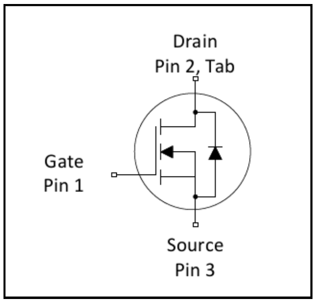
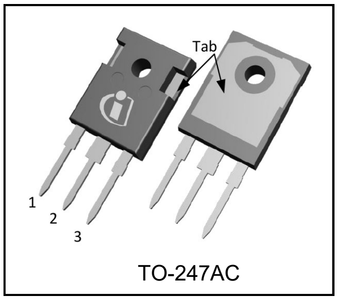
IRFP140NPbF

$V_{(BR)DSS}$	**100V**
$R_{DS(on)}$ **max.**	**0.052Ω**
I_D	**33A**





G	D	S
Gate	Drain	Source

Features

- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

Description

Fifth Generation HEXFET Power MOSFETs utilizes 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 other applications.

The TO-247AC package is preferred for commercial-industrial applications where higher power levels preclude th use of TO-220 devices. The TO-247AC is similar but superior to the earlier TO-218 package because of its isolated mounting hole.

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFP140NPbF	TO-247AC	Tube	25	IRFP140NPbF

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V ⑤	33	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V ⑤	23	
I_{DM}	Pulsed Drain Current ①⑤	110	
P_D @T_C = 25°C	Maximum Power Dissipation	140	W
	Linear Derating Factor	0.91	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ②⑤	300	mJ
I_{AR}	Avalanche Current ①	16	A
E_{AR}	Repetitive Avalanche Energy ①	14	mJ
dv/dt	Peak Diode Recovery dv/dt③⑤	5.0	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	10 lbf•in (1.1N•m)	

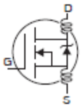
Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	1.1	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	——	
$R_{\theta JA}$	Junction-to-Ambient	——	40	

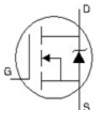
Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.11	——	V/°C	Reference to 25°C, I_D = 1mA⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	——	0.052	Ω	V_{GS} = 10V, I_D = 16A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	——	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
gfs	Forward Trans conductance	11	——	——	S	V_{DS} = 50V, I_D = 16A⑤
I_{DSS}	Drain-to-Source Leakage Current	——	——	25	μA	V_{DS} = 100V, V_{GS} = 0V
		——	——	250		V_{DS} = 80V,V_{GS} = 0V,T_J =150°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-100		V_{GS} = -20V

Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Q_g	Total Gate Charge	——	——	94	nC	I_D = 16A
Q_{gs}	Gate-to-Source Charge	——	——	15		V_{DS} = 80V
Q_{gd}	Gate-to-Drain Charge	——	——	43		V_{GS} = 10V, See Fig.6 and 13 ④⑤
$t_{d(on)}$	Turn-On Delay Time	——	8.2	——	ns	V_{DD} = 50V
t_r	Rise Time	——	39	——		I_D = 16A
$t_{d(off)}$	Turn-Off Delay Time	——	44	——		R_G= 5.1Ω
t_f	Fall Time	——	33	——		R_D= 3.0Ω , See Fig.10④⑤
L_D	Internal Drain Inductance	——	5.0	——	nH	Between lead, 6mm (0.25in.) from package and center of die contact 
L_S	Internal Source Inductance	——	13	——		
C_{iss}	Input Capacitance	——	1400	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	330	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	170	——		f = 1.0MHz, See Fig.5⑤

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	33	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	110		
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C,I_S = 16A,V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	170	250	ns	T_J = 25°C ,I_F = 16A
Q_{rr}	Reverse Recovery Charge	——	1.1	1.6	μC	di/dt = 100A/μs ④⑤

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11).

② V_{DD} = 25V, T_J = 25°C, L = 2.0mH, R_G = 25Ω, I_{AS} = 16A.(See fig. 12).

③ $I_{SD} \leq$ 16A, di/dt $\leq$ 210A/μs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C.

④ Pulse width $\leq$ 300μs; duty cycle $\leq$ 2%.

