

Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	200	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	0.30
Q_g (Max.) (nC)	43	
Q_{gs} (nC)	7.0	
Q_{gd} (nC)	23	
Configuration	Single	

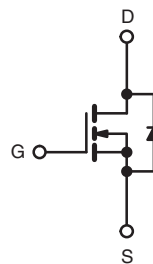
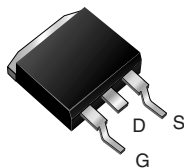
FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Surface Mount
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC



RoHS*
COMPLIANT
HALOGEN
FREE
Available

D²PAK (TO-263)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	200	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25\text{ }^{\circ}\text{C}$	I_D	10	A
		$T_C = 100\text{ }^{\circ}\text{C}$		6.7	
Pulsed Drain Current ^a			I_{DM}	36	W/ $^{\circ}\text{C}$
Linear Derating Factor				0.59	
Linear Derating Factor (PCB Mount) ^e				0.025	
Single Pulse Avalanche Energy ^b			E_{AS}	250	mJ
Repetitive Avalanche Current ^a			I_{AR}	9.0	A
Repetitive Avalanche Energy ^a			E_{AR}	7.4	mJ
Maximum Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$		P_D	74	W
Maximum Power Dissipation (PCB Mount) ^e	$T_A = 25\text{ }^{\circ}\text{C}$			3.0	

* Pb containing terminations are not RoHS compliant, exemptions may apply

Peak Diode Recovery dV/dt^c	dV/dt	5.0	V/ns
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ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^{\circ}\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 4.6\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 9.0\text{ A}$ (see fig. 12).
 c. $I_{SD} \leq 9.0\text{ A}$, $dl/dt \leq 120\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^{\circ}\text{C}$.
 d. 1.6 mm from case.
 e. When mounted on 1" square PCB (FR-4 or G-10 material).

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mount) ^c	R_{thJA}	-	-	40	$^{\circ}\text{C}/\text{W}$
Maximum Junction-to-Ambient	R_{thJA}	-	-	62	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	1.7	

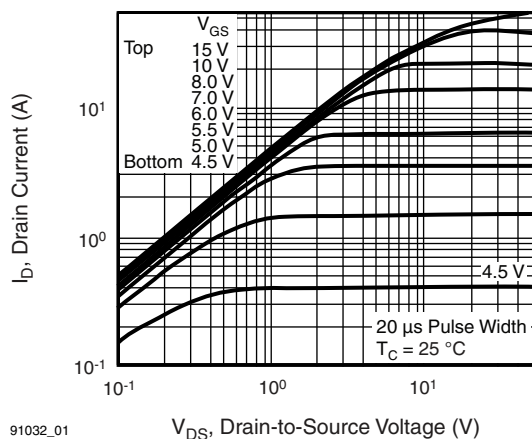
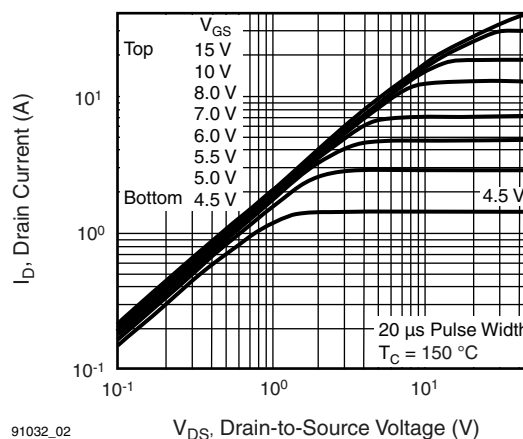
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$, $I_D = 250\text{ }\mu\text{A}$	200	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$	-	0.24	-	$\text{V}/^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	25	μA
		$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 5.4\text{ A}^b$	-	0.30	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 5.4\text{ A}^b$	3.8	-	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5	-	800	-	pF
Output Capacitance	C_{oss}		-	240	-	
Reverse Transfer Capacitance	C_{rss}		-	76	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$, $I_D = 5.9\text{ A}$, $V_{DS} = 160\text{ V}$ see fig. 6 and 13 ^b	-	-	43	nC
Gate-Source Charge	Q_{gs}		-	-	7.0	
Gate-Drain Charge	Q_{gd}		-	-	23	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 100\text{ V}$, $I_D = 5.9\text{ A}$ $R_g = 12\text{ }\Omega$, $R_D = 16\text{ }\Omega$ see fig. 10 ^b	-	9.4	-	ns
Rise Time	t_r		-	28	-	
Turn-Off Delay Time	$t_{d(off)}$		-	39	-	
Fall Time	t_f		-	20	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.5	-	nH
Internal Source Inductance	L_S		-	7.5	-	

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	9.0	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	36	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 9.0\text{ A}$, $V_{GS} = 0\text{ V}^b$	-	-	2.0	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = 5.9\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$	-	170	340	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	1.1	2.2	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.
 c. When mounted on 1" square PCB (FR-4 or G-10 material).

