

Benefits

- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

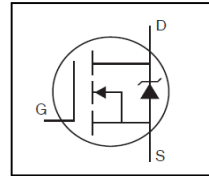
Description

Advanced HEXFET® Power MOSFETs from International Rectifier utilize 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 applications.

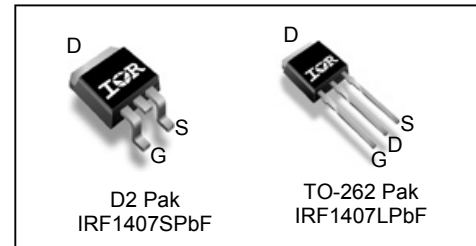
The D2Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D2Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.

The through-hole version (IRF1407L) is available for low-profile applications.

HEXFET® Power MOSFET



V_{DSS}	75V
R_{DS(on)}	0.0078Ω
I_D	100A[Ⓔ]



G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRF1407LPbF	TO-262	Tube	50	IRF1407LPbF (Obsolete)
IRF1407SPbF	D2-Pak	Tape and Reel Left	800	IRF1407STRLPbF

Absolute Maximum Ratings

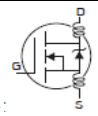
Symbol	Parameter	Max.	Units
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V [Ⓔ]	100 [Ⓔ]	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V [Ⓔ]	70 [Ⓔ]	
I _{DM}	Pulsed Drain Current ^① [Ⓔ]	520	
P _D @ T _A = 25°C	Maximum Power Dissipation	3.8	W
P _D @ T _C = 25°C	Maximum Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
V _{GS}	Gate-to-Source Voltage	± 20	V
E _{AS}	Single Pulse Avalanche Energy (Thermally Limited) ^② [Ⓔ]	390	mJ
I _{AR}	Avalanche Current ^①	See Fig.15,16, 12a, 12b	A
E _{AR}	Repetitive Avalanche Energy ^②		mJ
dv/dt	Peak Diode Recovery dv/dt ^③ [Ⓔ]	4.6	V/ns
T _J	Operating Junction and Storage Temperature Range	-55 to + 175	°C
T _{STG}			
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Thermal Resistance

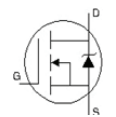
Symbol	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	0.75	°C/W
R _{θJA}	Junction-to-Ambient (PCB Mount, steady state) ^⑨	—	40	