⑤ Uses IRF540N data and test conditions

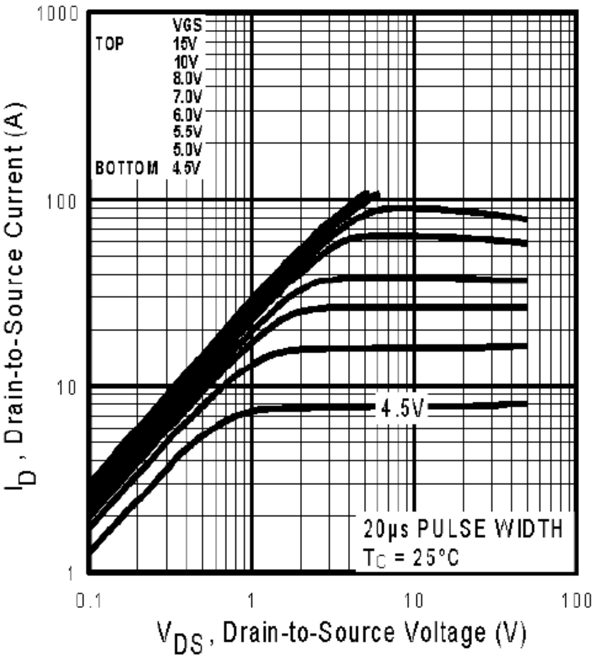


Fig. 1 Typical Output Characteristics

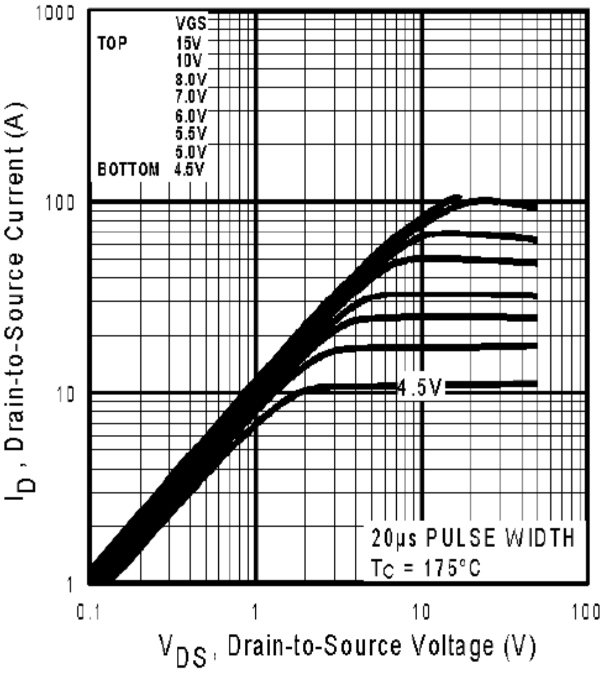


Fig. 2 Typical Output Characteristics

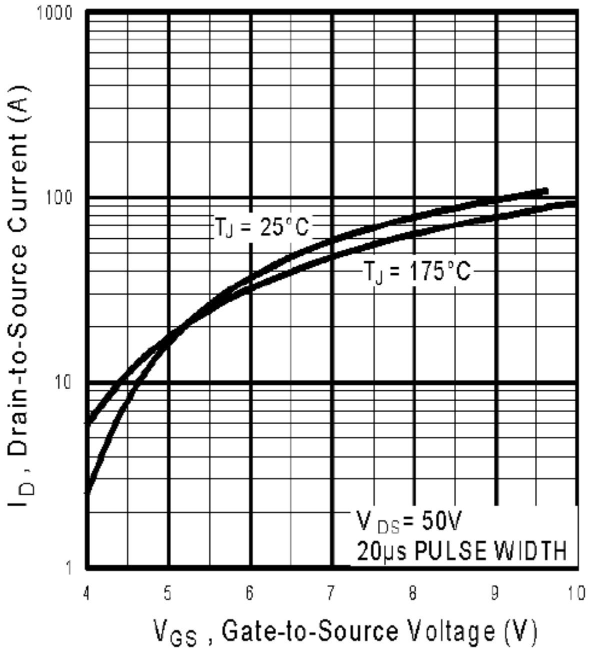


