

N-Channel 600V (D-S) Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	600	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	2.2
Q_g (Max.) (nC)	39	
Q_{gs} (nC)	10	
Q_{gd} (nC)	19	
Configuration	Single	

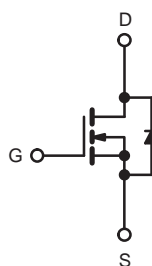
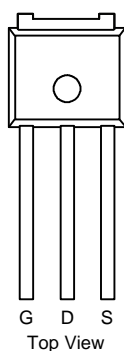
FEATURES

- Ultra Low Gate Charge
- Reduced Gate Drive Requirement
- Enhanced 30 V, V_{GS} Rating
- Reduced C_{iss} , C_{oss} , C_{rss}
- Extremely High Frequency Operation
- Repetitive Avalanche Rated
- Compliant to RoHS Directive 2002/95/EC



Available
RoHS*
 COMPLIANT

TO-251



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}	600	V
Gate-Source Voltage			V _{GS}	± 30	
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	I _D	4	A
		T _C = 100 °C		2.9	
Pulsed Drain Current ^a			I _{DM}	25	
Linear Derating Factor				1.0	W/°C
Single Pulse Avalanche Energy ^b			E _{AS}	530	mJ
Repetitive Avalanche Current ^a			I _{AR}	6.2	A
Repetitive Avalanche Energy ^a			E _{AR}	13	mJ
Maximum Power Dissipation	T _C = 25 °C		P _D	125	W
Peak Diode Recovery dV/dt ^c			dV/dt	3.0	V/ns
Operating Junction and Storage Temperature Range			T _J , T _{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s			300 ^d	
Mounting Torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

Notes

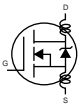

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 25\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 6.2\text{ A}$ (see fig. 12).
 c. $I_{SD} \leq 6.2\text{ A}$, $dI/dt \leq 80\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
 d. 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.0	

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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		600	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$		-	0.70	-	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}	$V_{GS} = \pm 20$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	100	μA
		$V_{DS} = 480\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$		-	-	500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 3.7\text{ A}^b$	-	2.2	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 100\text{ V}$, $I_D = 3.7\text{ A}^b$		3.7	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$ $V_{DS} = 25\text{ V}$ $f = 1.0\text{ MHz}$, see fig. 5		-	1100	-	pF
Output Capacitance	C_{oss}			-	140	-	
Reverse Transfer Capacitance	C_{rss}			-	15	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 4\text{ A}$, $V_{DS} = 360\text{ V}$, see fig. 6 and 13 ^b	-	-	39	nC
Gate-Source Charge	Q_{gs}			-	-	10	
Gate-Drain Charge	Q_{gd}			-	-	19	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 300\text{ V}$, $I_D = 4\text{ A}$ $R_g = 9.1\text{ }\Omega$, $R_D = 47\text{ }\Omega$, see fig. 10 ^b		-	12	-	ns
Rise Time	t_r			-	20	-	
Turn-Off Delay Time	$t_{d(off)}$			-	27	-	
Fall Time	t_f			-	17	-	
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	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	4.0	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	25	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 4\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = 4\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$ ^b		-	440	680	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 $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

