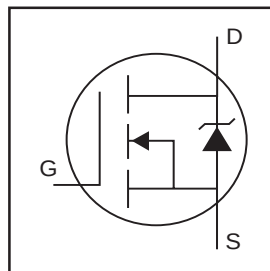


IRLBL1304

HEXFET® Power MOSFET

- >1mm lower profile than D²Pak
- Same footprint as D²pak
- Logic Level Gate
- Surface mount
- Ultra Low On-Resistance
- Fully Avalanche Rated
- 50% greater current in typ. application condition vs. D²Pak



$V_{DS} = 40V$
$R_{DS(on)} = 0.0045\Omega$
$I_D = 185A^{⑤}$

Description

The HEXFET® MOSFET is the most popular power MOSFET in the world.

This particular HEXFET® MOSFET is in the SuperD²Pak™ and has the same outline and pinout as the standard D²Pak but has increased current handling capability and >1mm lower profile. This makes it ideal to reduce component count in multiparallel D²Pak operation, reduce system power dissipation or upgrade existing design.

This package has also been designed to meet automotive qualification standard Q101 and can be used with normal surface mouting equipment and has the same temperature profile and recommendations as the commonly used D²Pak.



Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{⑥}$	185, pkg limited to 95A*	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{⑥}$	130, pkg limited to 95A*	
I_{DM}	Pulsed Drain Current ①⑥	740	
$P_D @ T_C = 25^\circ C$	Power Dissipation	300	W
	Linear Derating Factor	2.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy②⑥	1160	mJ
I_{AR}	Avalanche Current①	100	A
E_{AR}	Repetitive Avalanche Energy①	30	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑥	5.0	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.50	W
$R_{\theta JA}$	Junction-to-Ambient	—	40	

* Current capability in normal application, see Fig.9.

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	40	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.043	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$ ⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.0045 0.0065	Ω	$V_{GS} = 10V, I_D = 110A$ ④ $V_{GS} = 4.5V, I_D = 93$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	120	—	—	S	$V_{DS} = 25V, I_D = 110A$ ⑥
I_{DSS}	Drain-to-Source Leakage Current	—	—	25 250	μA	$V_{DS} = 40V, V_{GS} = 0V$ $V_{DS} = 32V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100	nA	$V_{GS} = -16V$
Q_g	Total Gate Charge	—	—	140	nC	$I_D = 110A$
Q_{gs}	Gate-to-Source Charge	—	—	39	nC	$V_{DS} = 32V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	79	nC	$V_{GS} = 4.5V$, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	—	21	—		$V_{DD} = 20V$ $I_D = 110A$ $R_G = 0.9\Omega$ $R_D = 0.18\Omega$, See Fig. 10④⑥
t_r	Rise Time	—	350	—		
$t_{d(off)}$	Turn-Off Delay Time	—	45	—		
t_f	Fall Time	—	103	—		
L_D	Internal Drain Inductance	—	2.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	5.0	—		
C_{iss}	Input Capacitance	—	7660	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	2150	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	460	—		$f = 1.0MHz$, See Fig. 5⑥

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	185⑤	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	740		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 110A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	100	150	ns	$T_J = 25^\circ\text{C}, I_F = 110A$
Q_{rr}	Reverse Recovery Charge	—	250	380	nC	$di/dt = 100A/\mu s$ ④⑥
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 $T_J = 25^\circ\text{C}$, $L = 230\mu H$
 $R_G = 25\Omega$, $I_{AS} = 100A$. (See Figure 12)
- ③ $I_{SD} \leq 110A$, $di/dt \leq 170A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$

- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.
- ⑤ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4.
- ⑥ Uses IRLBA1304/P data and test conditions.

