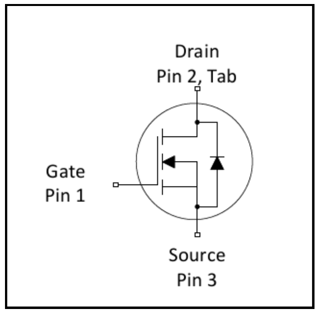
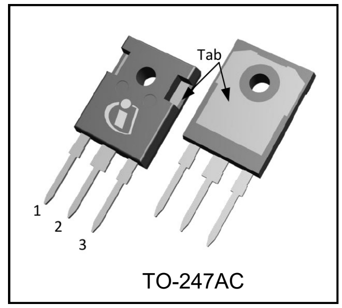
IRFP4127PbF

V_{DSS}	200V
$R_{DS(on)}$ typ.	17mΩ
max.	21mΩ
I_D	75A





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, RoHS Compliant

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFP4127PbF	TO-247	Tube	25	IRFP4127PbF

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	75	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	53	
I_{DM}	Pulsed Drain Current ①	300	
P_D @T_C = 25°C	Maximum Power Dissipation	341	W
	Linear Derating Factor	2.3	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ③	5.7	V/ns
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	244	mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑧	——	0.4	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface	0.24	——	
$R_{\theta JA}$	Junction-to-Ambient ⑦⑨	——	40	

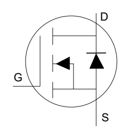
Static @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	200	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.23	——	V/°C	Reference to 25°C, I_D = 5mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	17	21	mΩ	V_{GS} = 10V, I_D = 44A ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	——	5.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source Leakage Current	——	——	20	μA	V_{DS} = 200V, V_{GS} = 0V
		——	——	250		V_{DS} = 200V, 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
R_G	Gate Resistance	——	3.0	——	Ω	

Dynamic @ T_J = 25°C (unless otherwise specfied)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	45	——	——	S	V_{DS} = 50V, I_D = 44A
Q_g	Total Gate Charge	——	100	150	nC	I_D = 44A
Q_{gs}	Gate-to-Source Charge	——	30	——		V_{DS} =100V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	31	——		V_{GS} = 10V ⑤
Q_{sync}	Total Gate Charge Sync. (Q_g-Q_{gd})	——	69	——		I_D = 44A, V_{DS} =0V, V_{GS} = 10V
$t_{d(on)}$	Turn-On Delay Time	——	17	——	ns	V_{DD} = 100V
t_r	Rise Time	——	18	——		I_D = 44A
$t_{d(off)}$	Turn-Off Delay Time	——	56	——		R_G = 2.7Ω
t_f	Fall Time	——	22	——		V_{GS} = 10V
C_{iss}	Input Capacitance	——	5380	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	410	——		V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	——	86	——		*ƒ* = 1.0 MHz,
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related)	——	360	——		V_{GS} = 0V, V_{DS} = 0V to 160V ⑥
C_{oss} eff. (TR)	Effective Output Capacitance (Time Related)	——	590	——		V_{GS} = 0V, V_{DS} = 0V to 160V 10V ⑤

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions	
I_S	Continuous Source Current (Body Diode) ①	——	——	75	A	MOSFET symbol showing the integral reverse p-n junction diode.	
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	300			
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C, I_S = 44A, V_{GS} = 0V ④	
t_{rr}	Reverse Recovery Time	——	136	——	ns	T_J = 25°C	V_R = 100V,
		——	139	——		T_J = 125°C	I_F = 44A
Q_{rr}	Reverse Recovery Charge	——	458	——	nC	T_J = 25°C	di/dt = 100A/μs ④
		——	688	——		T_J = 125°C	
I_{RRM}	Reverse Recovery Current	——	8.3	——	A	T_J = 25°C	

Notes:

① Repetitive rating; pulse width limited by max. Junction temperature.

② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.25mH, R_G = 25Ω, I_{AS} = 44A,V_{GS} =10V. Part not Recommended for use above this value.

③ I_{SD} ≤ 44A, di/dt ≤ 760A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

④ Pulse width ≤ 400μs; duty cycle ≤ 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}.

⑦When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-0994

⑧ R_θ is measured at T_J approximately 90°C.