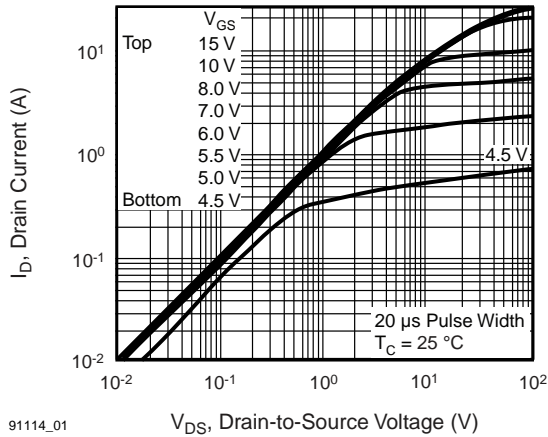


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ °C}$

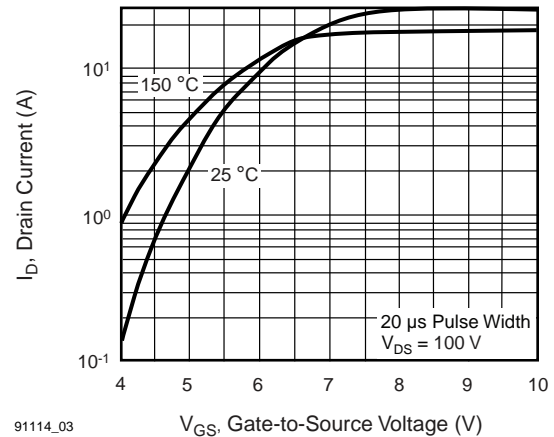


Fig. 3 - Typical Transfer Characteristics

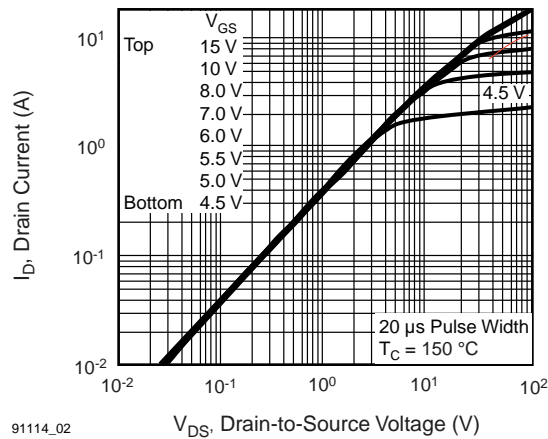


Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ °C}$

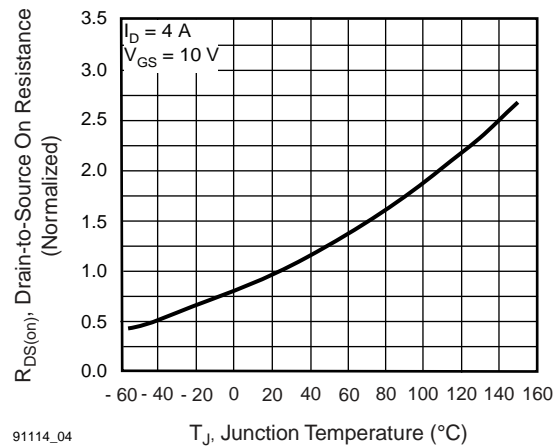


Fig. 4 - Normalized On-Resistance vs. Temperature

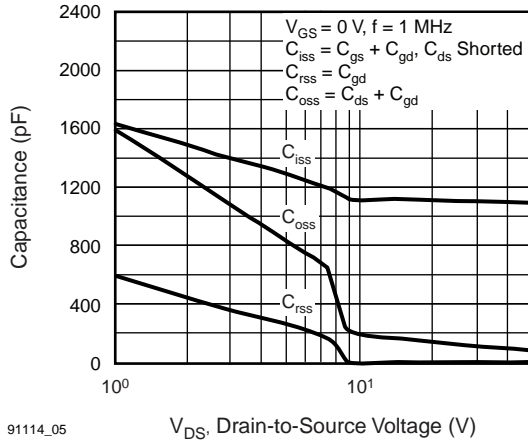


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

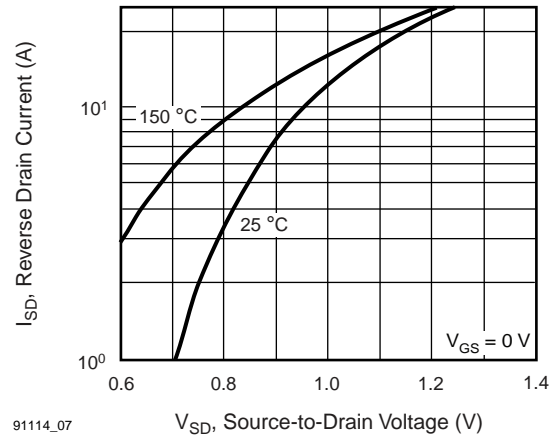


Fig. 7 - Typical Source-Drain Diode Forward Voltage

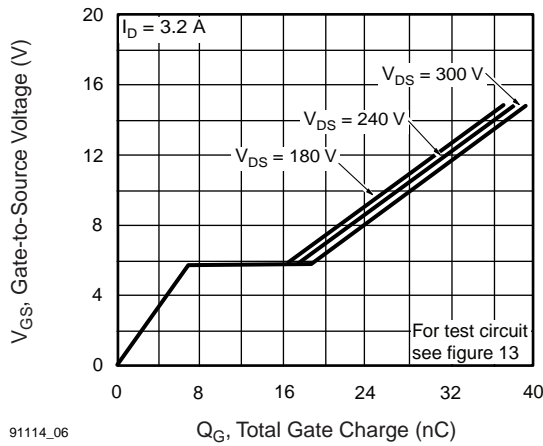