Fig. 3 Typical Transfer Characteristics

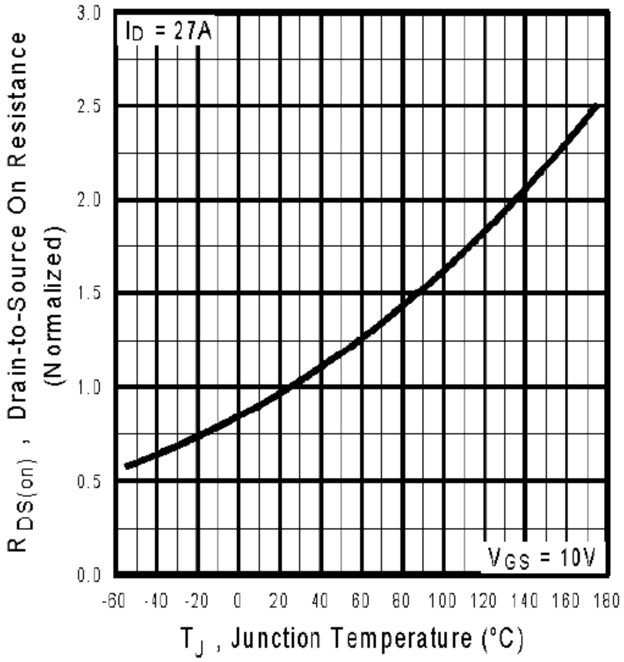


Fig. 4 Normalized On-Resistance vs. Temperature

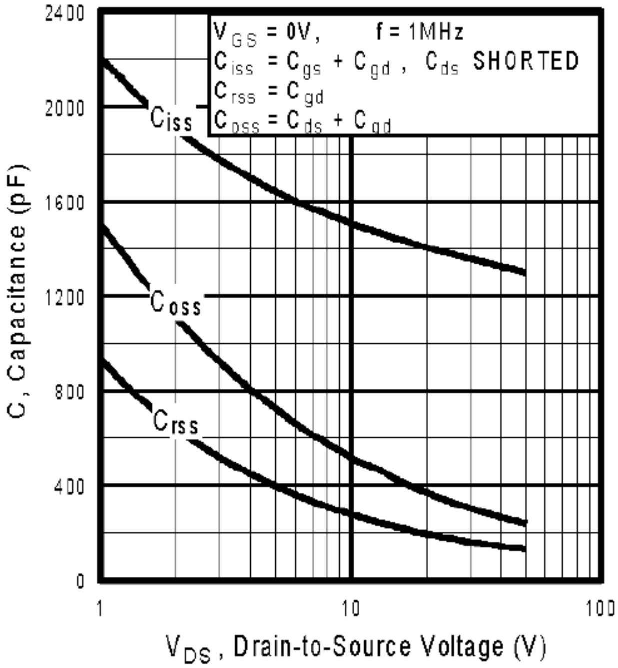


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

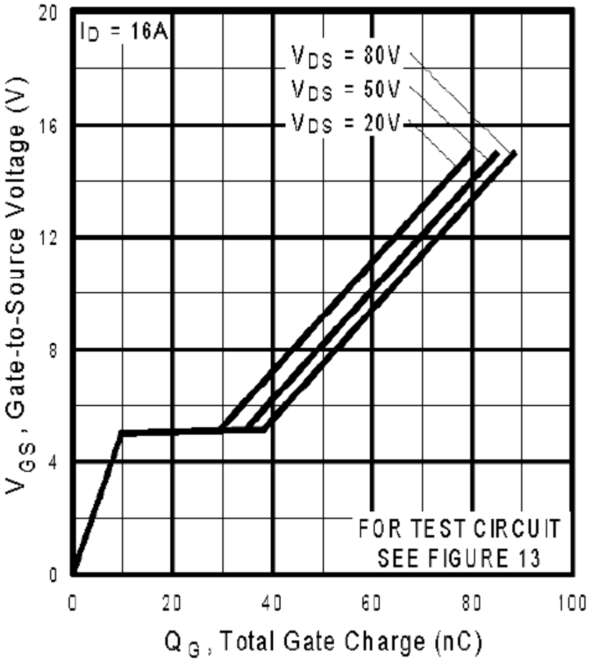


