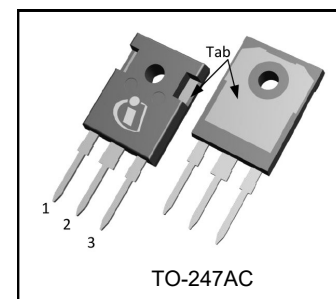
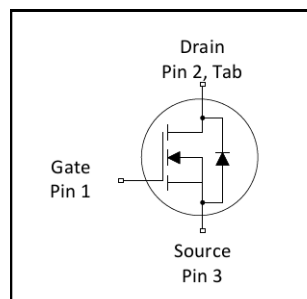


V_{DSS}	300V
$R_{DS(on)}$ typ.	25.5mΩ
max.	32mΩ
I_D	70A



Applications

- High Efficiency Synchronous Rectification in SMPS
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits

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

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFP4868PbF	TO-247AC	Tube	25	IRFP4868PbF

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	70	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	49	
I_{DM}	Pulsed Drain Current ①	280	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	517	W
	Linear Derating Factor	3.4	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	10lbf.in (1.1N.m)	

Avalanche Characteristics

E_{AS} (Thermally limited)	Single Pulse Avalanche Energy ②	1093	mJ
I_{AR}	Avalanche Current ①	See Fig. 14, 15, 22a, 22b	A
E_{AR}	Repetitive Avalanche Energy ①		mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑦⑧	—	0.29	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

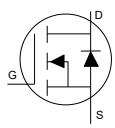
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	300	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.29	—	V/°C	Reference to $25^\circ\text{C}, I_D = 5mA$ ①
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	25.5	32	mΩ	$V_{GS} = 10V, I_D = 42A$ 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	—	—	20	μA	$V_{DS} = 300V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 300V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
R_G	Internal Gate Resistance	—	1.1	—	Ω	

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	80	—	—	S	$V_{DS} = 50V, I_D = 42A$
Q_g	Total Gate Charge	—	180	270	nC	$I_D = 42A$
Q_{gs}	Gate-to-Source Charge	—	60	—		$V_{DS} = 150V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	57	—		$V_{GS} = 10V$ ④
Q_{sync}	Total Gate Charge Sync. ($Q_g - Q_{gd}$)	—	123	—		$I_D = 42A, V_{DS} = 0V, V_{GS} = 10V$
$t_{d(on)}$	Turn-On Delay Time	—	24	—	ns	$V_{DD} = 195V$
t_r	Rise Time	—	50	—		$I_D = 42A$
$t_{d(off)}$	Turn-Off Delay Time	—	62	—		$R_G = 1.0\Omega$
t_f	Fall Time	—	45	—		$V_{GS} = 10V$ ④
C_{iss}	Input Capacitance	—	10774	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	612	—		$V_{DS} = 50V$
C_{rss}	Reverse Transfer Capacitance	—	193	—		$f = 1.0\text{ MHz}, \text{ See Fig. 5}$
$C_{oss\text{ eff. (ER)}}$	Effective Output Capacitance (Energy Related) ⑥	—	406	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 240V$ ⑥, See Fig. 11
$C_{oss\text{ eff. (TR)}}$	Effective Output Capacitance (Time Related) ⑤	—	710	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 240V$ ⑤

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	70	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	280	A	
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 42A, V_{GS} = 0V$ ④
dv/dt	Peak Diode Recovery ③	—	7.3	—	V/ns	$T_J = 25^\circ\text{C}, I_S = 42A, V_{DS} = 300V$
t_{rr}	Reverse Recovery Time	—	351	—	ns	$T_J = 25^\circ\text{C}$
		—	454	—		$T_J = 125^\circ\text{C}$
Q_{rr}	Reverse Recovery Charge	—	2520	—	nC	$T_J = 25^\circ\text{C}$
		—	3686	—		$T_J = 125^\circ\text{C}$
I_{RRM}	Reverse Recovery Current	—	16	—	A	$T_J = 25^\circ\text{C}$
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.
- ② Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}, L = 1.2mH$
 $R_G = 50\Omega, I_{AS} = 42A, V_{GS} = 10V$. Part not recommended for use above this value.
- ③ $I_{SD} \leq 42A, di/dt \leq 1706A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$.
- ④ Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$.

- ⑤ Coss eff. (TR) is a fixed capacitance that gives the same charging time as Coss while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑥ Coss eff. (ER) is a fixed capacitance that gives the same energy as Coss while V_{DS} is rising from 0 to 80% V_{DSS} .
- ⑦ R_θ is measured at T_J approximately 90°C .
- ⑧ $R_{\theta JC}$ value shown is at time zero.