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

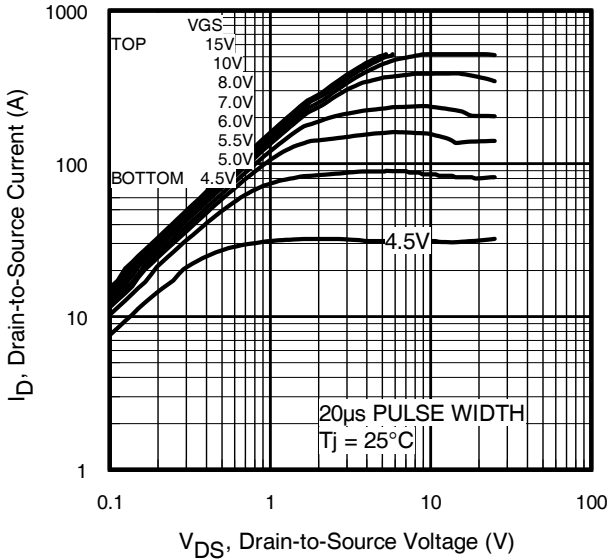
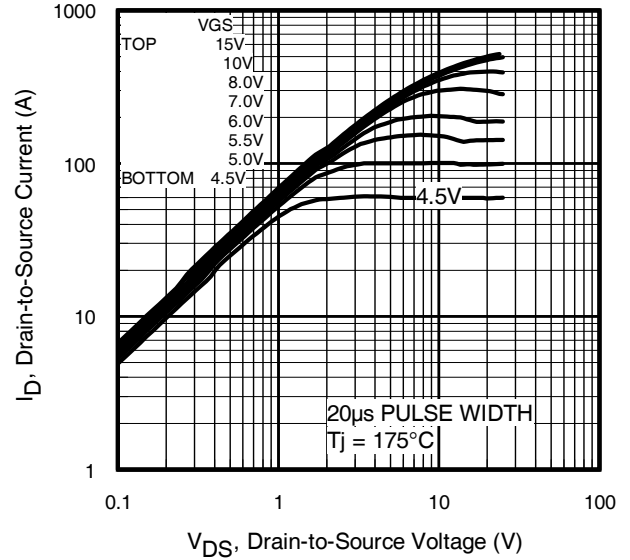
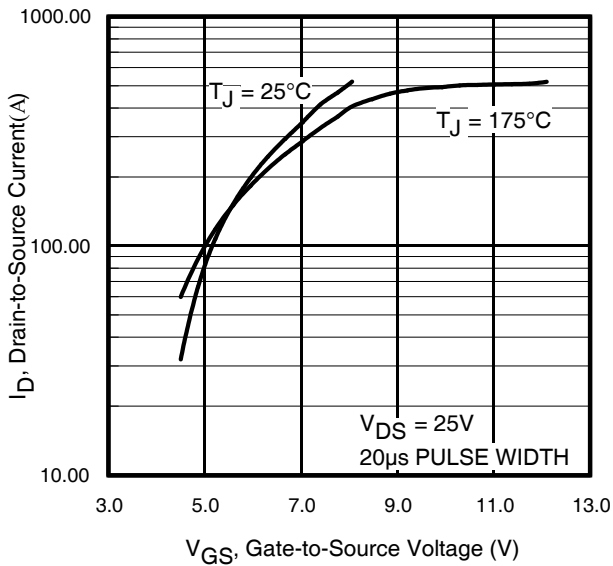
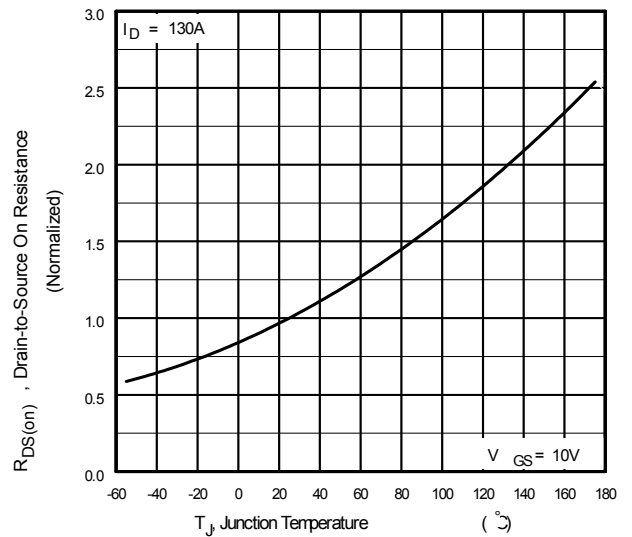
	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	75	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.09	—	V/°C	Reference to 25°C, I _D = 1mA ⑧
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.0078	Ω	V _{GS} = 10V, I _D = 78A ④
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Trans conductance	74	—	—	S	V _{DS} = 25V, I _D = 78A⑧
I _{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	V _{DS} = 75 V, V _{GS} = 0V
		—	—	250		V _{DS} = 60V, V _{GS} = 0V, T _J = 150°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	V _{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V _{GS} = -20V
Q _g	Total Gate Charge	—	160	250	nC	I _D = 78A
Q _{gs}	Gate-to-Source Charge	—	35	52		V _{DS} = 60V
Q _{gd}	Gate-to-Drain Charge	—	54	81		V _{GS} = 10V ④⑧
t _{d(on)}	Turn-On Delay Time	—	11	—	ns	V _{DD} = 38V
t _r	Rise Time	—	150	—		I _D = 78A
t _{d(off)}	Turn-Off Delay Time	—	150	—		R _G = 2.5Ω
t _f	Fall Time	—	140	—		V _{GS} = 10V ④⑧
L _D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	7.5	—		
C _{iss}	Input Capacitance	—	5600	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	890	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	190	—		f = 1.0kHz, See Fig. 5⑧
C _{oss}	Output Capacitance	—	5800	—		V _{GS} = 0V, V _{DS} = 1.0V f = 1.0kHz
C _{oss}	Output Capacitance	—	560	—		V _{GS} = 0V, V _{DS} = 60V f = 1.0kHz
C _{oss eff.}	Effective Output Capacitance	—	1100	—		V _{GS} = 0V, V _{DS} = 0V to 60V


Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	100⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	520		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 78A, V _{GS} = 0V ④⑧
t _{rr}	Reverse Recovery Time	—	110	170	ns	T _J = 25°C, I _F = 78A
Q _{rr}	Reverse Recovery Charge	—	390	590	nC	di/dt = 100A/μs ④⑧
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. (See fig. 11)
- ② starting T_J = 25°C, L = 0.13mH, R_G = 25Ω, I_{AS} = 78A, V_{GS} = 10V. (See fig. 12)
- ③ I_{SD} ≤ 78A, di/dt ≤ 320A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C.
- ④ Pulse width ≤ 400μs; duty cycle ≤ 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 75A.
- ⑦ Limited by T_{Jmax}, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑧ Uses IRF1407 data and test conditions.
- ⑨ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994