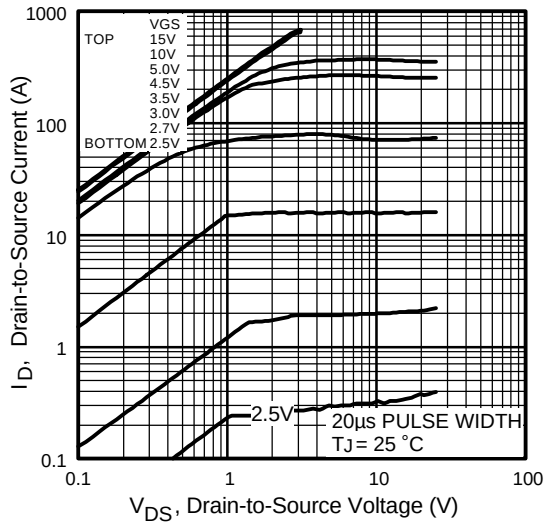


Fig 1. Typical Output Characteristics

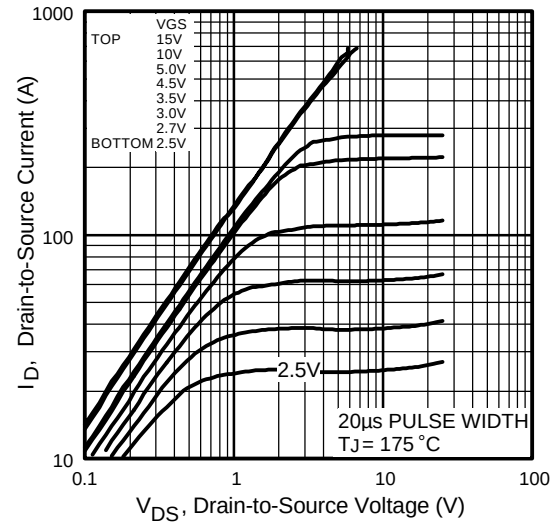


Fig 2. Typical Output Characteristics

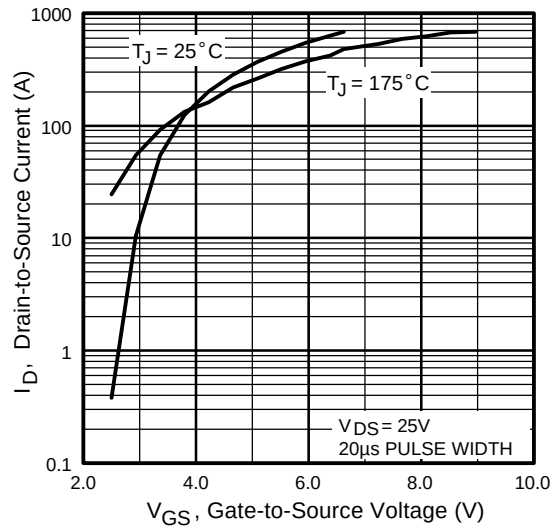


Fig 3. Typical Transfer Characteristics

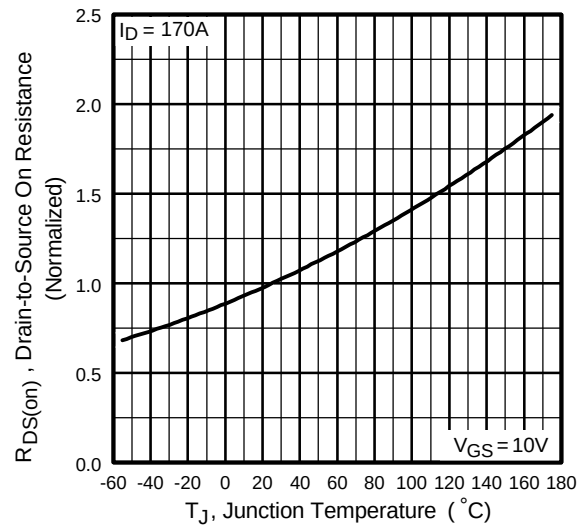


Fig 4. Normalized On-Resistance Vs. Temperature

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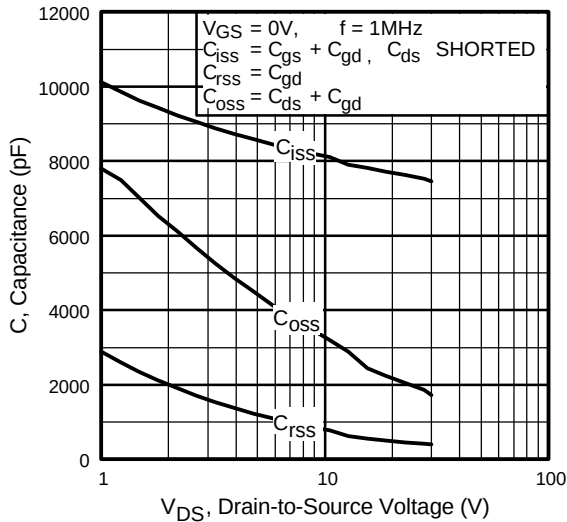