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

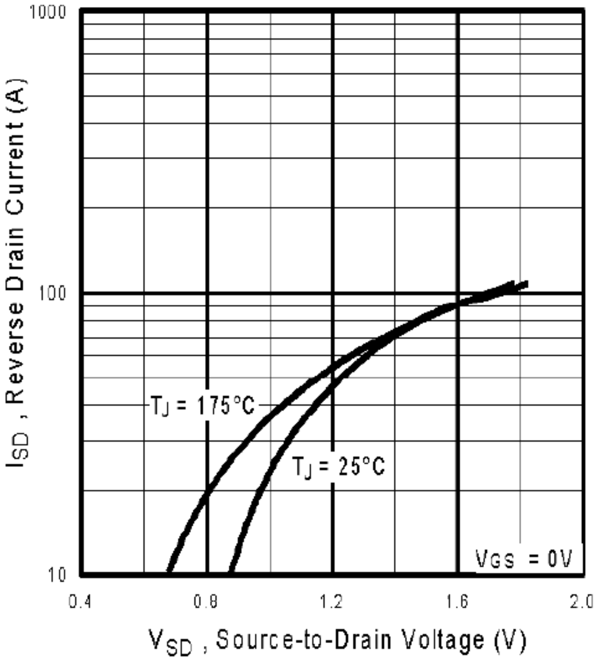


Fig. 7 Typical Source-to-Drain Diode Forward Voltage

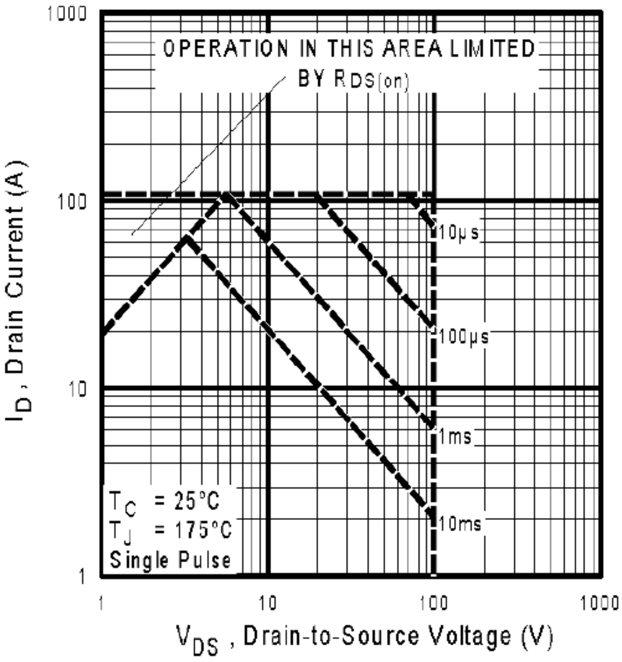


Fig 8. Maximum Safe Operating Area

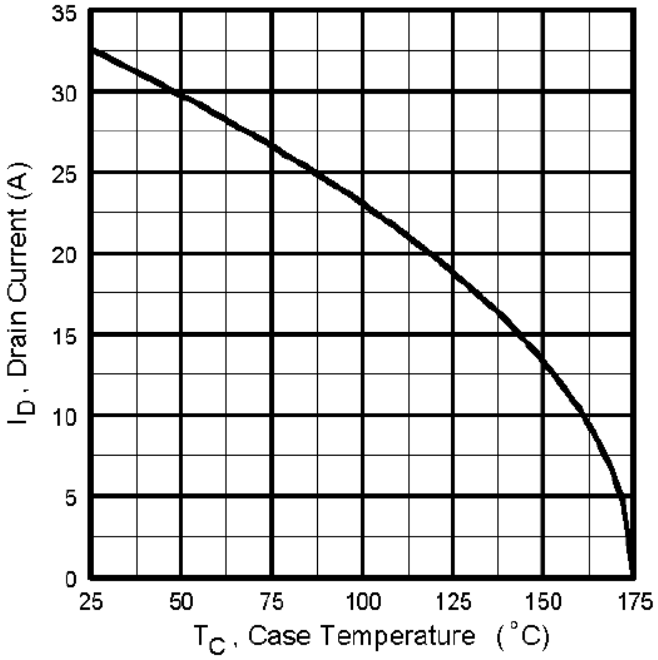