Fig. 1 Typical Output Characteristics

Fig. 2 Typical Output Characteristics

Fig. 3 Typical Transfer Characteristics

Fig. 4 Normalized On-Resistance vs. Temperature

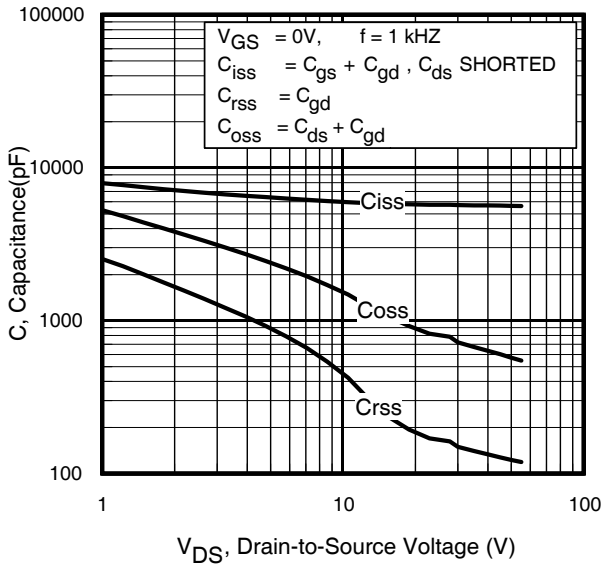


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

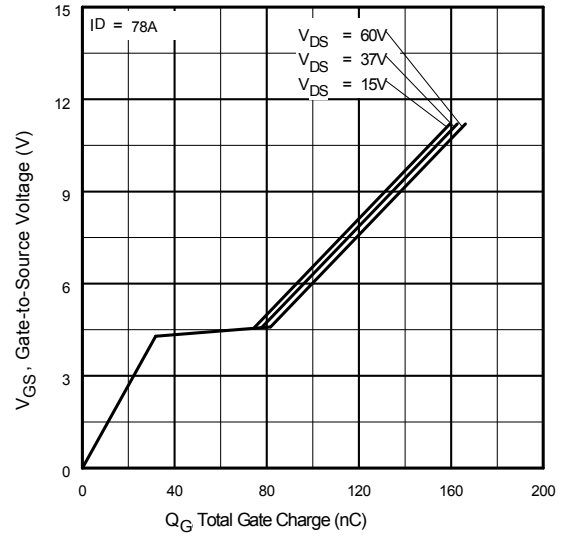


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