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

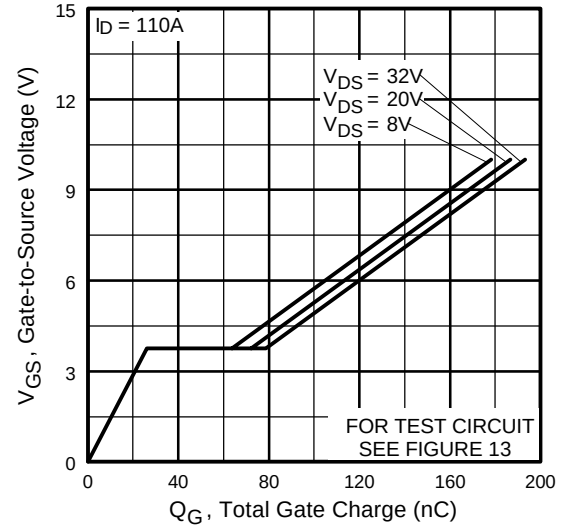


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

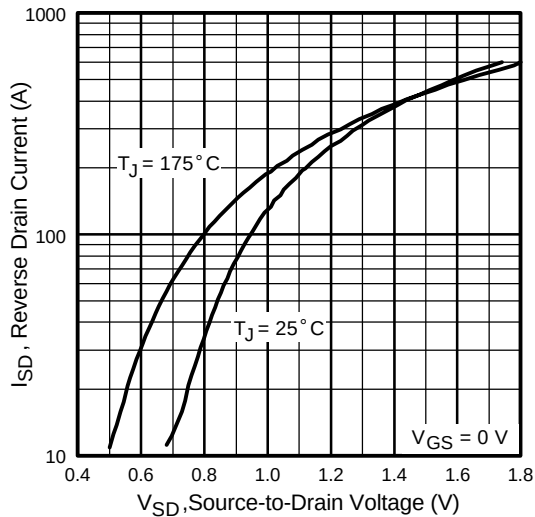


Fig 7. Typical Source-Drain Diode Forward Voltage

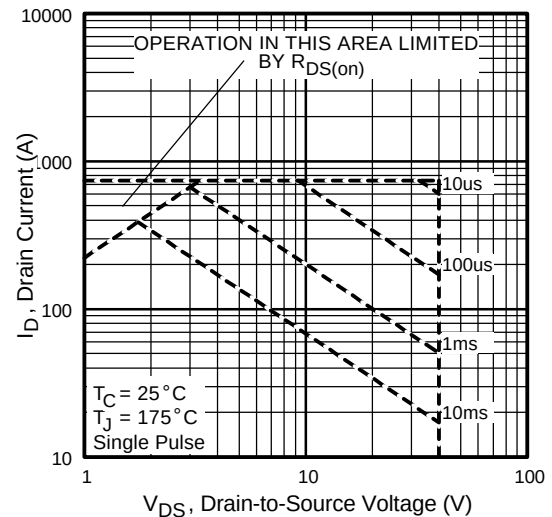


Fig 8. Maximum Safe Operating Area

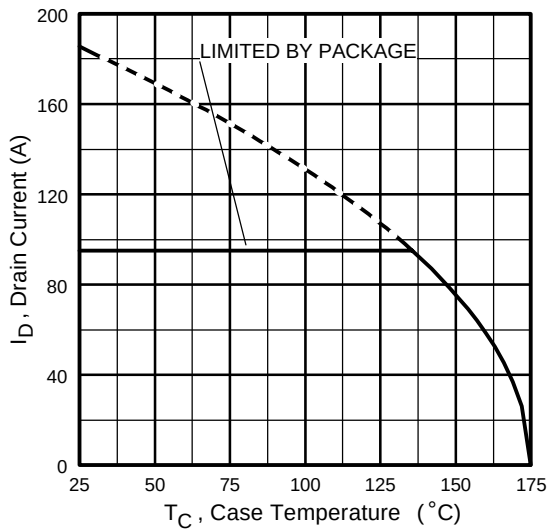


