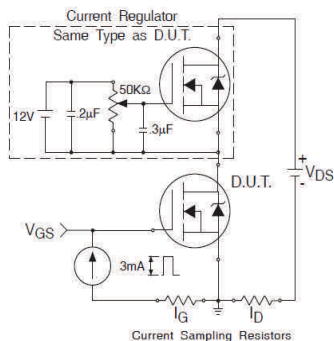


Fig 25a. Gate Charge Test Circuit

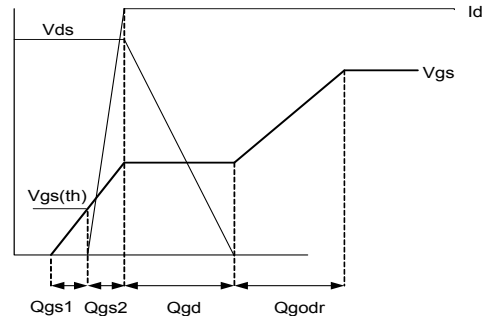


Fig 25b. Gate Charge Waveform

- | SYMBOL | DIMENSIONS | | | | NOTES |
|--------|------------|------|-------------|-------|-------|
| | INCHES | | MILLIMETERS | | |
| | MIN. | MAX. | MIN. | MAX. | |
| A | .183 | .209 | 4.65 | 5.31 | |
| A1 | .087 | .102 | 2.21 | 2.59 | |
| A2 | .059 | .098 | 1.50 | 2.49 | |
| b | .039 | .055 | 0.99 | 1.40 | |
| b1 | .039 | .053 | 0.99 | 1.35 | |
| b2 | .065 | .094 | 1.65 | 2.39 | |
| b3 | .065 | .092 | 1.65 | 2.34 | |
| b4 | .102 | .135 | 2.59 | 3.43 | |
| b5 | .102 | .133 | 2.59 | 3.38 | |
| c | .015 | .035 | 0.38 | 0.89 | |
| c1 | .015 | .033 | 0.38 | 0.84 | |
| D | .776 | .815 | 19.71 | 20.70 | 4 |
| D1 | .515 | — | 13.08 | — | 5 |
| D2 | .020 | .053 | 0.51 | 1.35 | |
| E | .602 | .625 | 15.29 | 15.87 | 4 |
| E1 | .530 | — | 13.46 | — | |
| E2 | .178 | .216 | 4.52 | 5.49 | |
| e | .215 BSC | | 5.46 BSC | | |
| Øk | .010 | | 0.25 | | |
| L | .559 | .634 | 14.20 | 16.10 | |
| L1 | .146 | .169 | 3.71 | 4.29 | |
| ØP | .140 | .144 | 3.56 | 3.66 | |
| ØP1 | — | .291 | — | 7.39 | |
| Q | .209 | .224 | 5.31 | 5.69 | |
| S | .217 BSC | | 5.51 BSC | | |

- 1.- ANODE/OPEN
- 2.- CATHODE
- 3.- ANODE

2015-11-30

Qualification Information[†]

Qualification Level	Industrial	
Moisture Sensitivity Level	TO-247AC	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.

Revision History

Date	Comments
02/19/2015	- Updated $E_{AS} (L=1mH) = 2004mJ$ on page 2 - Updated note 9 "Limited by T_{Jmax}, starting $T_J = 25^{\circ}C$, $L = 1mH$, $R_G = 50\Omega$, $I_{AS} = 63A$, $V_{GS} = 10V$" on page 2
11/30/2015	- Corrected fig 4 label typo from "25°C" to "175°C" on page 4. - Updated datasheet with corporate template

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