TYPICAL CHARACTERISTICS ($25\text{ }^{\circ}\text{C}$, unless otherwise noted)**Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^{\circ}\text{C}$** **Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ }^{\circ}\text{C}$**

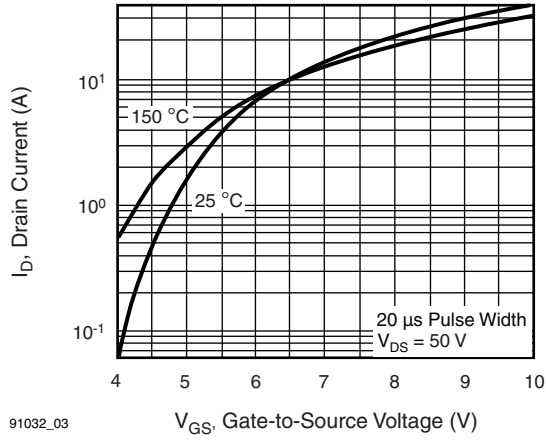


Fig. 3 - Typical Transfer Characteristics

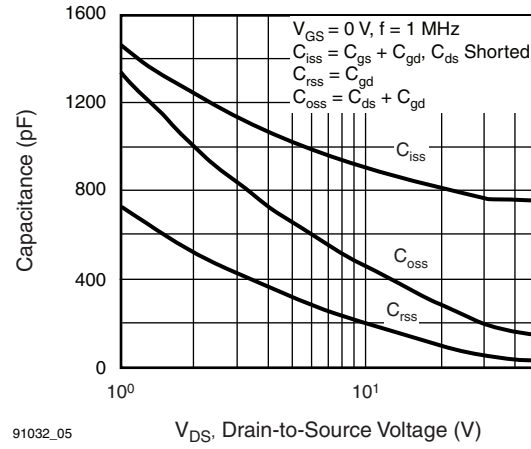


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



Fig. 4 - Normalized On-Resistance vs. Temperature



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

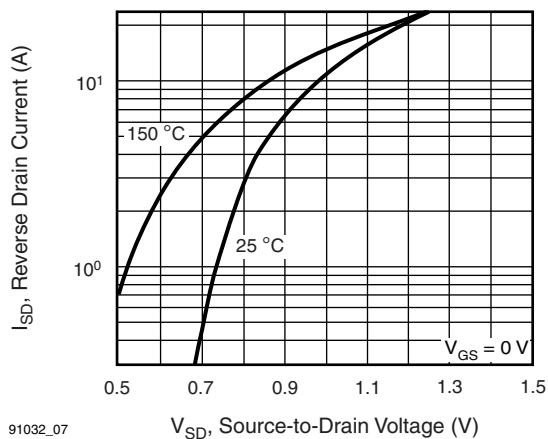


Fig. 7 - Typical Source-Drain Diode Forward Voltage

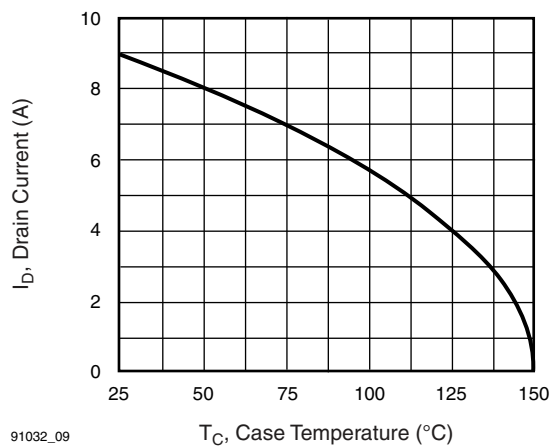


Fig. 9 - Maximum Drain Current vs. Case Temperature

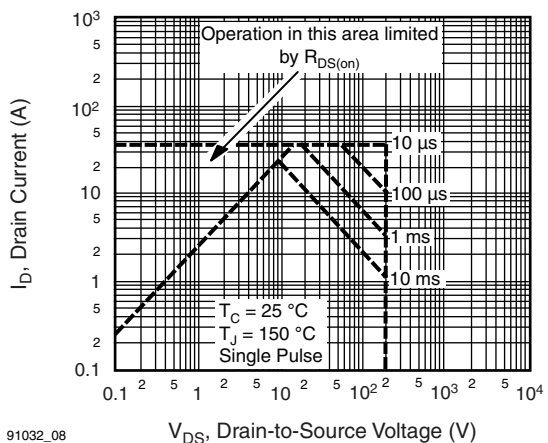


Fig. 8 - Maximum Safe Operating Area

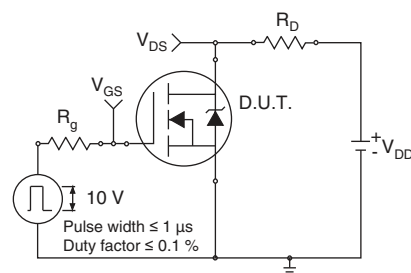


Fig. 10a - Switching Time Test Circuit

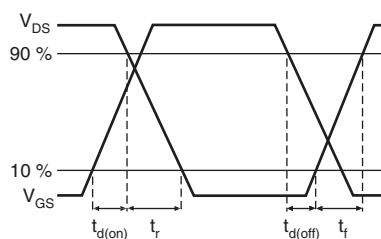


Fig. 10b - Switching Time Waveforms

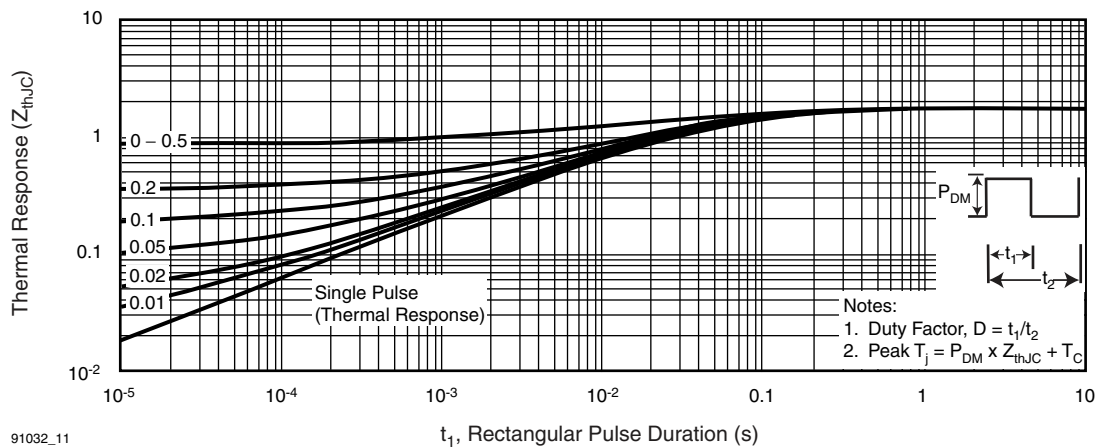


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

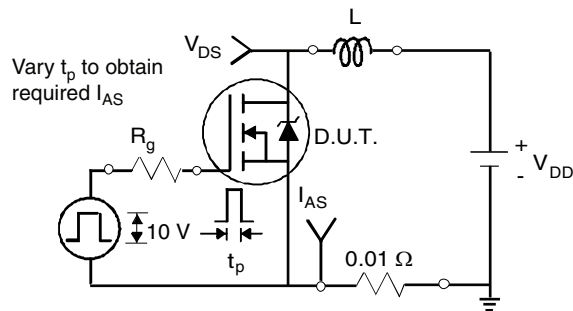


Fig. 12a - Unclamped Inductive Test Circuit