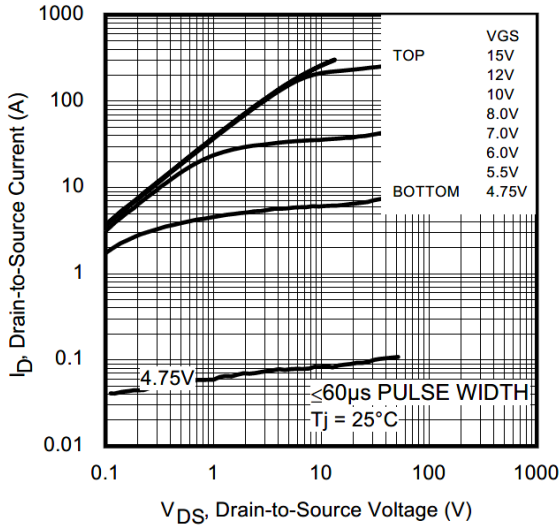


Fig 1. Typical Output Characteristics

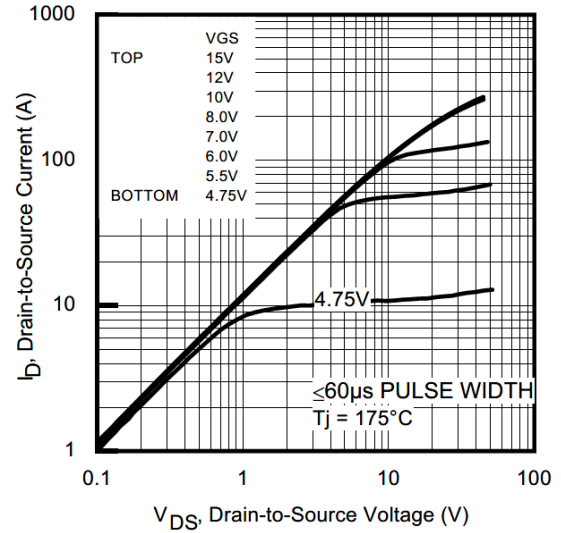


Fig 2. Typical Output Characteristics

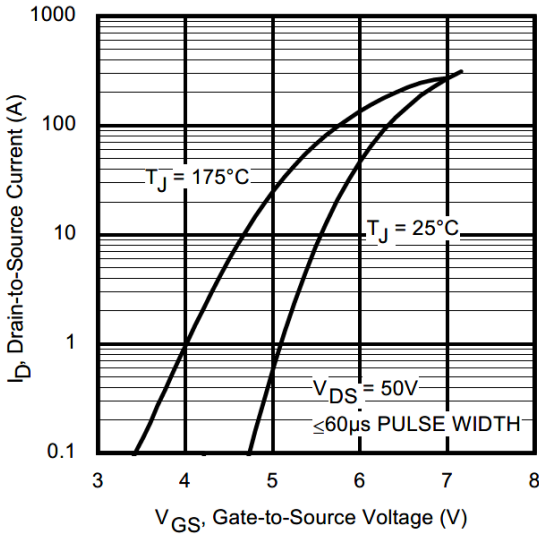


Fig 3. Typical Transfer Characteristics

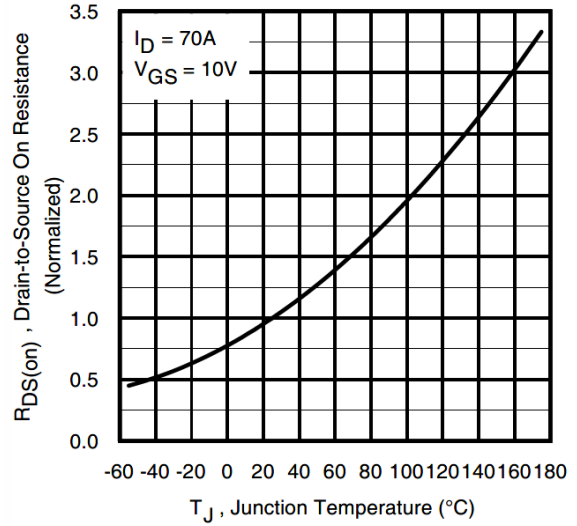


Fig 4. Normalized On-Resistance vs. Temperature

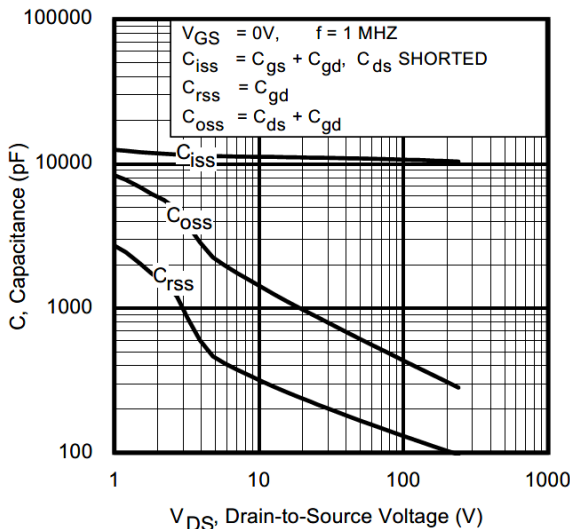