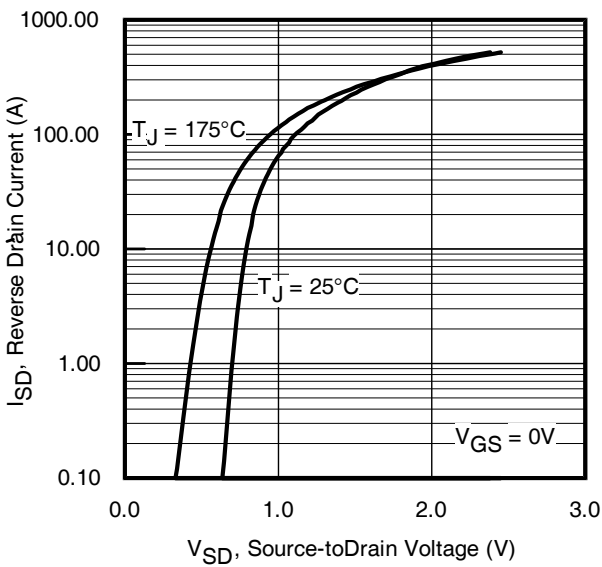


Fig 7. Typical Source-to-Drain Diode Forward Current

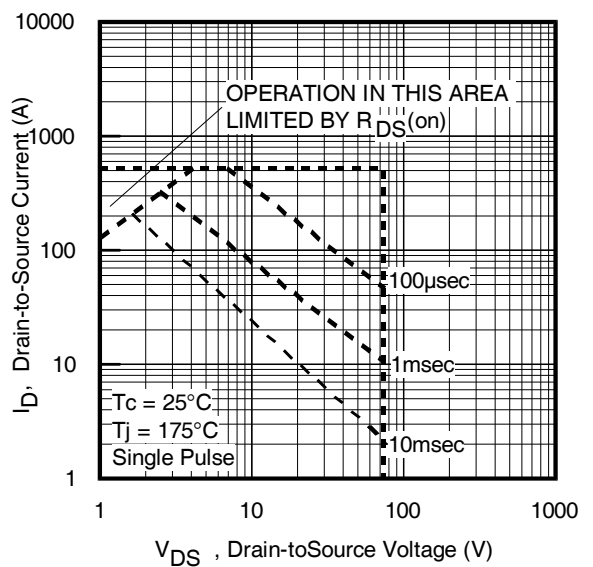


Fig 8. Maximum Safe Operating Area

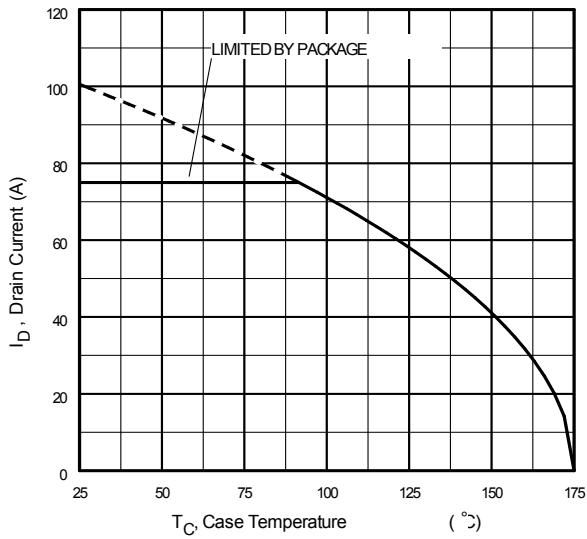

Fig 9. Maximum Drain Current vs. Case Temperature

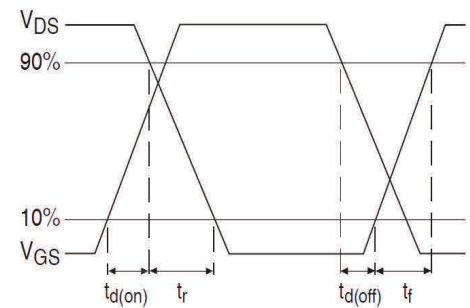