Fig 9. Maximum Drain Current Vs. Case Temperature

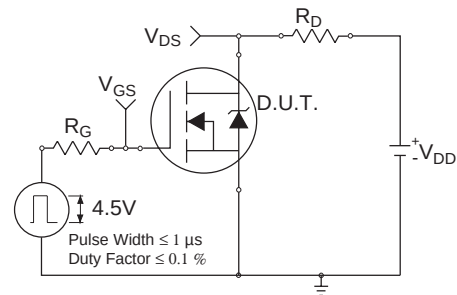


Fig 10a. Switching Time Test Circuit

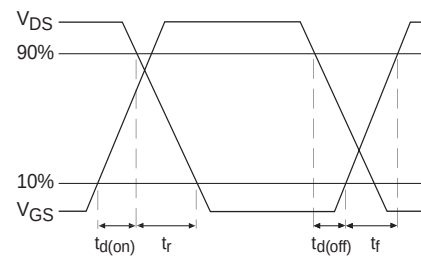


Fig 10b. Switching Time Waveforms

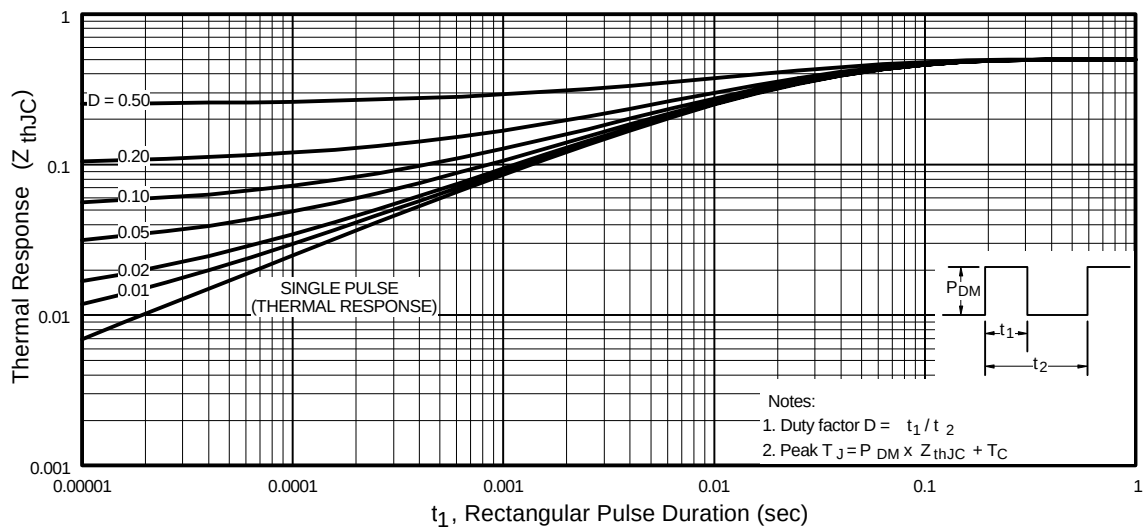


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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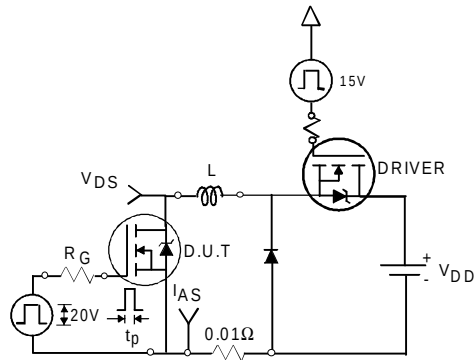