Fig 9. Maximum Drain Current vs. Case Temperature

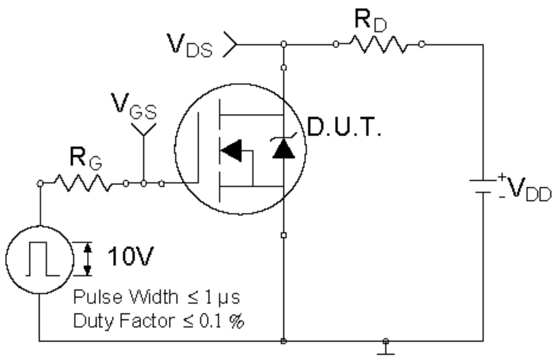


Fig 10a. Switching Time Test Circuit

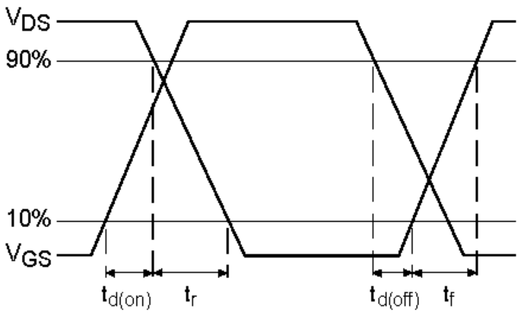


Fig 10a. Switching Time Waveforms

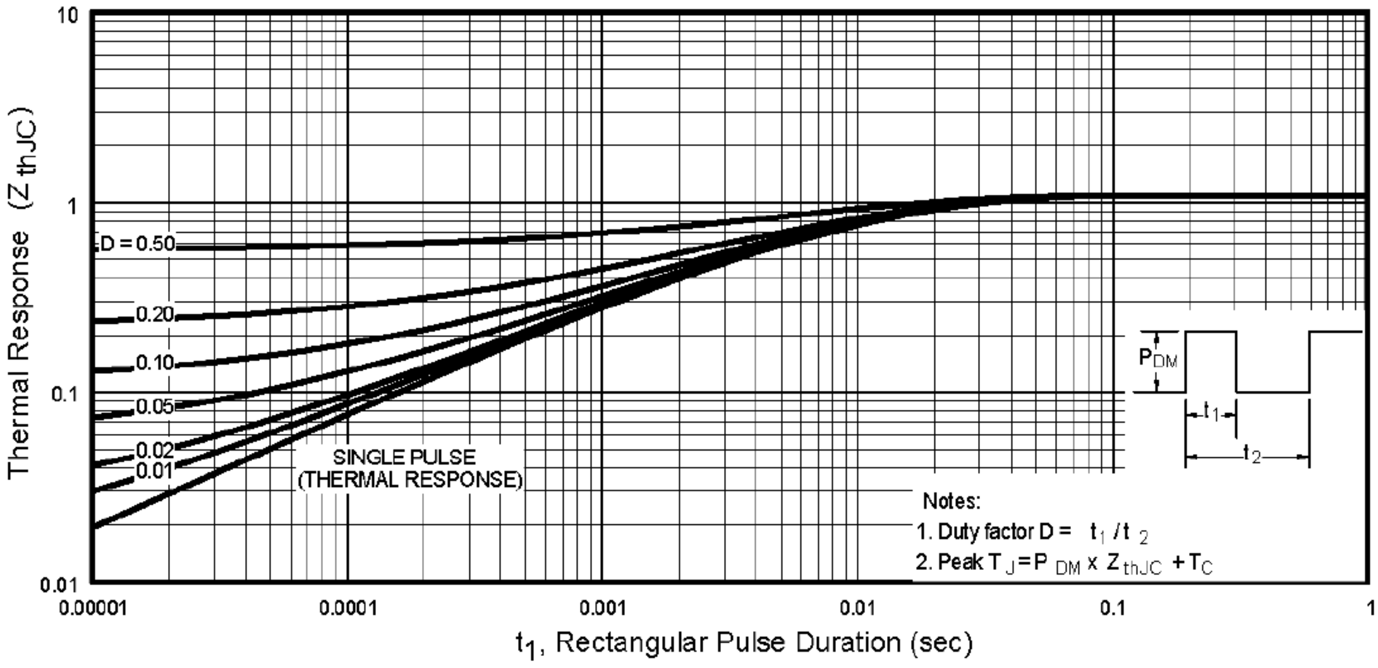