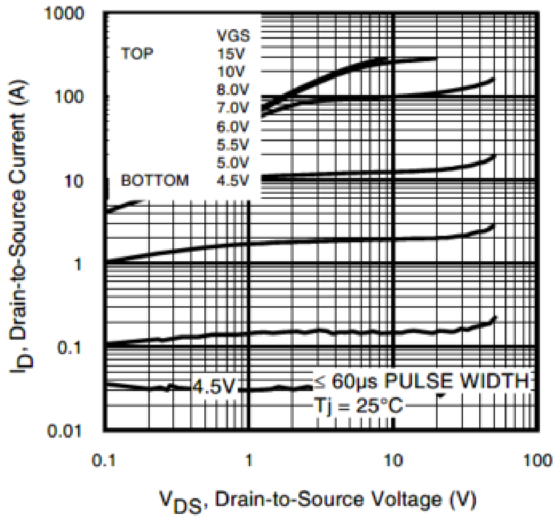


Fig 1. Typical Output Characteristics

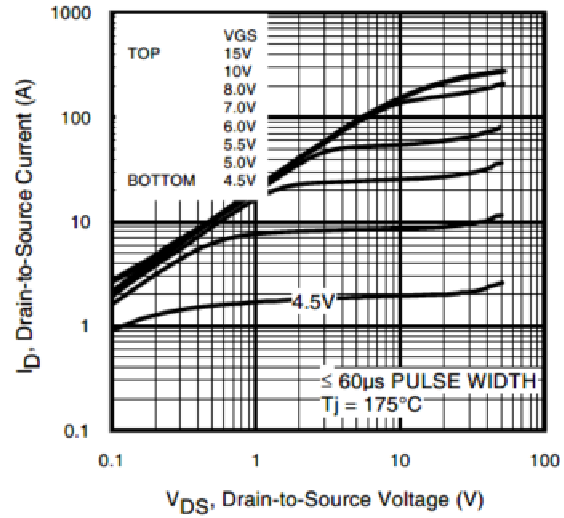


Fig 2. Typical Output Characteristics

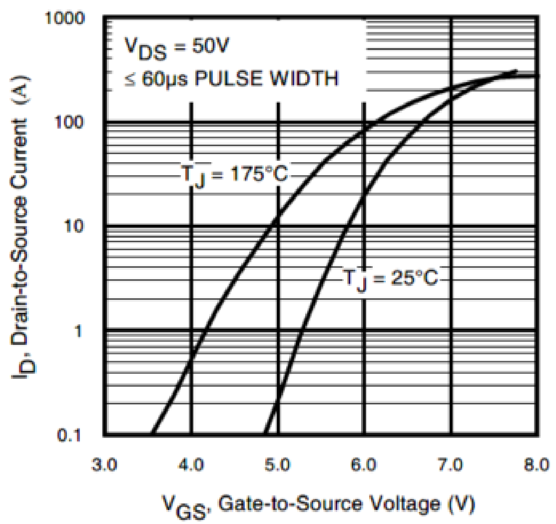


Fig 3. Typical Transfer Characteristics

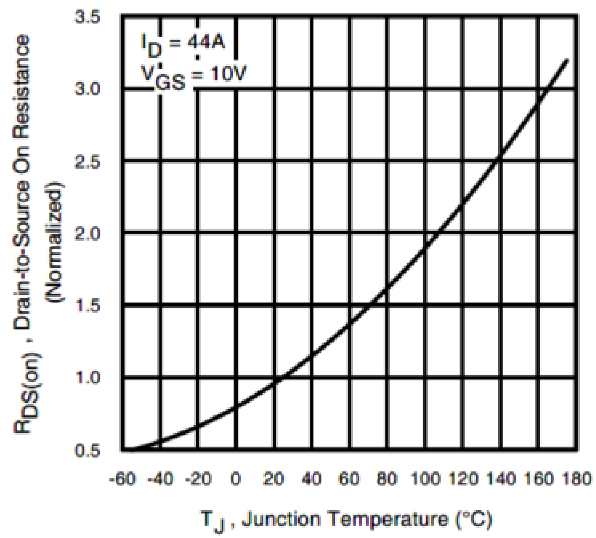


Fig 4. Normalized On-Resistance vs. Temperature

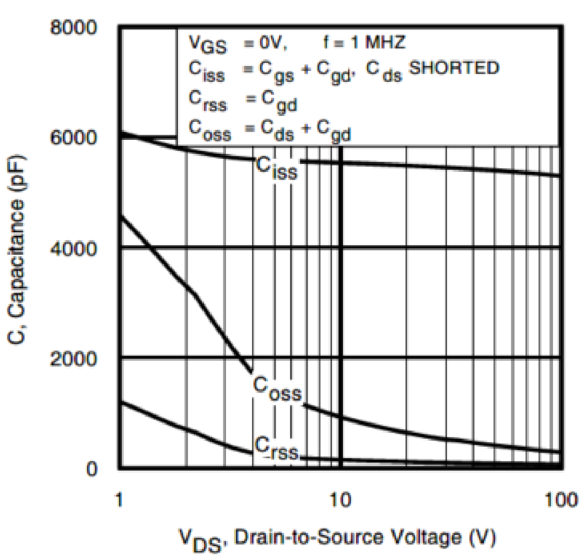


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

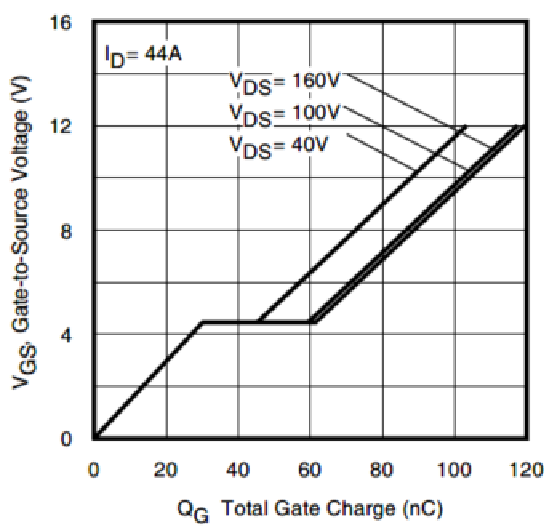