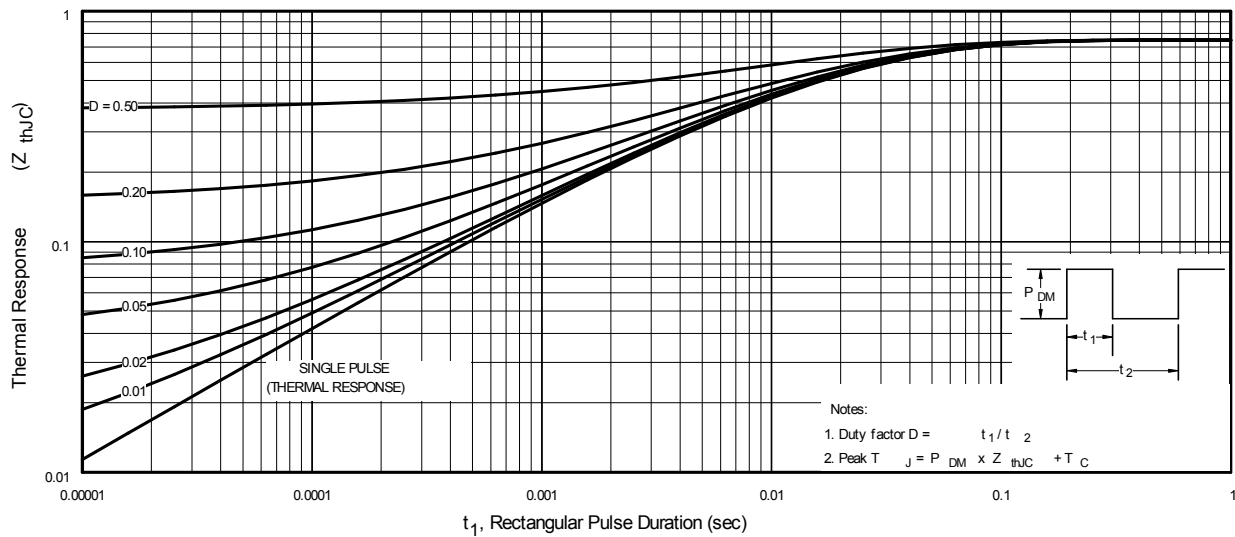
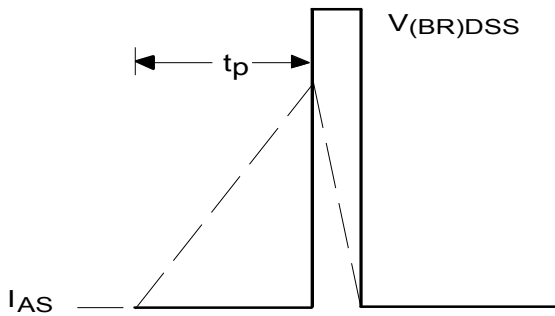
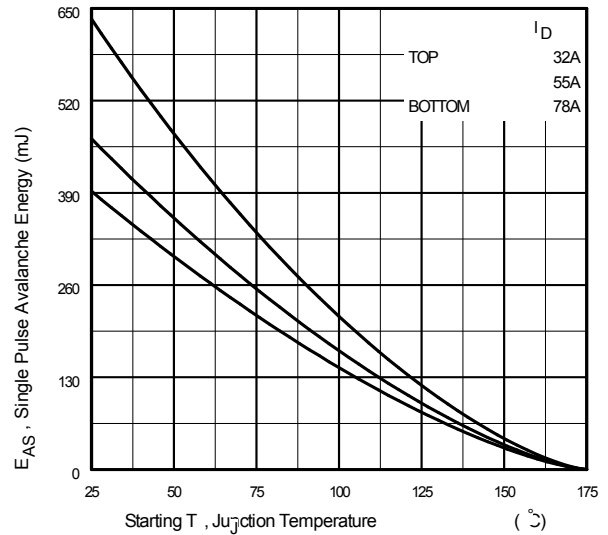
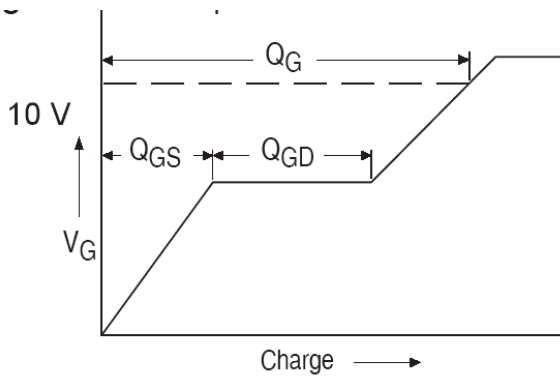
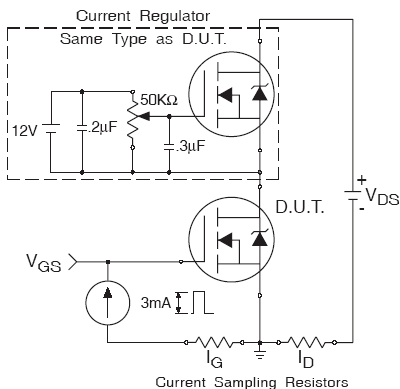
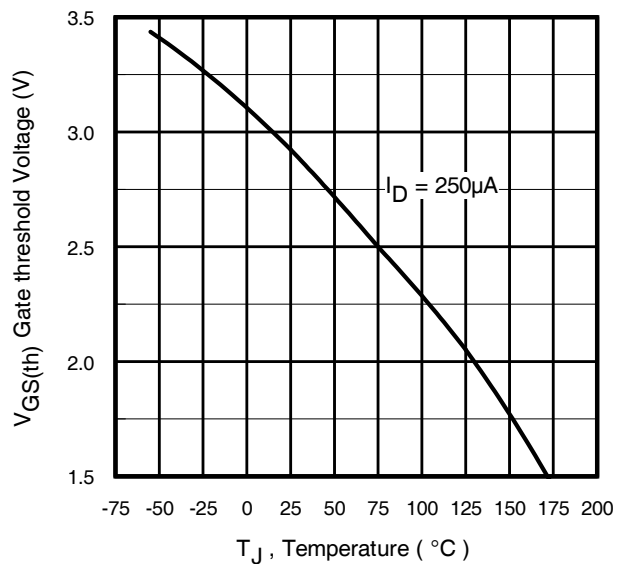
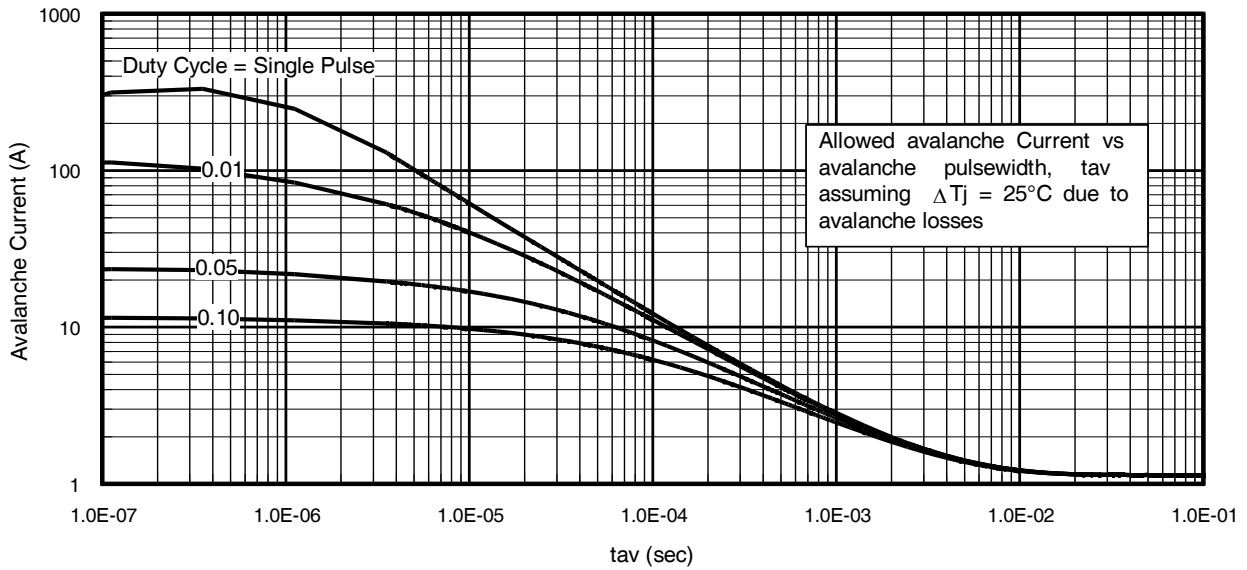
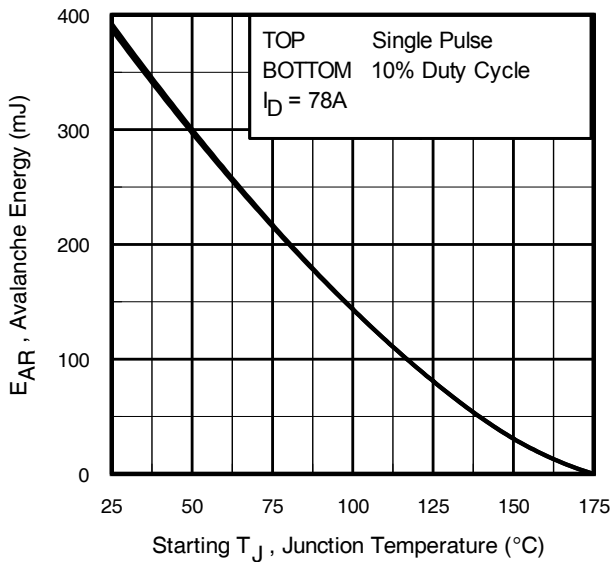
Fig 10a. Switching Time Test Circuit