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

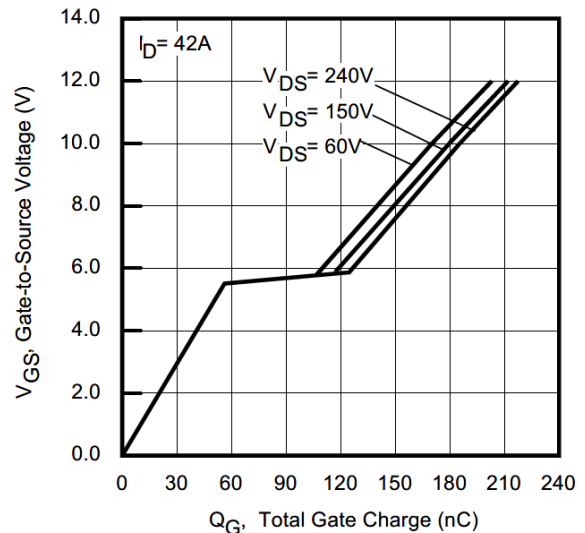


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

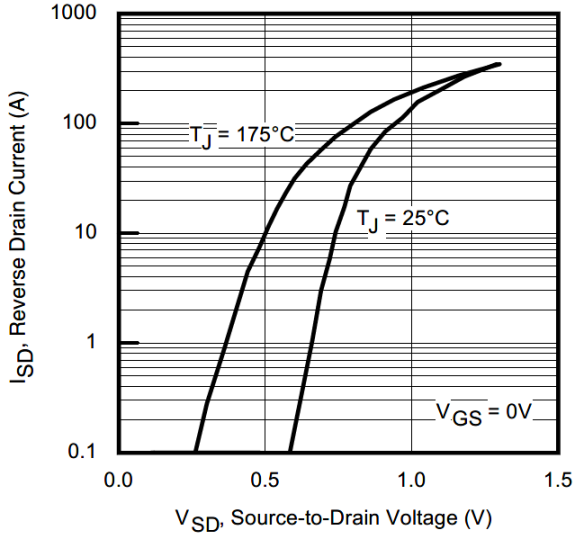


Fig 7. Typical Source-to-Drain Diode Forward Voltage

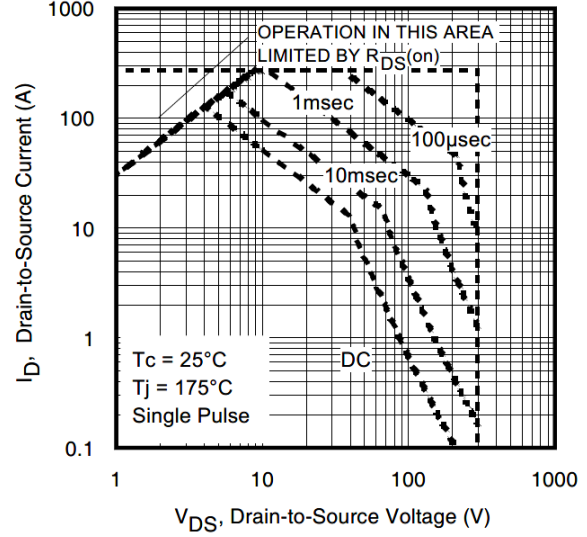


Fig 8. Maximum Safe Operating Area

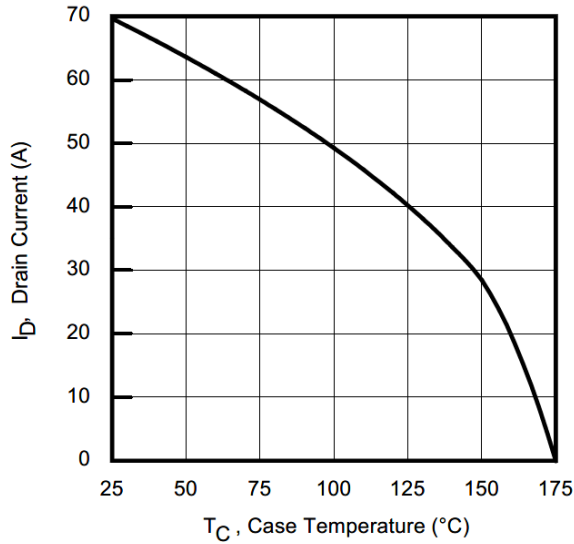


Fig 9. Maximum Drain Current vs. Case Temperature