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

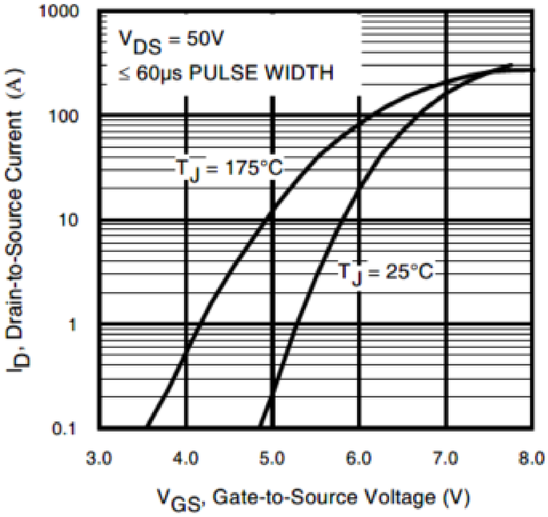


Fig 7. Typical Source-to-Drain Diode Forward Voltage

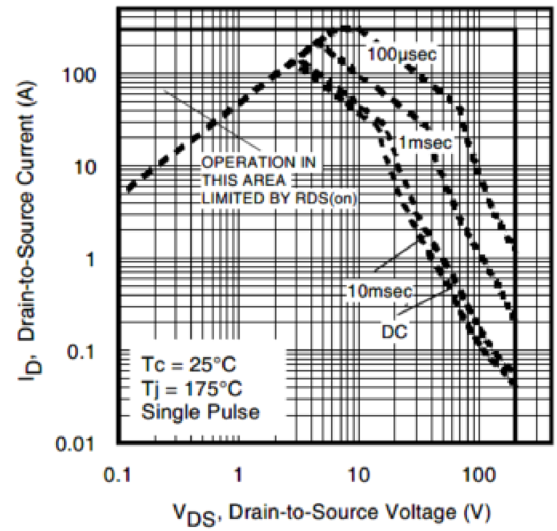


Fig 8. Maximum Safe Operating Area

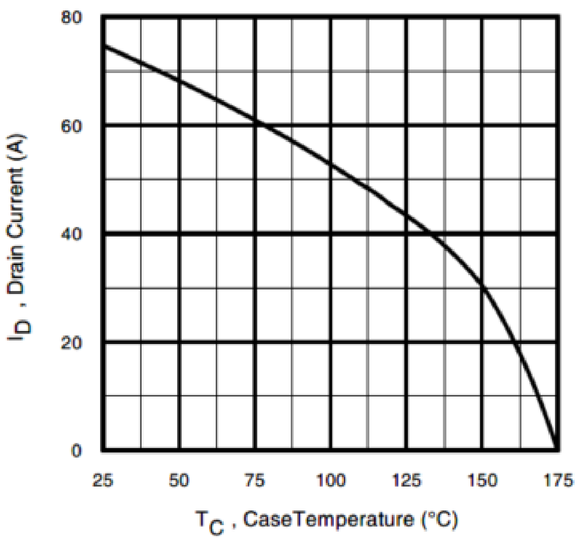


Fig 9. Maximum Drain Current vs. Case Temperature

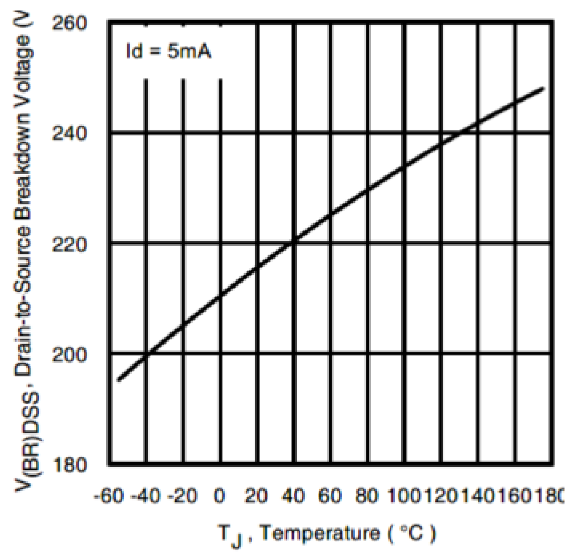


Fig 10. Drain-to-Source Breakdown Voltage

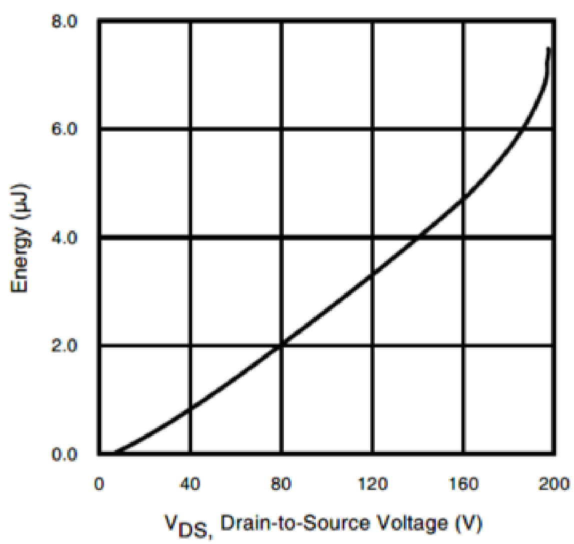