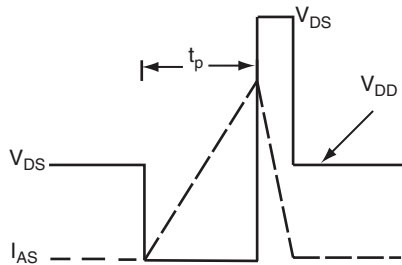


Fig. 12b - Unclamped Inductive Waveforms



Fig. 12c - Maximum Avalanche Energy vs. Drain Current



Fig. 13a - Basic Gate Charge Waveform

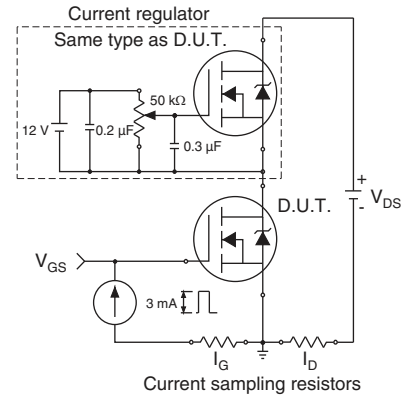
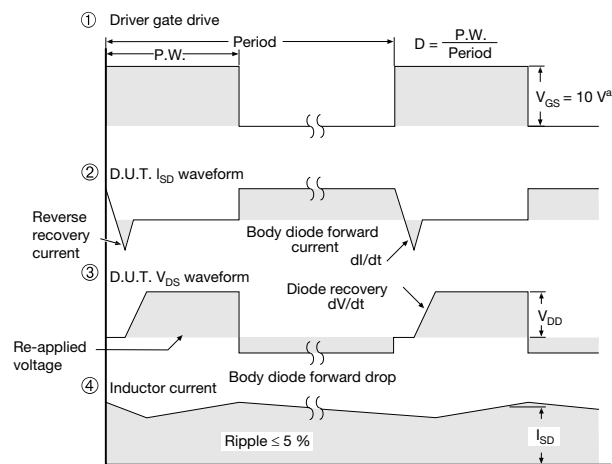
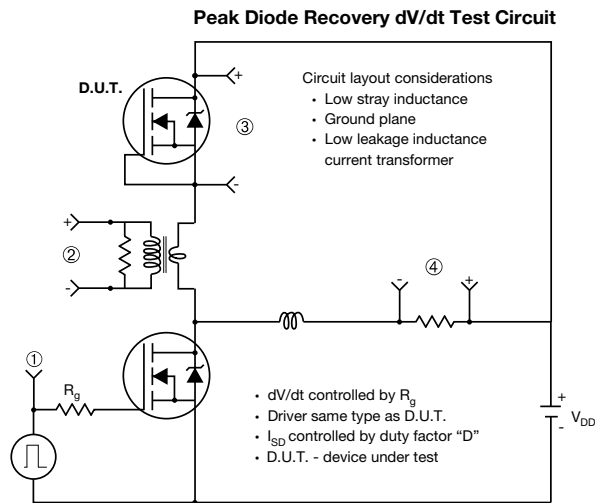


Fig. 13b - Gate Charge Test Circuit



Note

a. $V_{GS} = 5 \text{ V}$ for logic level devices

Fig. 14 - For N-Channel

Technical drawing of a lead tip assembly, showing multiple views and annotations:

- Main View (Top Left):** Shows the lead tip assembly with dimensions E , $L1$, D , H , and $L2$. It includes feature callouts 1, 2, 3, 4, and 5. Datum A is indicated. Surface texture symbols are present on features 3, 4, and 5.
- Detail A (Top Right):** A magnified view of the lead tip tip, showing dimensions A , $c2$, and c . It includes a circular feature with diameter ϕ and a surface texture symbol.
- Seating Plane View (Middle Right):** A cross-sectional view of the lead tip seated on a seating plane. It shows the gauge plane, seating plane, and dimensions $L3$, $L4$, and $A1$. The lead tip is rotated 90° CW. Scale: 8:1.
- Section B - B and C - C (Bottom Center):** A cross-sectional view of the lead tip, showing the base metal, plating, and dimensions $b1$, $b3$, $c1$, c , and $(b, b2)$. It includes a surface texture symbol.
- View A - A (Bottom Right):** A cross-sectional view of the lead tip, showing dimensions E , $D1$, and $E1$. It includes feature callouts 4 and 5.
- Lead Tip (Bottom Left):** A small detail view of the lead tip, showing the lead tip and dimensions $2 \times b2$ and $2 \times b$.
- Annotations:**
 - (Datum A):** Indicated by a triangle and a dashed line.
 - Surface Texture Symbols:** Indicated by triangles with numbers 3, 4, and 5.
 - Feature Callouts:** 1, 2, 3, 4, and 5.
 - Dimensions:** E , $L1$, D , H , $L2$, A , $c2$, c , $L3$, $L4$, $A1$, $b1$, $b3$, $c1$, c , $(b, b2)$, $E1$, and $D1$.
 - Scale:** 8:1 for the Seating Plane View and Section B - B and C - C.

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

ECN: S-82110-Rev. A, 15-Sep-08
DWG: 5970

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

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