Fig 10b. Switching Time Waveforms

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


Fig 12a. Unclamped Inductive Test Circuit

Fig 12b. Unclamped Inductive Waveforms

Fig 12c. Maximum Avalanche Energy vs. Drain Current

Fig 13a. Gate Charge Waveform

Fig 13b. Gate Charge Test Circuit

Fig 14. Threshold Voltage vs. Temperature


Fig 15. Typical Avalanche Current vs. Pulse width

Fig 16. Maximum Avalanche Energy vs. Temperature
**Notes on Repetitive Avalanche Curves , Figures 15, 16:
(For further info, see AN-1005 at www.infineon.com)**

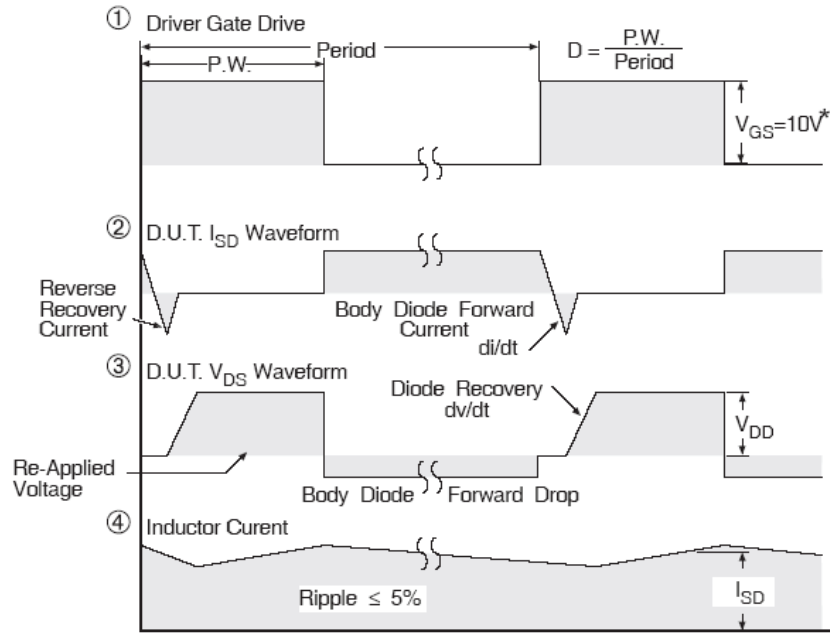
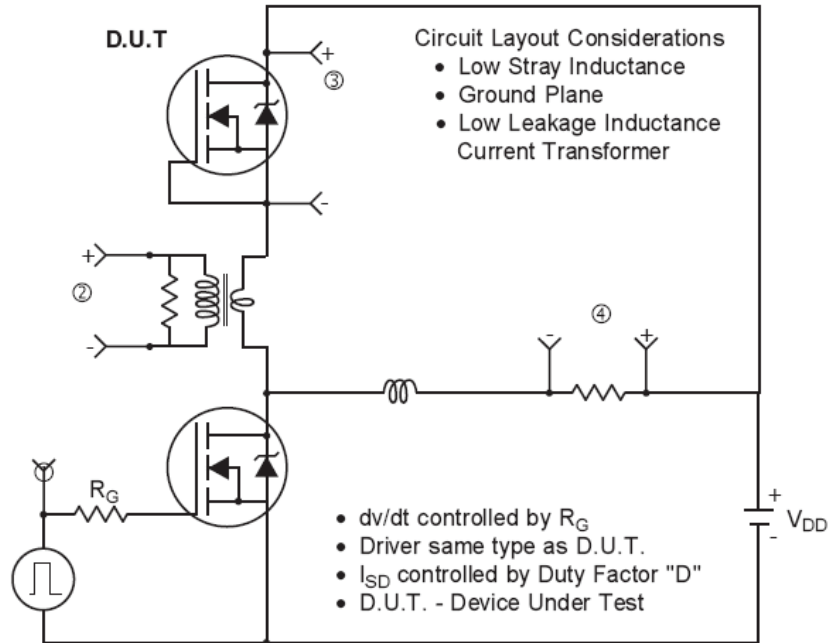
1. Avalanche failures assumption:
Purely a thermal phenomenon and failure occurs at a temperature far in excess of T_{jmax} . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as T_{jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 12a, 12b.
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 15, 16).
 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)