Fig 11. Typical Coss Stored Energy

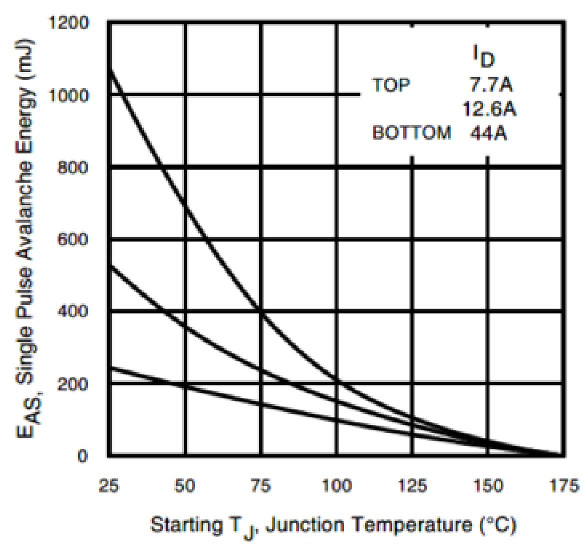


Fig 12. Maximum Avalanche Energy vs. Drain Current

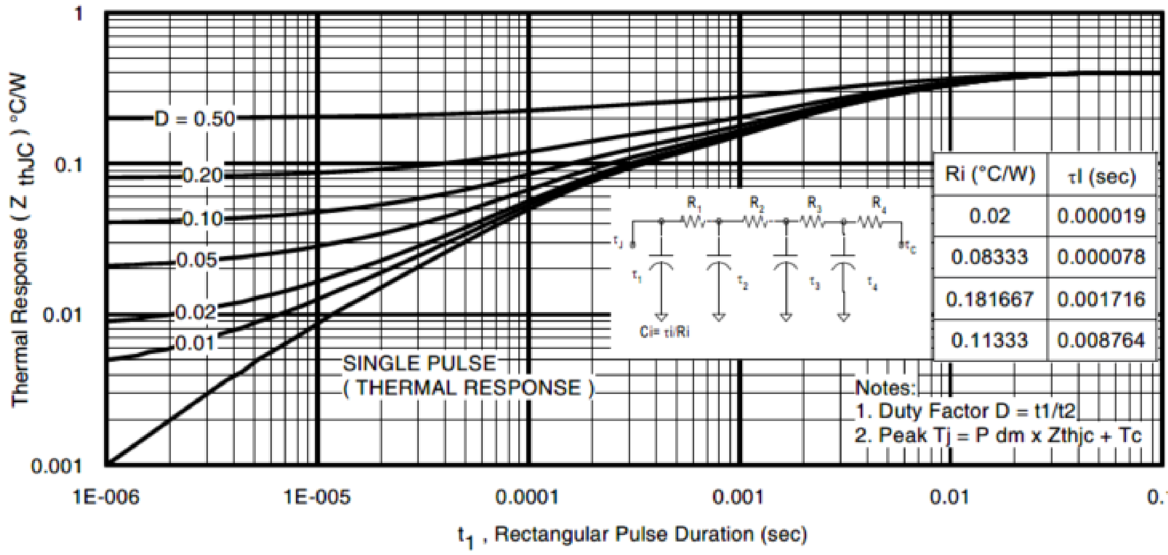


Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

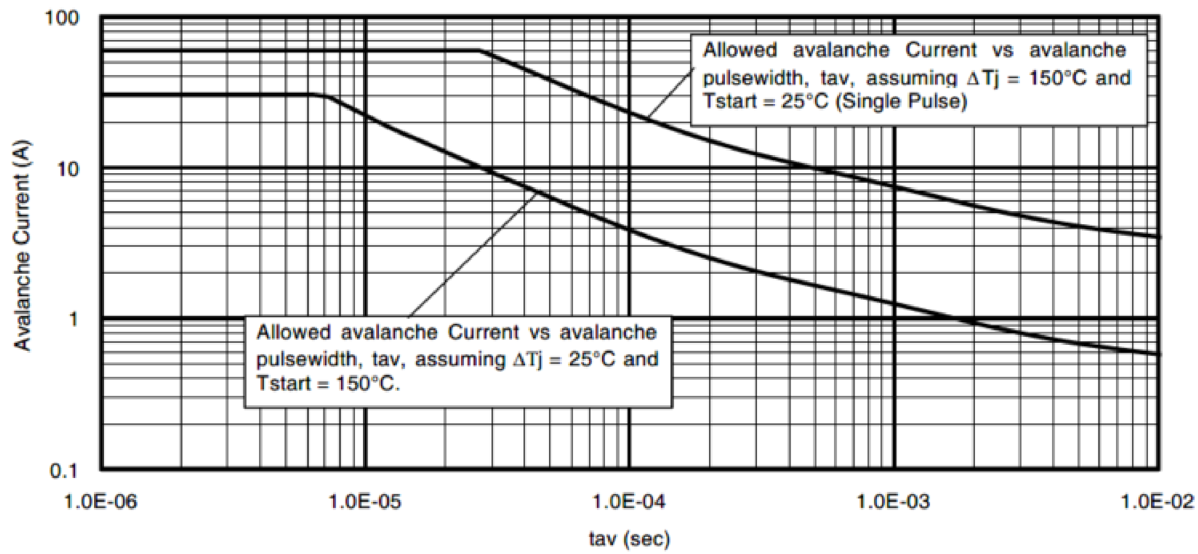


Fig 14. Typical Avalanche Current vs. Pulsewidth

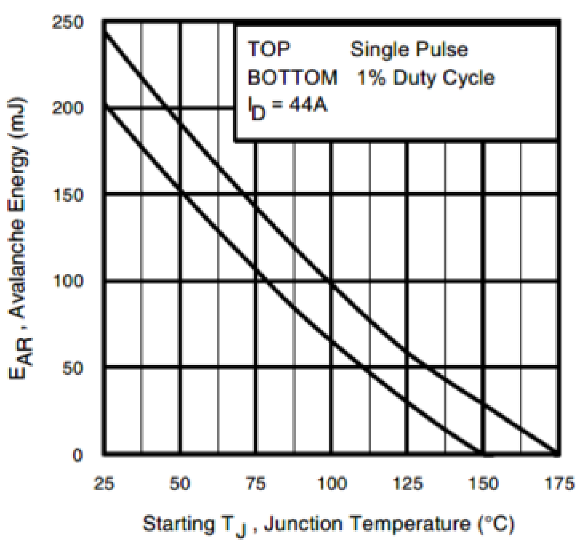


Fig 15. Maximum Avalanche Energy vs. Temperature

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 Tjmax. This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as Tjmax 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 Tjmax (assumed as 25°C in Figure 14, 15).
   t_{av} = Average time in avalanche.
   D = Duty cycle in avalanche = tav ·f
   $Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see Figures 13)

$$P_{D\ (ave)} = 1/2\ (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$
$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$
$$E_{AS\ (AR)} = P_{D\ (ave)} \cdot t_{av}$$

