

Power MOSFET

PRODUCT SUMMARY

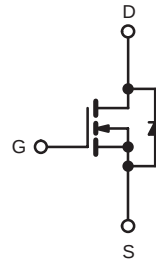
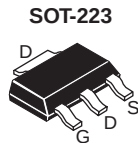
V_{DS} (V)	650	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	2.1
Q_g (Max.) (nC)	48	
Q_{gs} (nC)	12	
Q_{gd} (nC)	19	
Configuration	Single	

FEATURES

- Low Gate Charge Q_g Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Compliant to RoHS directive 2002/95/EC



Available

RoHS*
 COMPLIANT


N-Channel MOSFET

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

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25\text{ }^\circ\text{C}$, $L = 24\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AS} = 3.2\text{ A}$ (see fig. 12).
- $I_{SD} \leq 3.2\text{ A}$, $dI/dt \leq 90\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.
- Drain current limited by maximum junction temperature.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	2.1	

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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		650	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}^d$		-	670	-	mV/ $^{\circ}\text{C}$	
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}	$V_{GS} = \pm 30\text{ V}$		-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	25	μA	
		$V_{DS} = 520\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$		-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 3.1\text{ A}^b$	-	2.1	-	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 3.1\text{ A}$		3.9	-	-	S	
Dynamic								
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	1417	-	pF	
Output Capacitance	C_{oss}			-	177	-		
Reverse Transfer Capacitance	C_{rss}			-	7.0	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}$, $f = 1.0\text{ MHz}$	-	1912	-		
			$V_{DS} = 520\text{ V}$, $f = 1.0\text{ MHz}$	-	48	-		
Effective Output Capacitance	$C_{oss\text{ eff.}}$	$V_{DS} = 0\text{ V to } 520\text{ V}^c$		-	84	-		
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 3.2\text{ A}$, $V_{DS} = 400\text{ V}$ see fig. 6 and 13 ^b	-	-	48	nC	
Gate-Source Charge	Q_{gs}			-	-	12		
Gate-Drain Charge	Q_{gd}			-	-	19		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 325\text{ V}$, $I_D = 3.2\text{ A}$ $R_G = 9.1\text{ }\Omega$, $R_D = 62\text{ }\Omega$, see fig. 10 ^b		-	14	-	ns	
Rise Time	t_r			-	20	-		
Turn-Off Delay Time	$t_{d(off)}$			-	34	-		
Fall Time	t_f			-	18	-		
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	4	A	
Pulsed Diode Forward Current ^a	I_{SM}			-	-	21		
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 3.2\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	1.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = 3.2\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$		-	493	739	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			-	2.1	3.2	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. $C_{oss\text{ eff.}}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DS} .
 d. $t = 60\text{ s}$, $f = 60\text{ Hz}$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

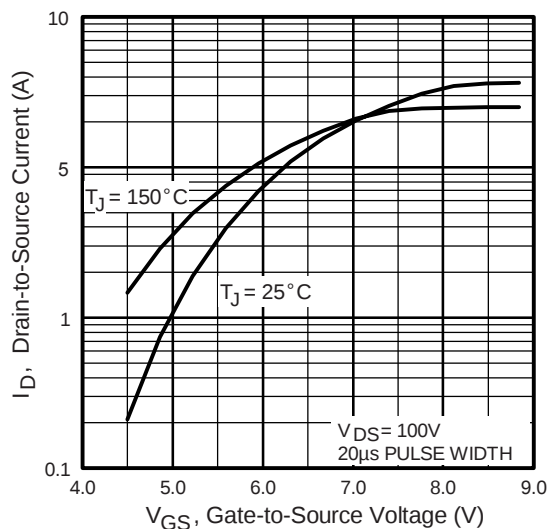
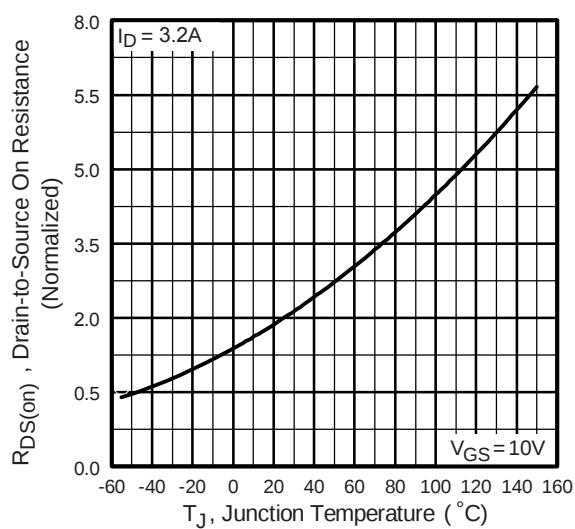
Fig. 1 - Typical Output Characteristics