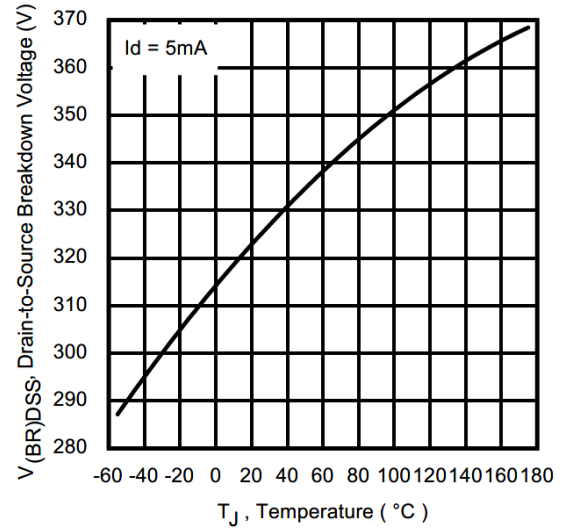


Fig 10. Drain-to-Source Breakdown Voltage

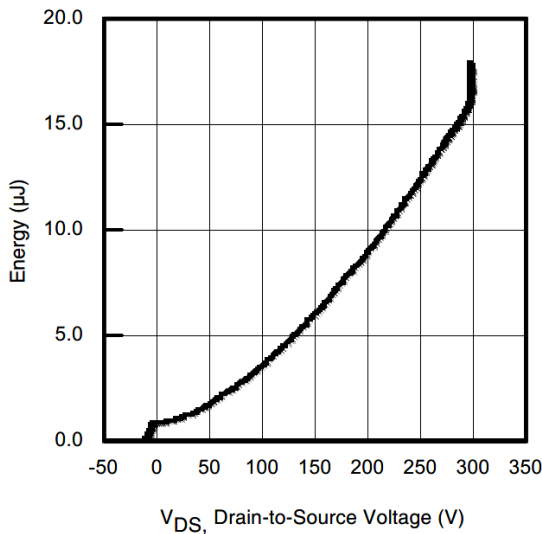


Fig 11. Typical Coss Stored Energy

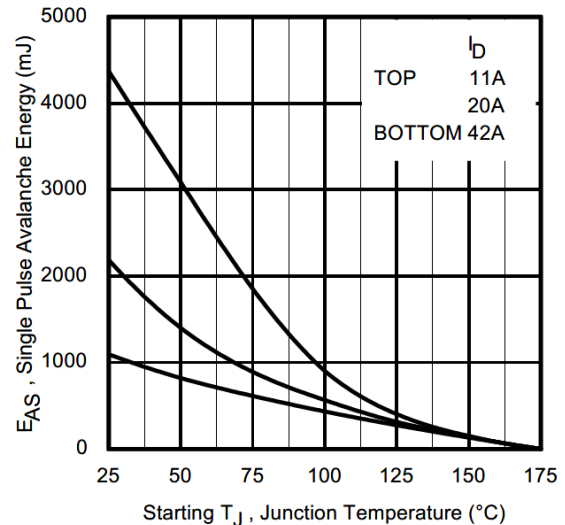


Fig 12. Maximum Avalanche Energy vs. Drain Current

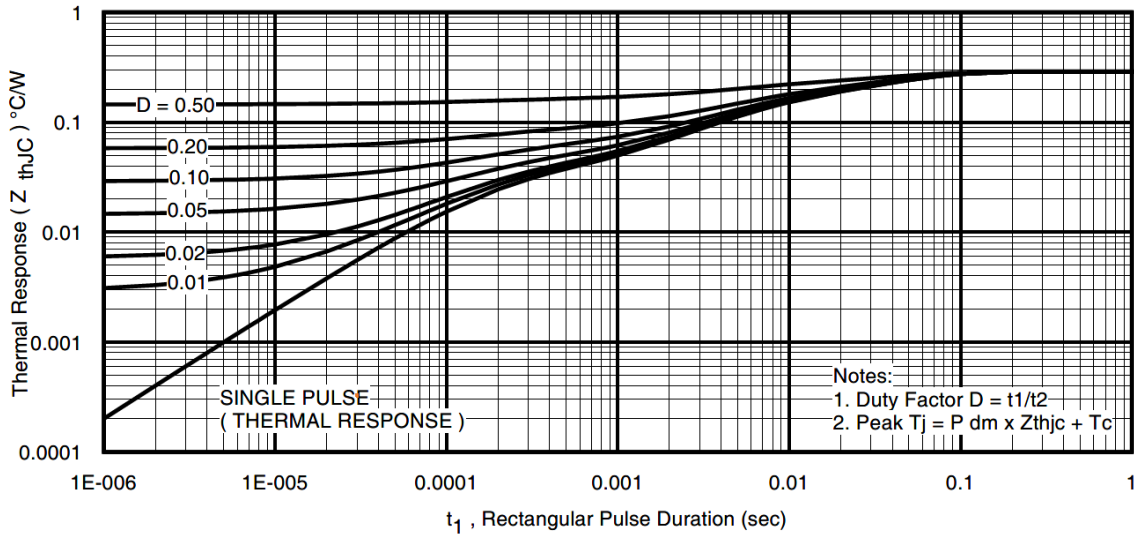


Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

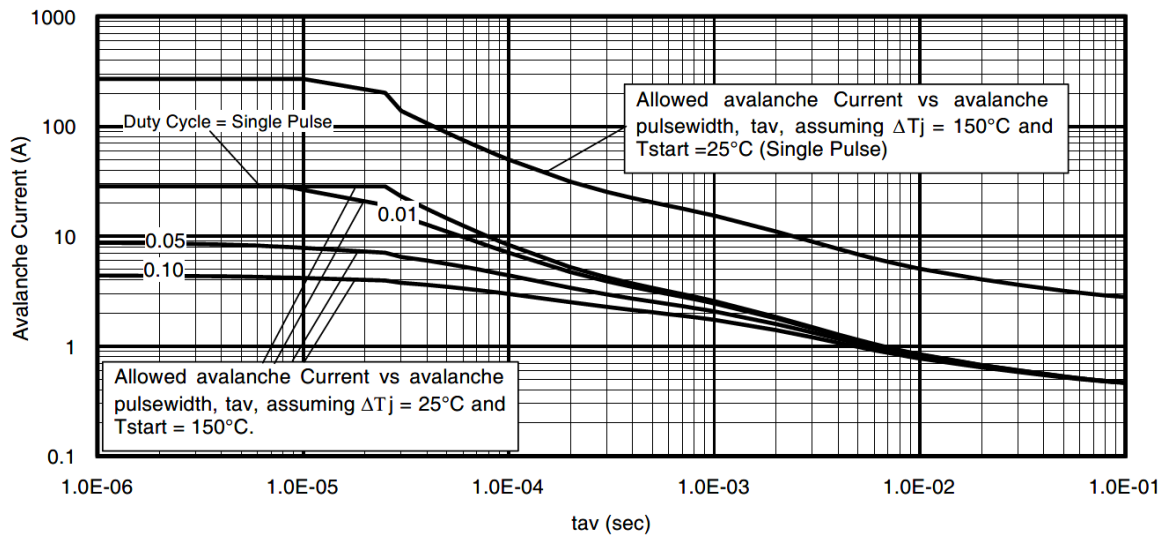
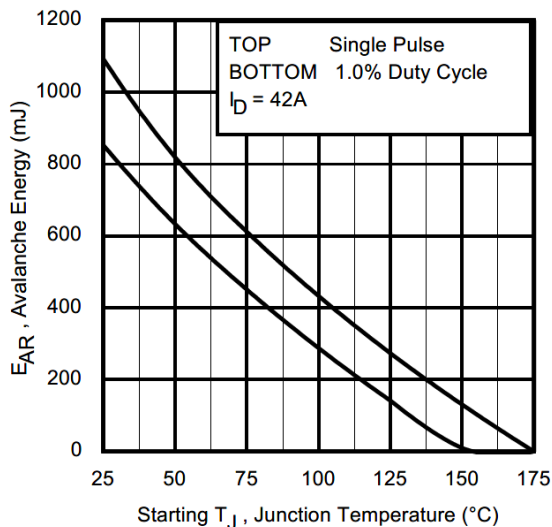


Fig 14. Typical Avalanche Current vs. Pulsewidth



Notes on Repetitive Avalanche Curves, Figures 14, 15:
 (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 16a, 16b.
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 $25^\circ C$ 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 15. Maximum Avalanche Energy vs. Temperature