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

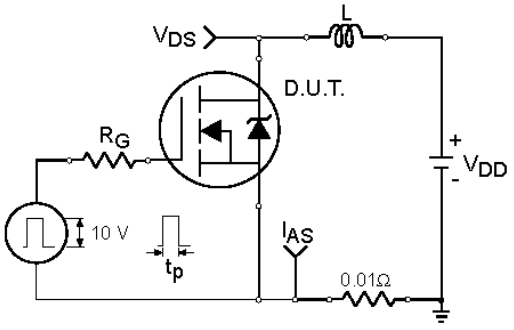


Fig. 12a. Unclamped Inductive Test Circuit

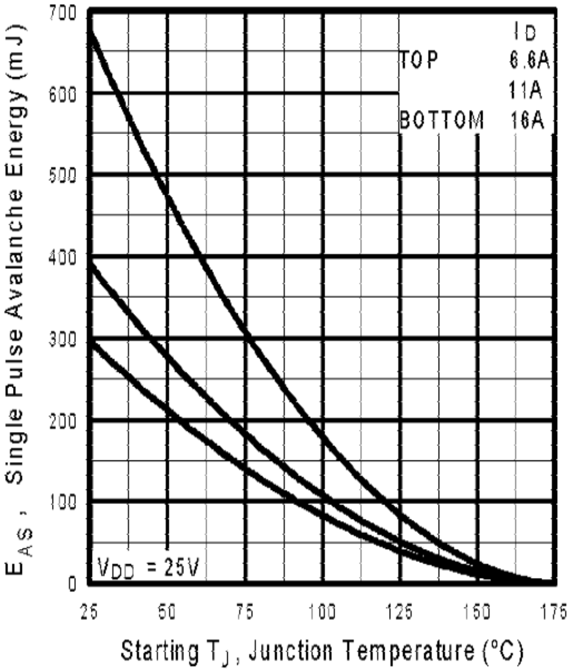


Fig 12c. Maximum Avalanche Energy vs. Drain Current

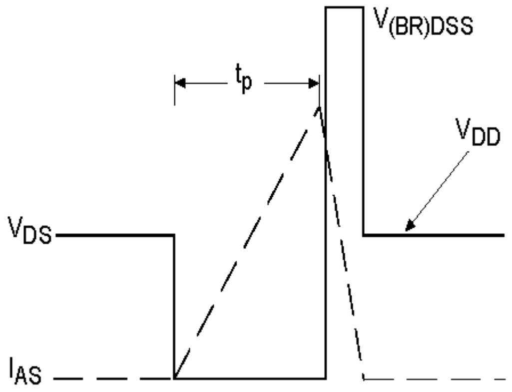