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature

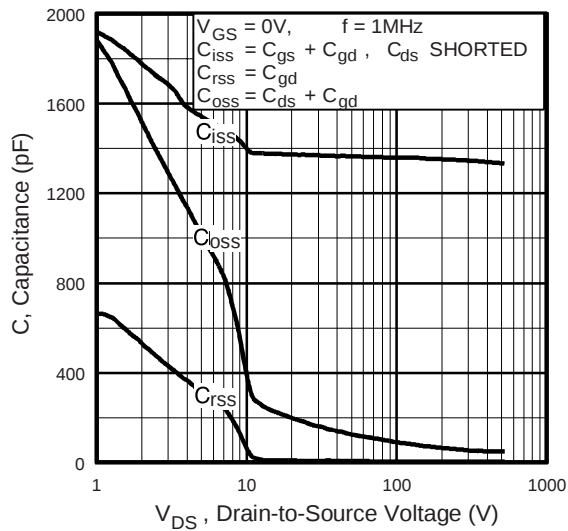


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



Fig. 7 - Typical Source-Drain Diode Forward Voltage



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

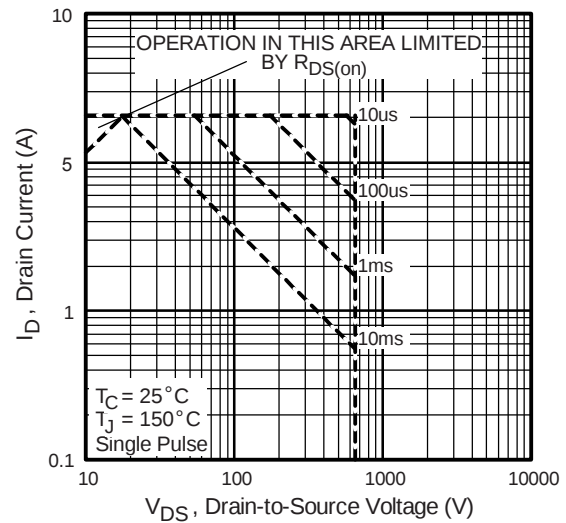


Fig. 8 - Maximum Safe Operating Area

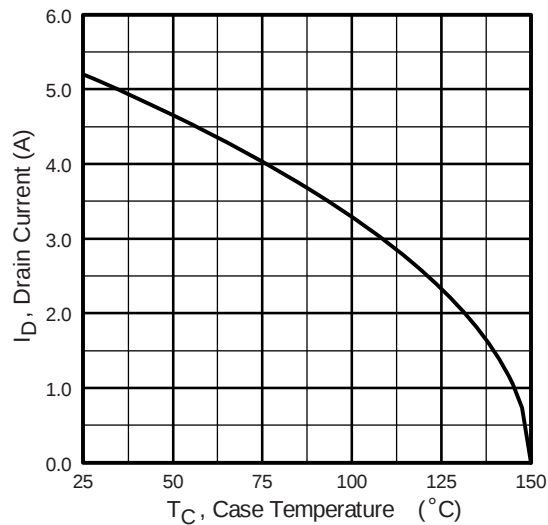


Fig. 9 - Maximum Drain Current vs. Case Temperature



Fig. 10a - Switching Time Test Circuit

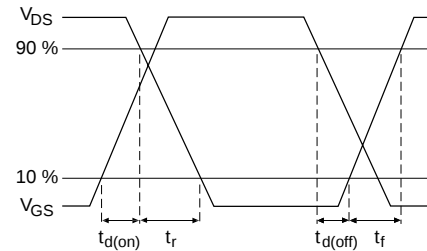


Fig. 10b - Switching Time Waveforms

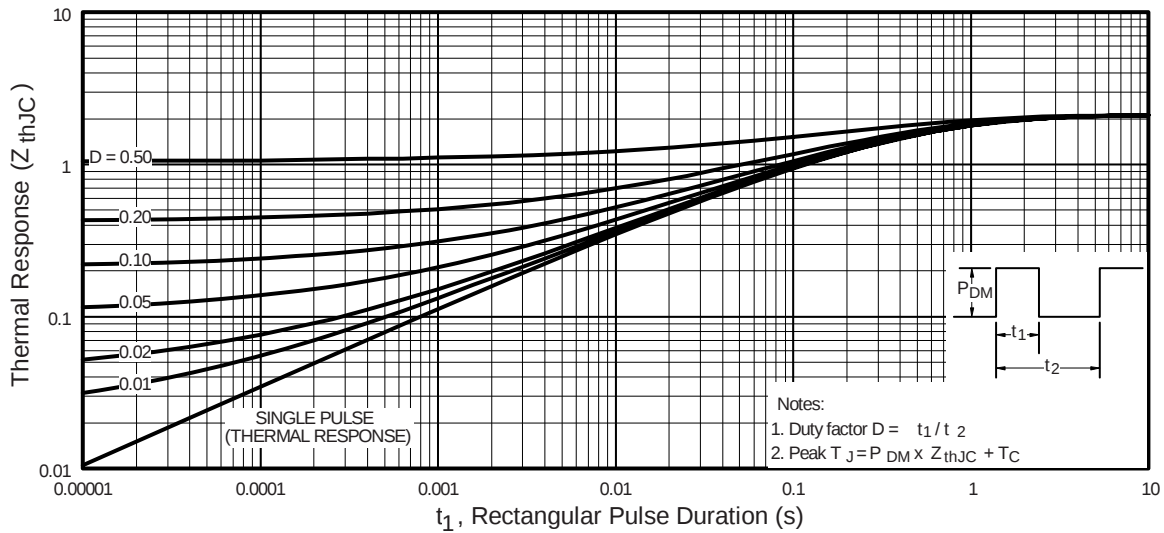


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case



Fig. 12a - Unclamped Inductive Test Circuit



Fig. 12b - Unclamped Inductive Waveforms