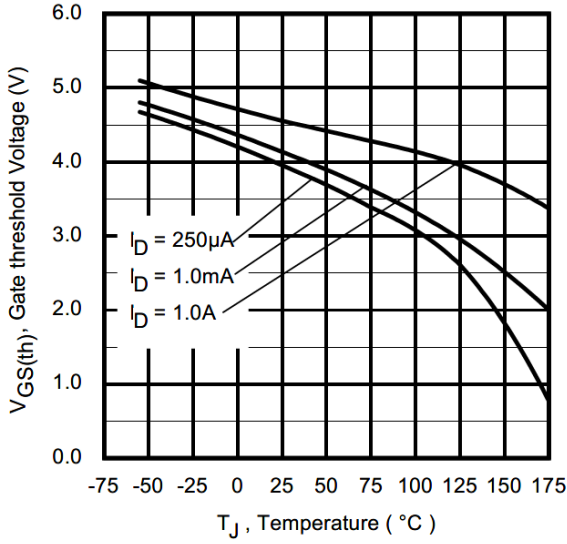


Fig. 16 Threshold Voltage vs. Temperature

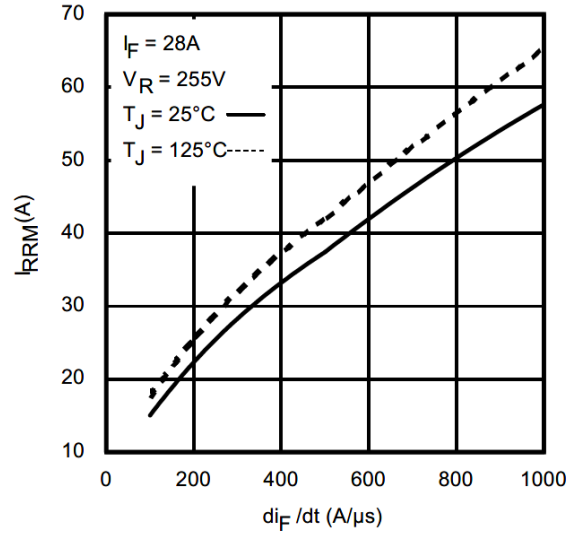


Fig. 17 Typical Recovery Current vs. dI_F/dt

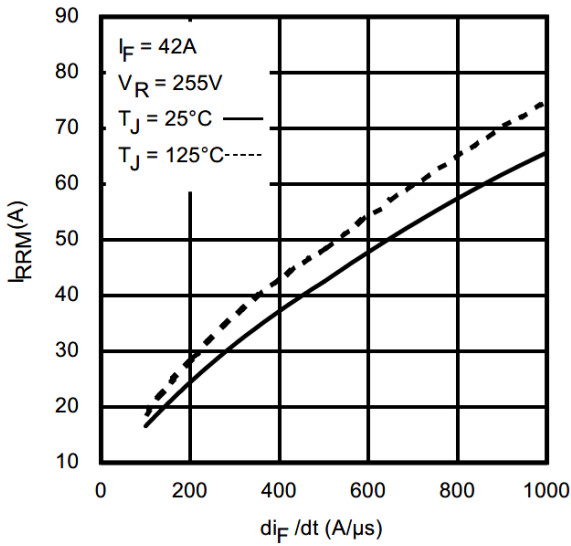


Fig 18. Typical Recovery Current vs. dI_F/dt

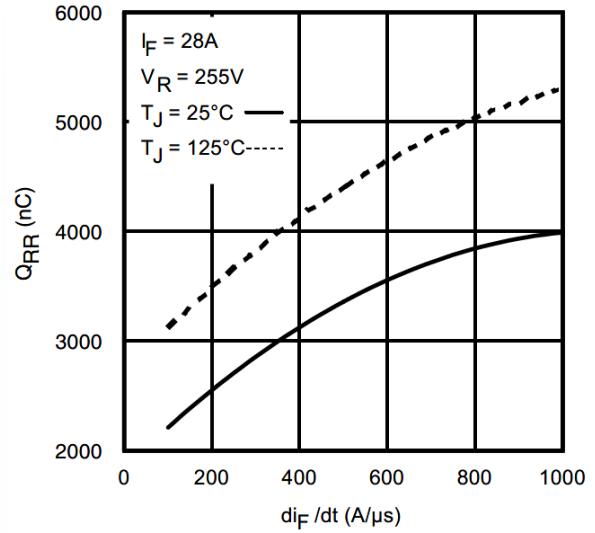


Fig 19. Typical Stored Charge vs. dI_F/dt

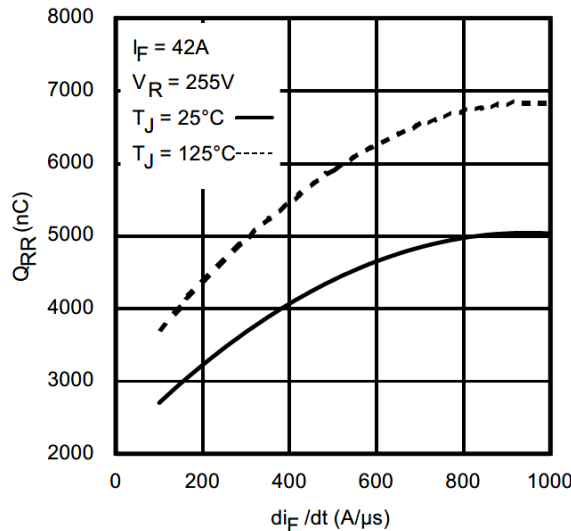


Fig 20. Typical Stored Charge vs. dI_F/dt