Fig. 12b. Unclamped Inductive Waveforms

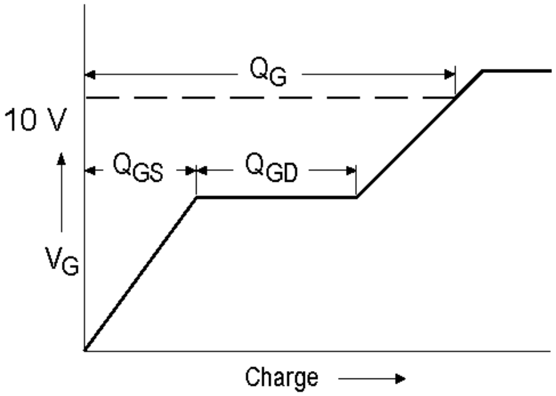


Fig 13a. Basic Gate Charge Waveform

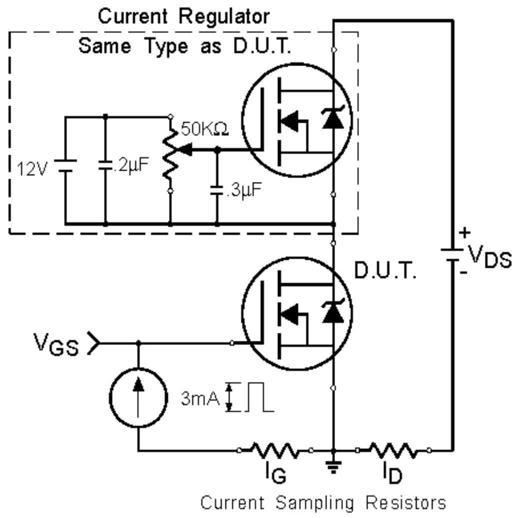
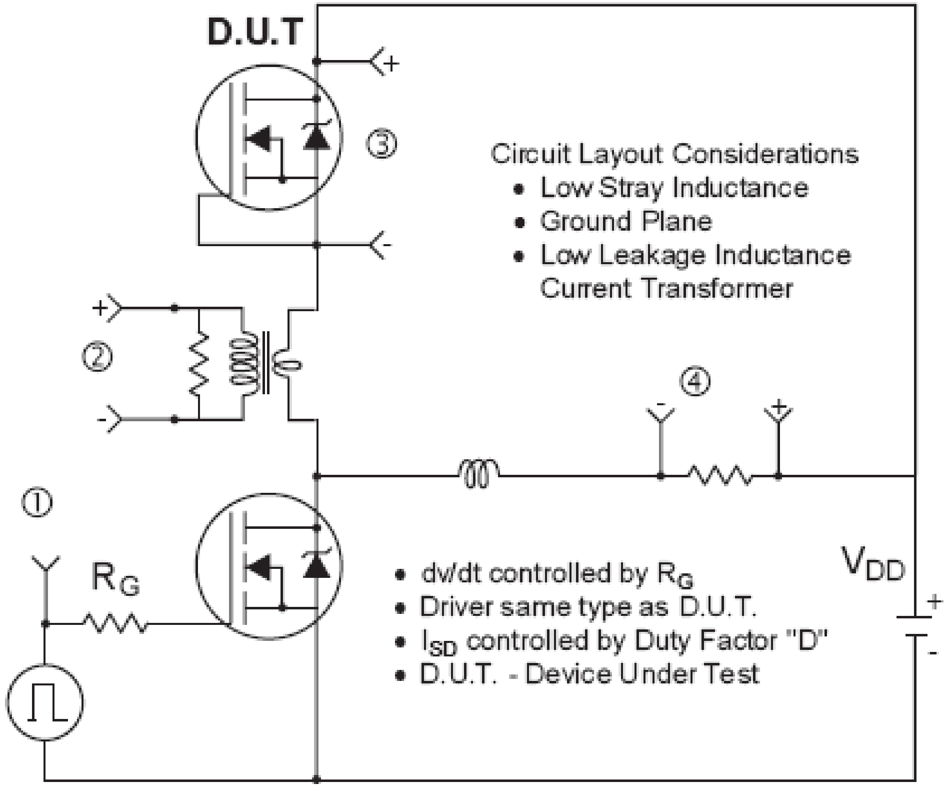
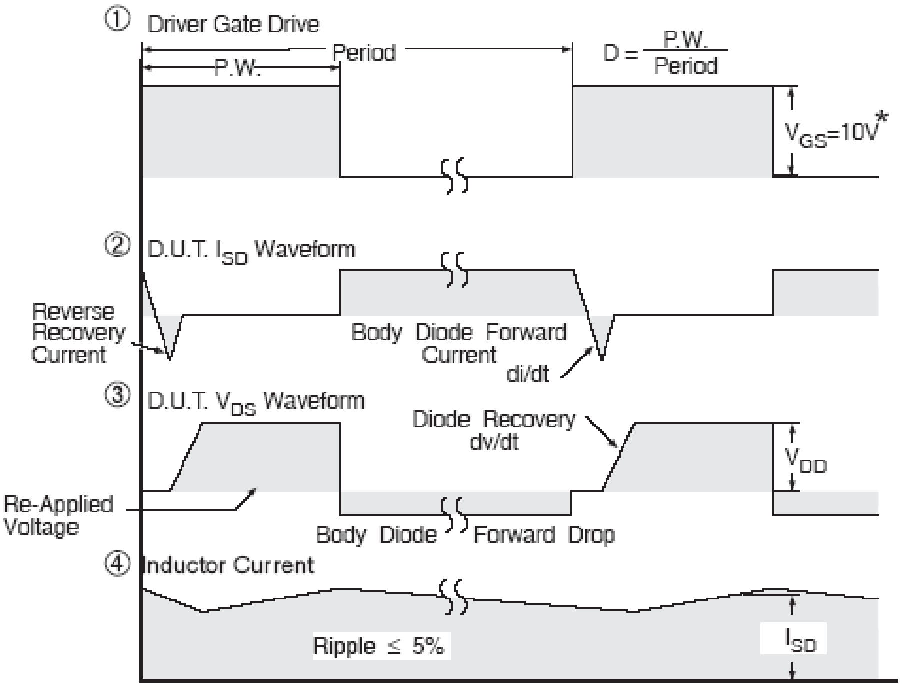