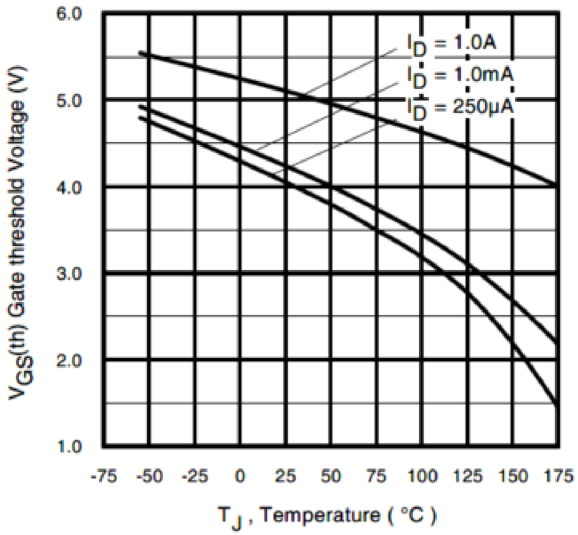


Fig. 16 Threshold Voltage vs. Temperature

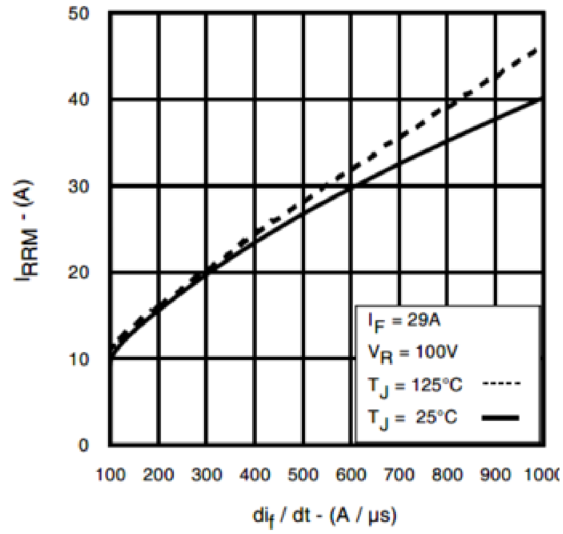


Fig. 17 Typical Recovery Current vs. di_f/dt

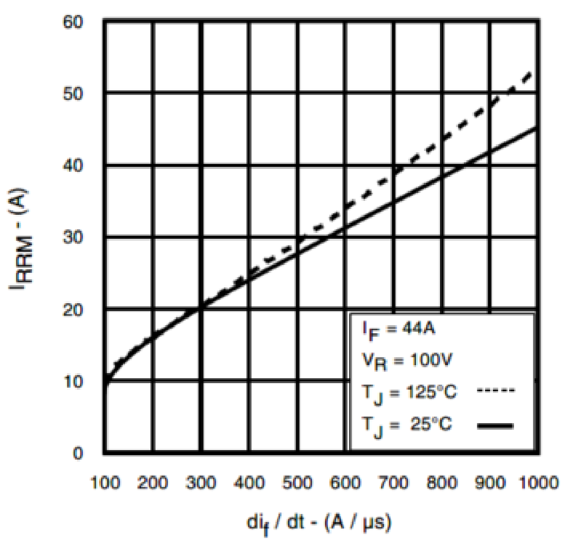


Fig 18. Typical Recovery Current vs. di_f/dt

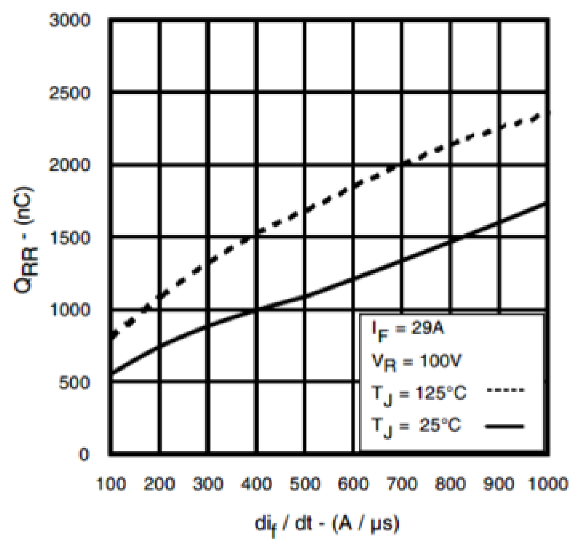


Fig 19. Typical Stored Charge vs. di_f/dt

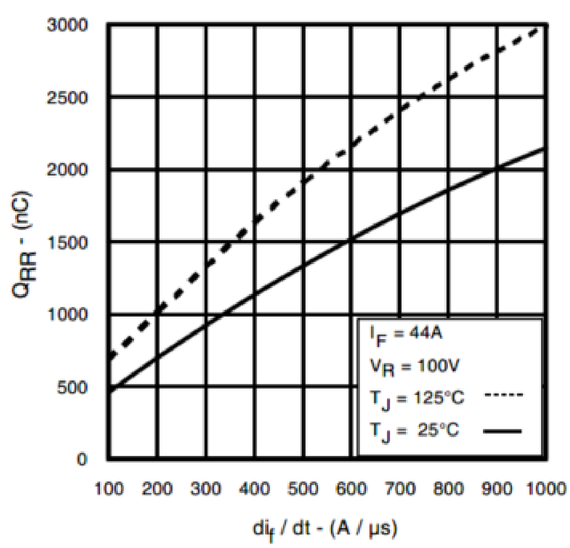


Fig 20. Typical Stored Charge vs. di_f/dt

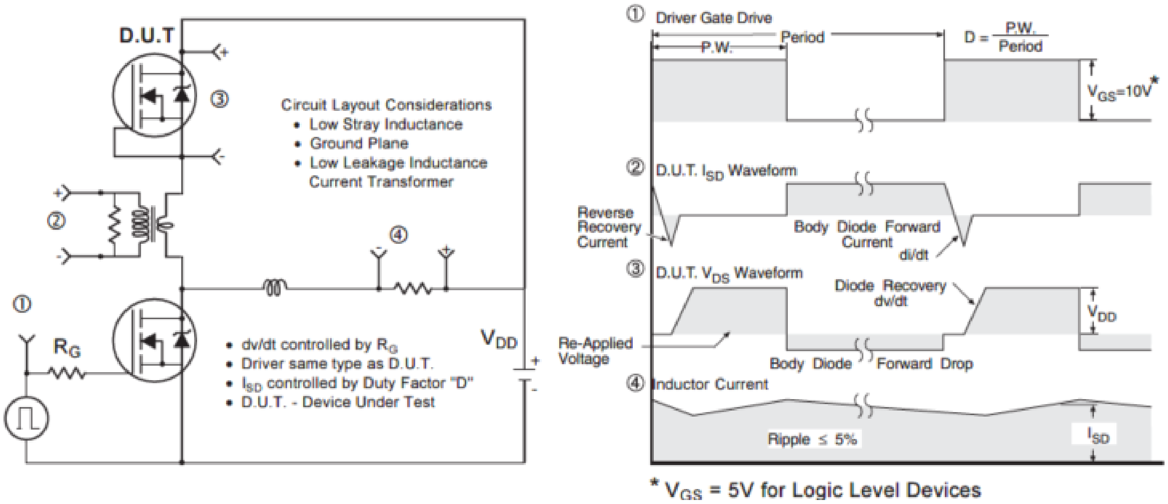


Fig 21. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

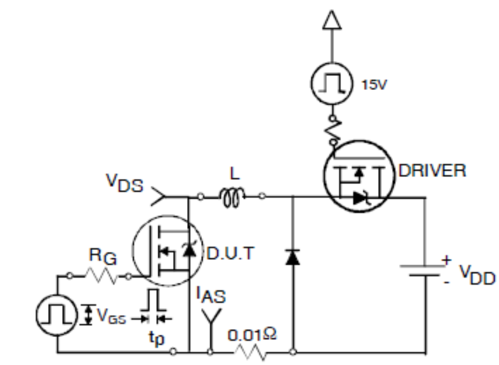


Fig 22a. Unclamped Inductive Test Circuit