$$P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$

$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{thJC}]$$

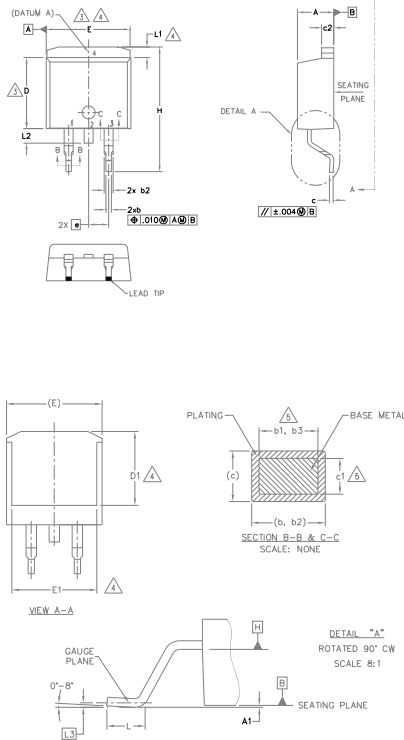
$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$

Peak Diode Recovery dv/dt Test Circuit



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

Fig 17. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

D2-Pak (TO-263AB) Package Outline (Dimensions are shown in millimeters (inches))

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1, b3 AND c1 APPLY TO BASE METAL ONLY.
6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
7. CONTROLLING DIMENSION: INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	—	.270	—	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	—	.245	—	4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	—	1.68	—	.066	4
L2	—	1.78	—	.070	
L3	0.25 BSC		.010 BSC		

LEAD ASSIGNMENTS
DIODES

- 1.- ANODE (TWO DIE) / OPEN (ONE DIE)
- 2, 4.- CATHODE
- 3.- ANODE

HEXFET

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

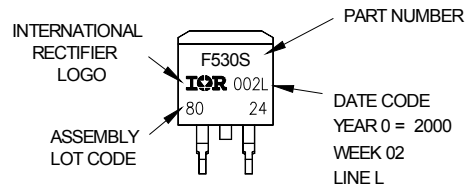
IGBTs, CoPACK

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

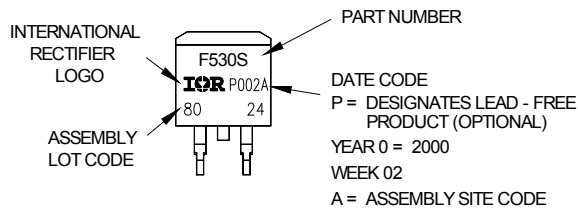
D2-Pak (TO-263AB) Part Marking Information

EXAMPLE: THIS IS AN IRF530S WITH
LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"

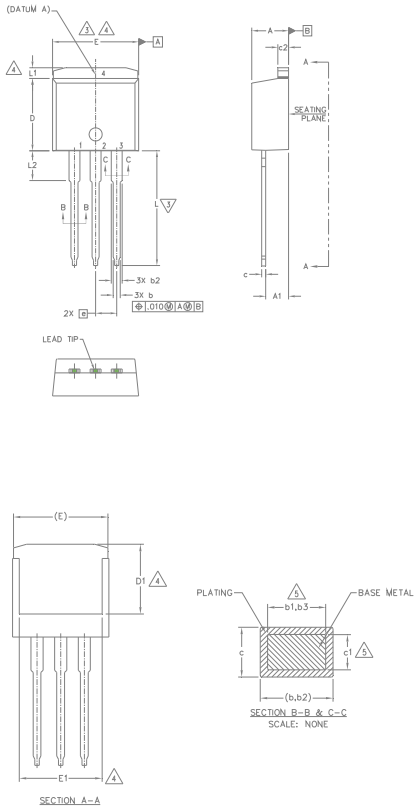
Note: "P" in assembly line position
indicates "Lead - Free"



OR



Note: For the most current drawing please refer to Infineon's web site www.infineon.com

TO-262 Package Outline (Dimensions are shown in millimeters (inches))


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
 4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
 5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
 6. CONTROLLING DIMENSION: INCH.
 7. OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

LEAD ASSIGNMENTS
IGBTs, CoPACK

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

HEXFET

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

DIODES

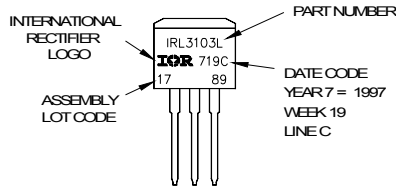
- 1.- ANODE (TWO DIE) / OPEN (ONE DIE)
- 2, 4.- CATHODE
- 3.- ANODE

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		
L	13.46	14.10	.530	.555	
L1	-	1.65	-	.065	4
L2	3.56	3.71	.140	.146	