Fig 13b. Gate Charge Test Circuit

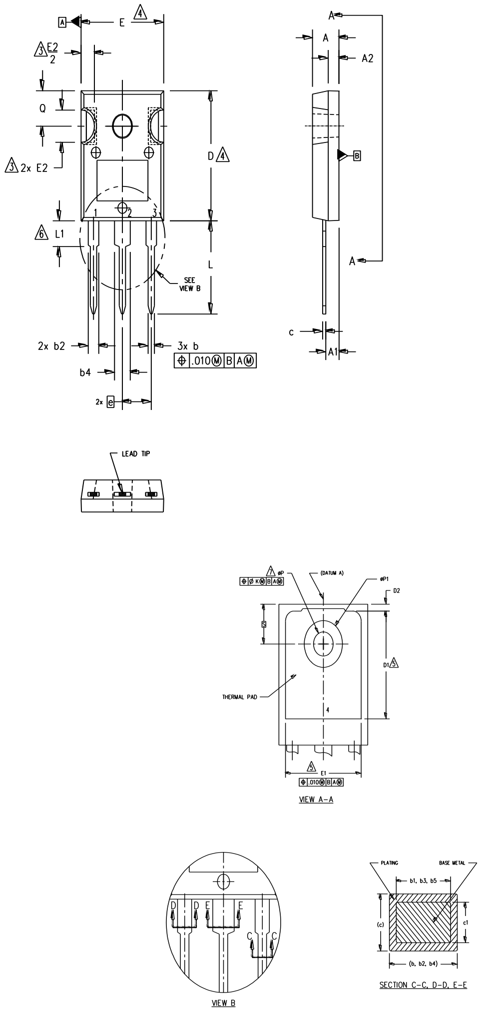




* V_{GS} = 5V for Logic Level Devices

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

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

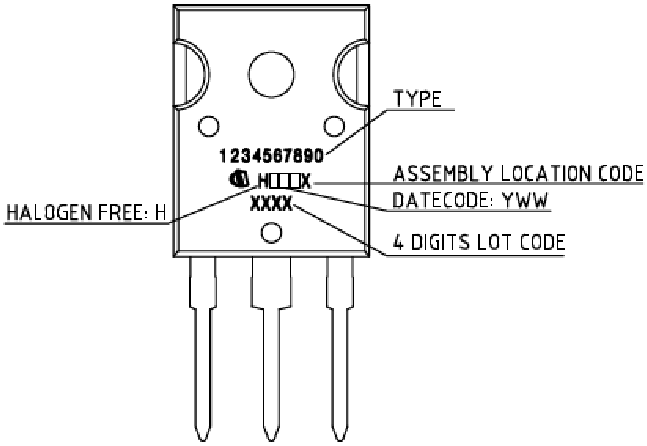
IGBTs, CoPACK

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.

Revision History

Date	Rev.	Comments
2024-10-03	2.1	• Update datasheet to Infineon format • Updated Part marking –page 8 • Added disclaimer on last page.

Trademarks

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