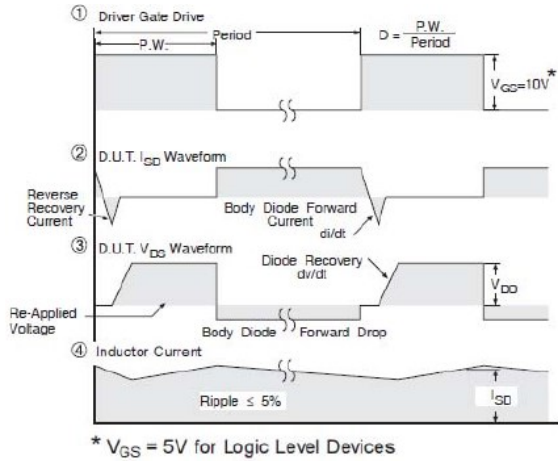
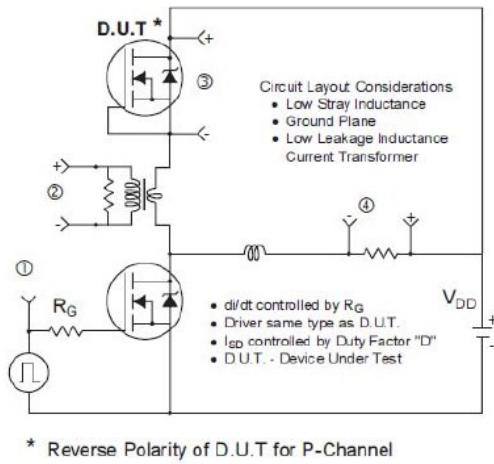


Fig 21. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

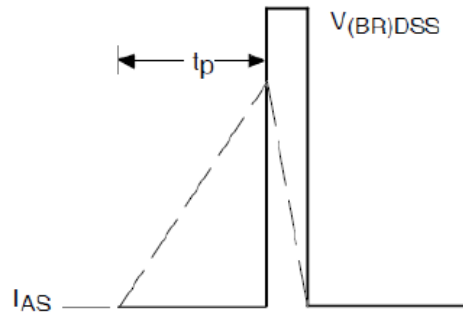
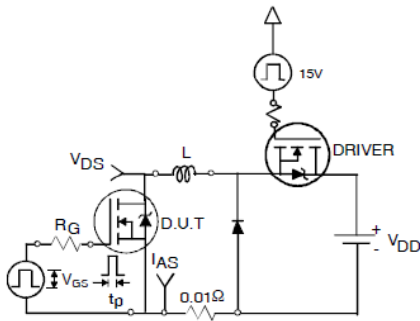


Fig 22a. Unclamped Inductive Test Circuit

Fig 22b. Unclamped Inductive Waveforms

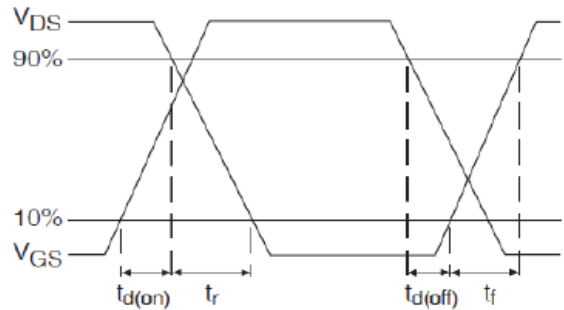
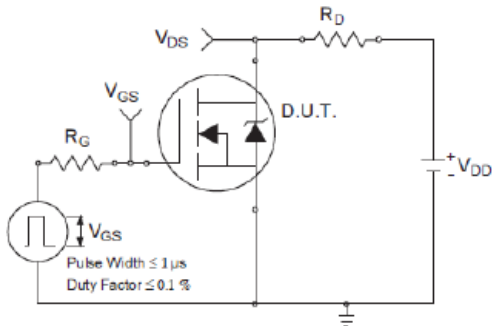