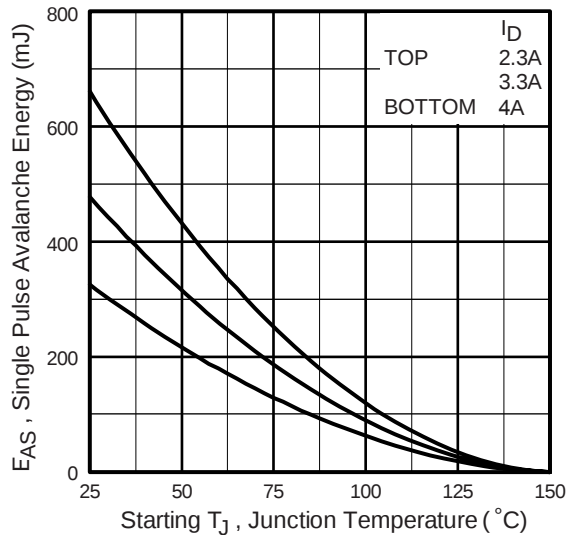


Fig. 12c - Maximum Avalanche Energy vs. Drain Current



Fig. 12d - Typical Drain-to Source Voltage vs. Avalanche Current

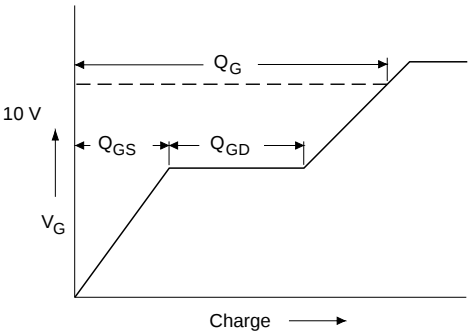


Fig. 13a - Basic Gate Charge Waveform

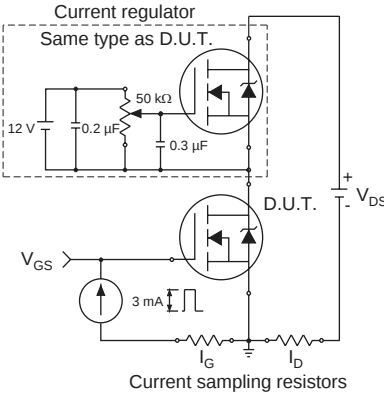


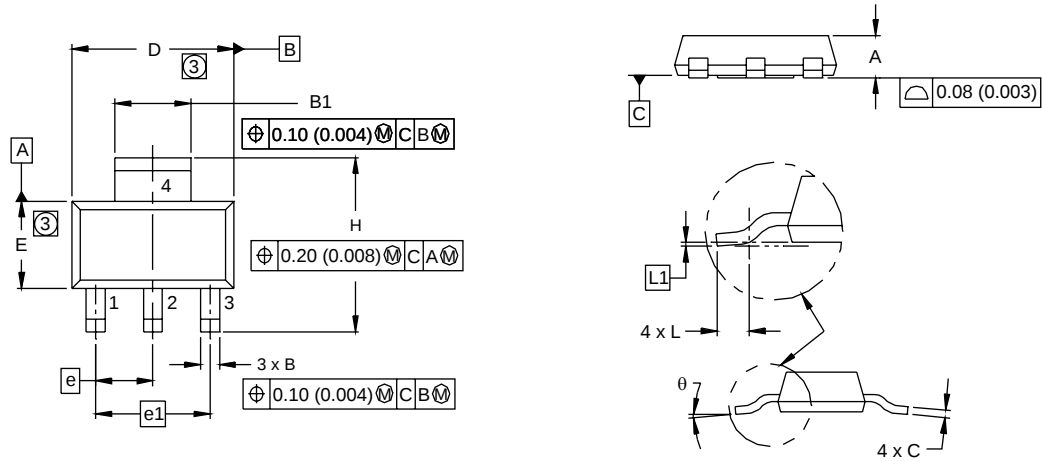
Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



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

Fig. 14 - For N-Channel

SOT-223 (HIGH VOLTAGE)

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
θ	-	10°	-	10°
ECN: S-82109-Rev. A, 15-Sep-08 DWG: 5969				

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension do not include mold flash.
4. Outline conforms to JEDEC outline TO-261AA.

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