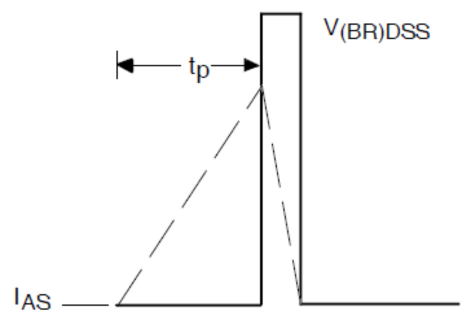


Fig 22b. Unclamped Inductive Waveforms

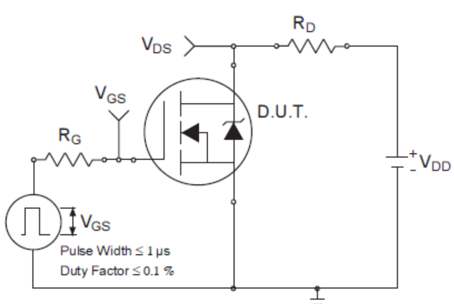


Fig 23a. Switching Time Test Circuit

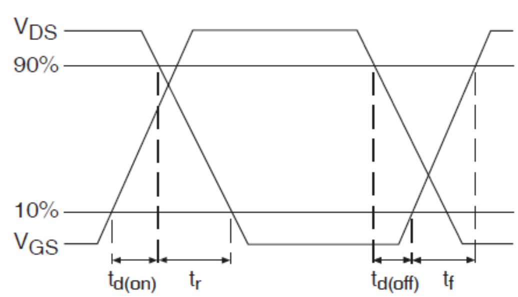


Fig 23b. Switching Time Waveforms

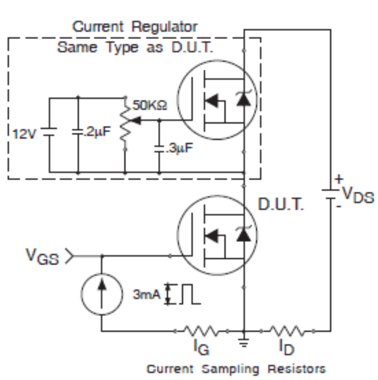


Fig 24a. Gate Charge Test Circuit

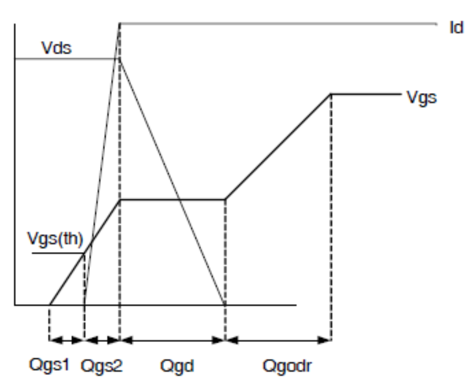
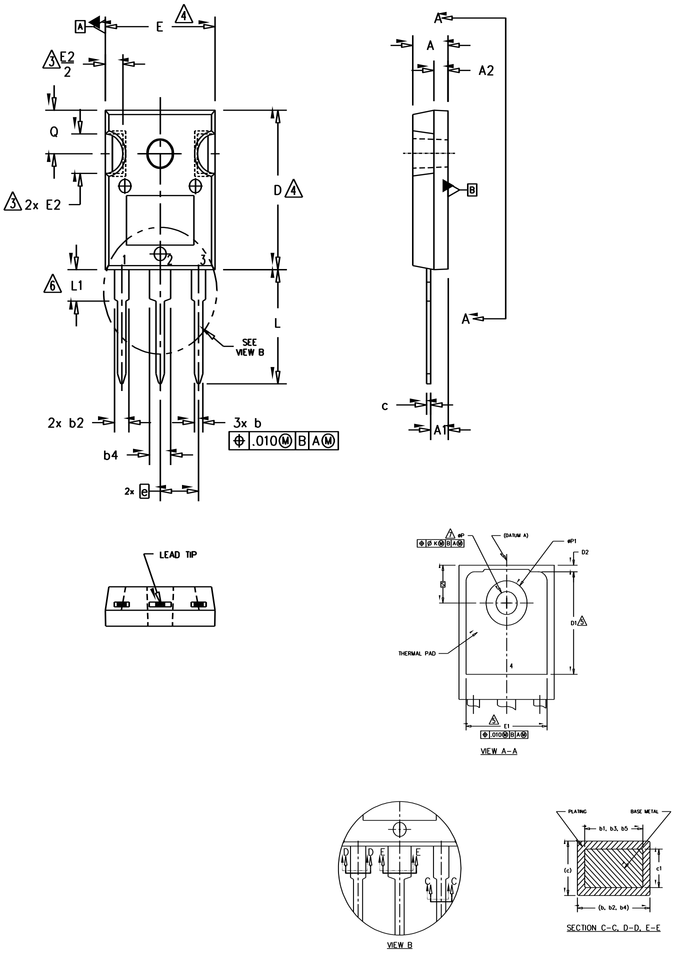


Fig 24b. Gate Charge Waveform

TO-247AC Package Outline (Dimensions are shown in millimeters (inches))



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

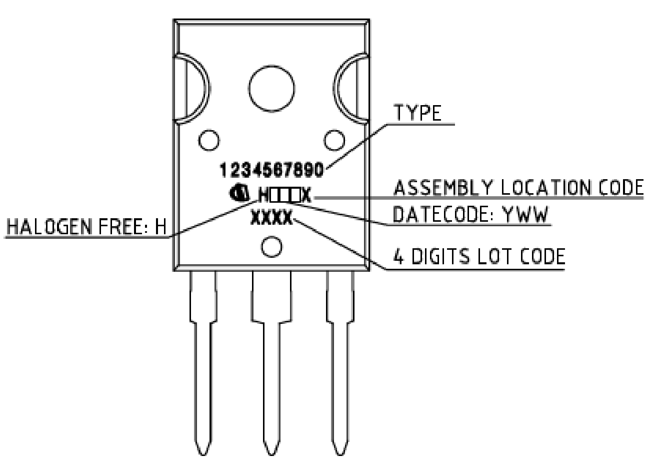
IGBTs, CoPACK

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.

Revision History

Date	Rev.	Comments
2013-09-06	2.0	• Final data sheet
2024-12-05	2.1	• Update datasheet to Infineon format • Updated Part marking –page 8 • Added disclaimer on last page.

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Revision history

IRFP4127PbF

Revision 2025-01-13, Rev. 1.0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2025-01-13	Update datasheet to Infineon format, Updated Part marking –page 8

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Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.