Fig 12a. Unclamped Inductive Test Circuit

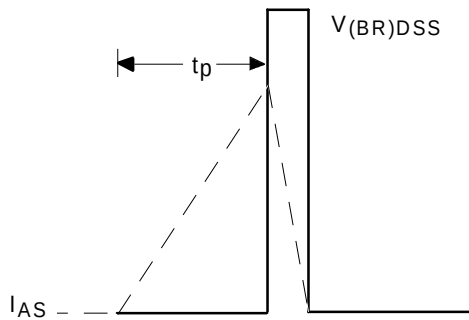


Fig 12b. Unclamped Inductive Waveforms

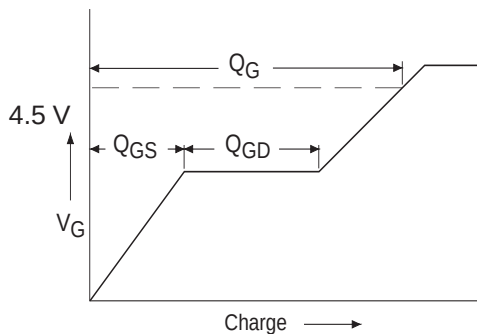


Fig 13a. Basic Gate Charge Waveform

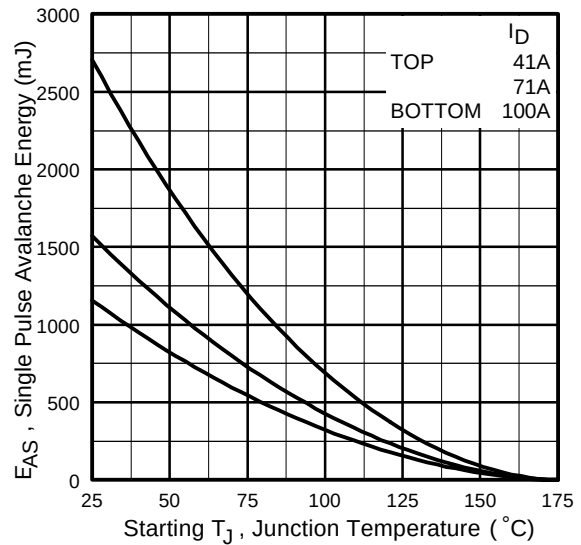


Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

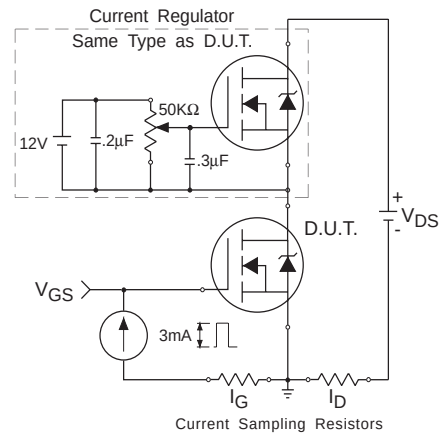
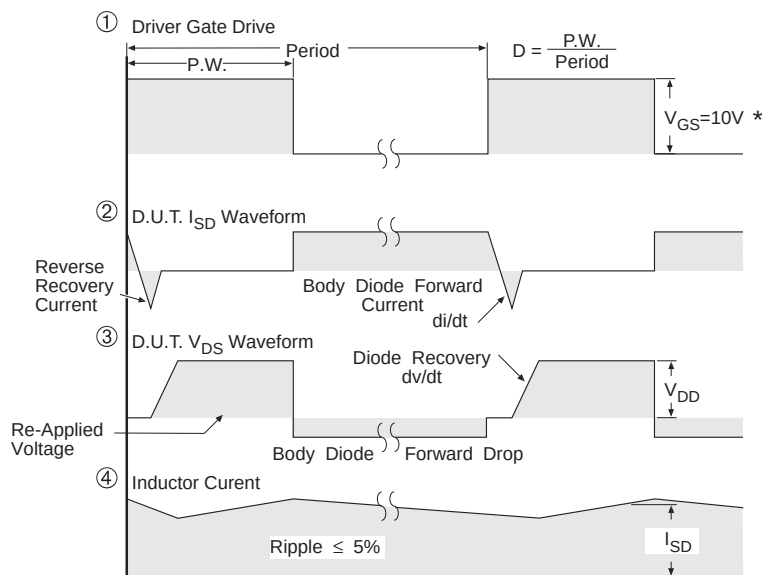
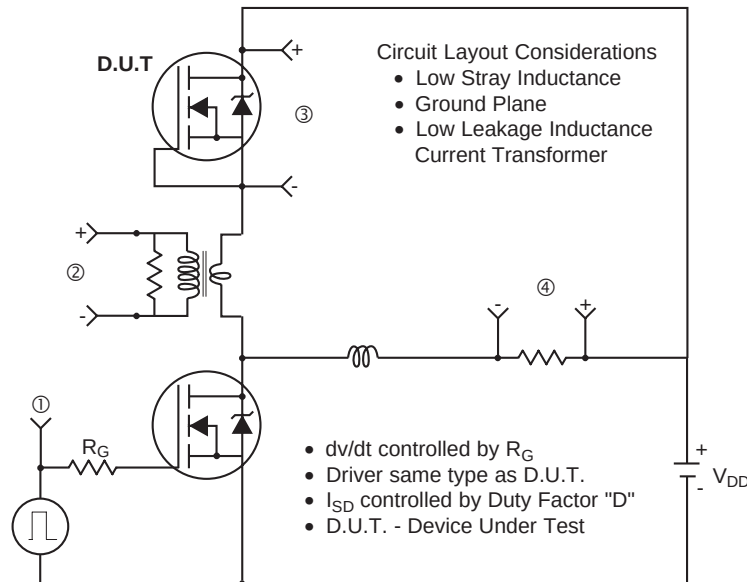