Fig 23a. Switching Time Test Circuit

Fig 23b. Switching Time Waveforms

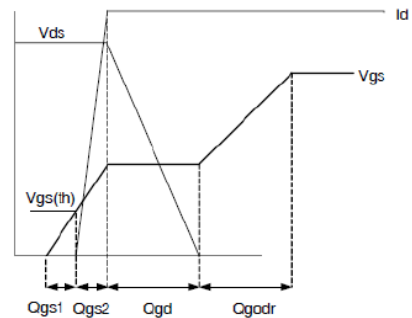
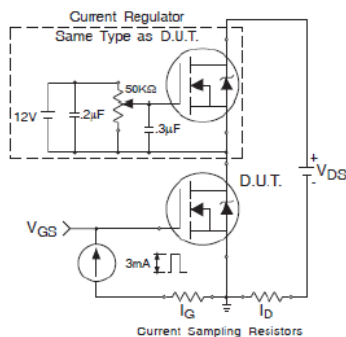


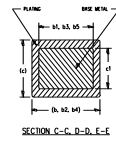
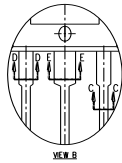
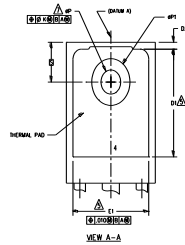
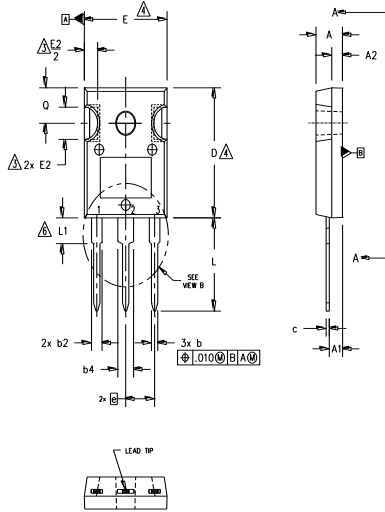
Fig 24a. Gate Charge Test Circuit

Fig 24b. Gate Charge Waveform

TO-247AC Package Outline (Dimensions are

NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES.
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION D & 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. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. ØP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247AC .



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		

LEAD ASSIGNMENTS

HEXFET

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

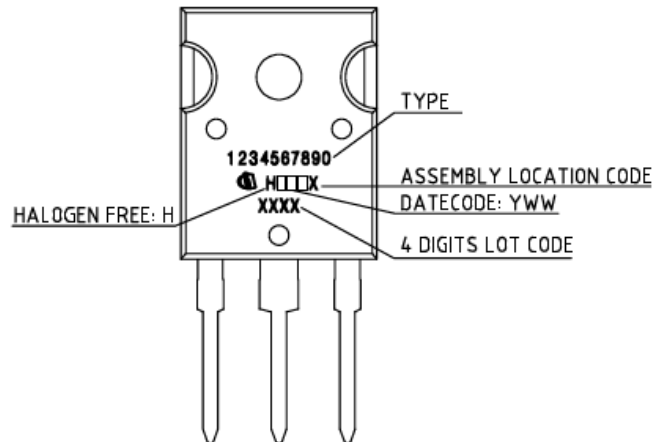
IGBTs, CoPACK

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

DIODES

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

TO-247AC Part Marking Information



TO-247AC package is not recommended for Surface Mount Application.

Qualification information

Qualification level	Industrial (per JEDEC JESD47F) [†]	
Moisture Sensitivity Level	TO-247AC	N/A
RoHS compliant	Yes	

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

Revision History

Date	Rev.	Comments
06/21/2017	2.1	<ul style="list-style-type: none"> • Changed datasheet with Infineon logo-all pages • Corrected Package outline on page 8. • Added disclaimer on last page.
06/10/2024	2.2	<ul style="list-style-type: none"> • Update datasheet to Infineon format • Corrected trise to latest lab measurements
10/18/2024	2.3	<ul style="list-style-type: none"> • Updated Part marking –page 8

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