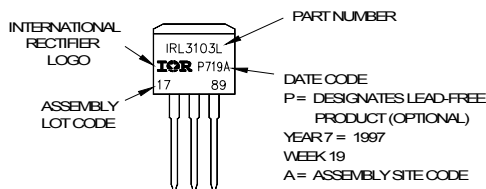
TO-262 Part Marking Information

EXAMPLE: THIS IS AN IRL3103L
 LOT CODE 1789
 ASSEMBLED ON WW19, 1997
 IN THE ASSEMBLY LINE "C"

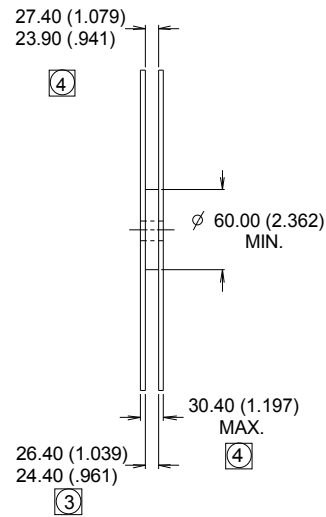
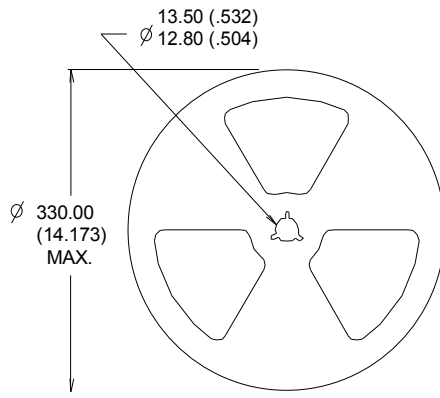
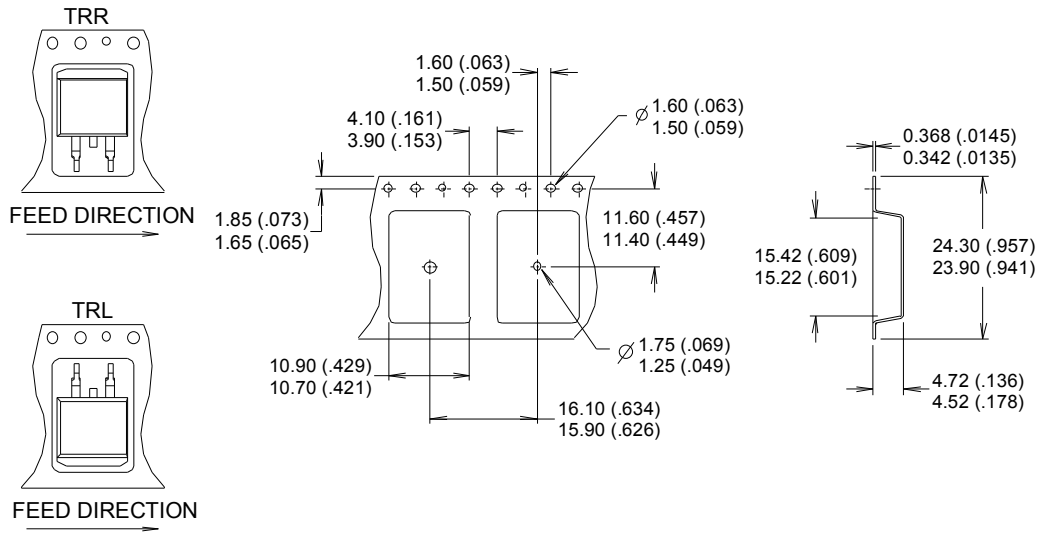
Note: "P" in assembly line position indicates "Lead - Free"



OR



Note: For the most current drawing please refer to Infineon's web site www.infineon.com

D2-Pak (TO-263AB) Tape & Reel Information (Dimensions are shown in millimeters (inches))

NOTES :

1. CONFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
- ③ DIMENSION MEASURED @ HUB.
- ④ INCLUDES FLANGE DISTORTION @ OUTER EDGE.

Note: For the most current drawing please refer to Infineon's web site www.infineon.com

Qualification Information[†]

Qualification Level	Industrial (per JEDEC JESD47F) ^{††}	
Moisture Sensitivity Level	D2-Pak	MSL1 (per JEDEC J-STD-020D) ^{††}
	TO-262	N/A
RoHS Compliant	Yes	

† Qualification standards can be found at Infineon's web site www.infineon.com

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

Revision History

Date	Comments
4/20/2016	<ul style="list-style-type: none"> Updated datasheet with corporate template. Corrected typo on Fig. 3 from $V_{DS} = 15V$ to $V_{DS} = 25V$ on page 3. Corrected typo on Fig. 5 from $f = 1MHz$ to $1kHz$ on page 4. Updated Package outline on pages 9,10.
5/26/2016	<ul style="list-style-type: none"> Added disclaimer on last page. TO-262 package was removed from ordering information since it is EOL on page 1.

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