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

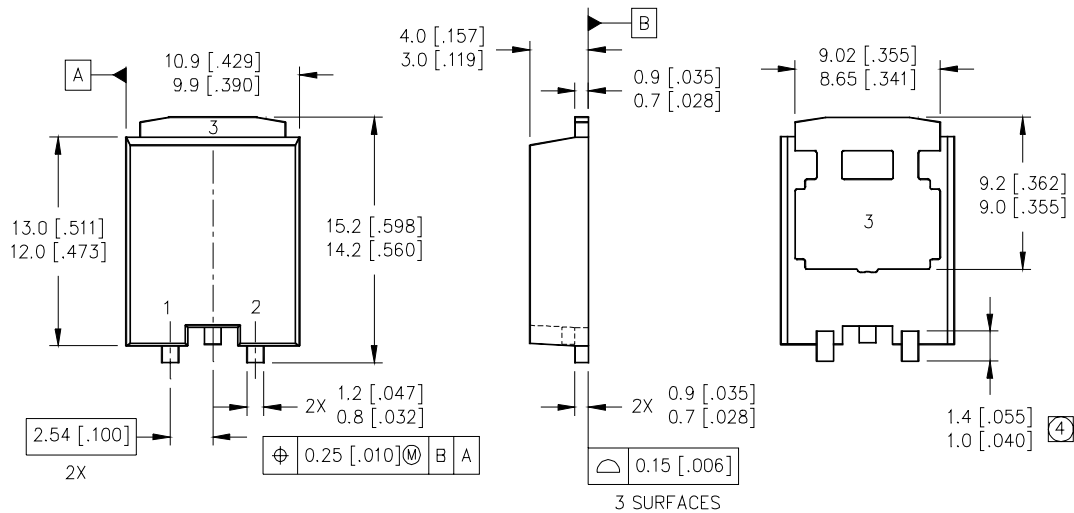
Fig 14. For N-Channel HEXFET® Power MOSFETs

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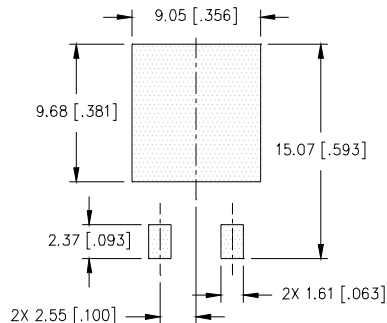
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Super-D²Pak™ Package Outline

Dimensions are shown in millimeters (inches)



MINIMUM RECOMMENDED FOOTPRINT



LEAD ASSIGNMENTS

MOSFET	SCHOTTKY / FRED
1 = GATE	1 = ANODE 1
2 = SOURCE	2 = ANODE 2
3 = DRAIN	3 = COMMON CATHODE

NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. DIMENSION IS MEASURED AT FULL LEAD WIDTH.

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Data and specifications subject to change without notice. 2/00