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

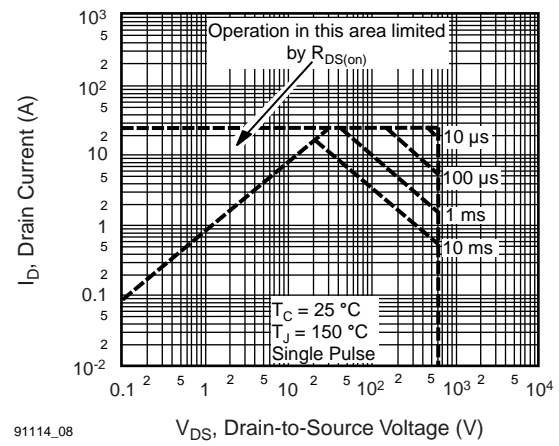


Fig. 8 - Maximum Safe Operating Area

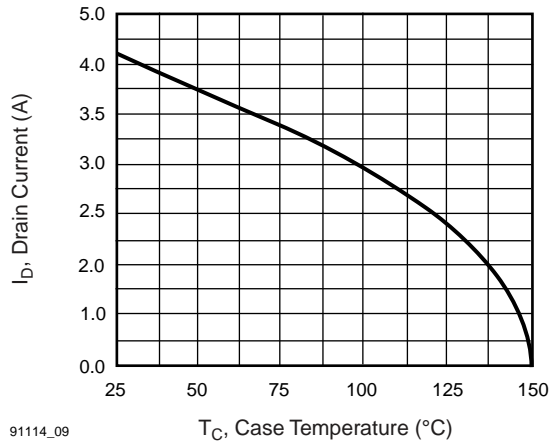


Fig. 9 - Maximum Drain Current vs. Case Temperature

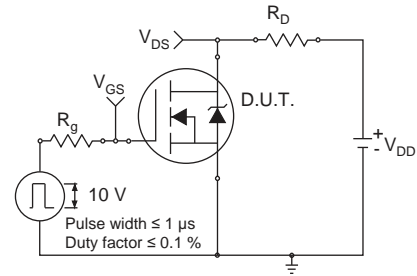


Fig. 10a - Switching Time Test Circuit

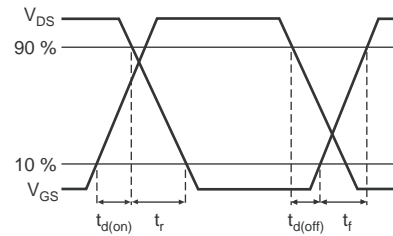


Fig. 10b - Switching Time Waveforms

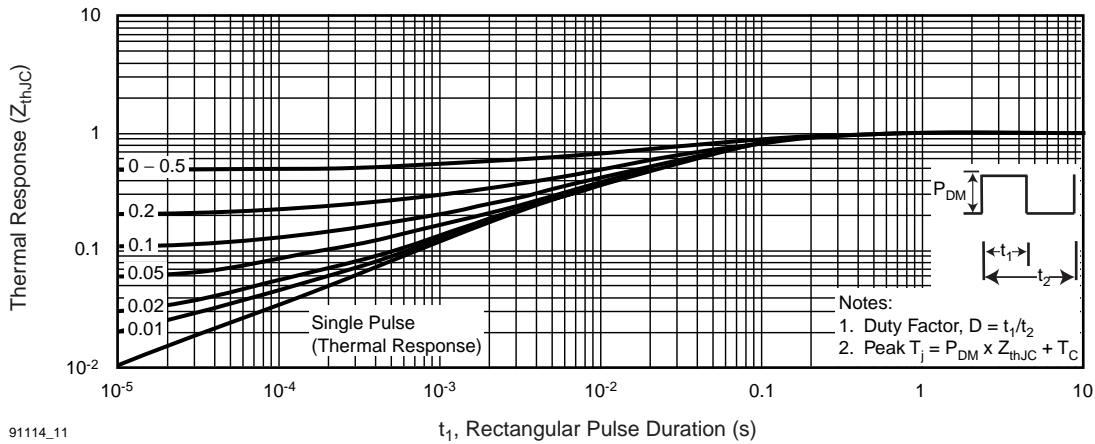


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

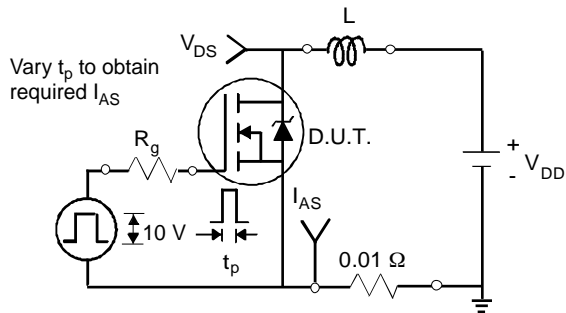


Fig. 12a - Unclamped Inductive Test Circuit

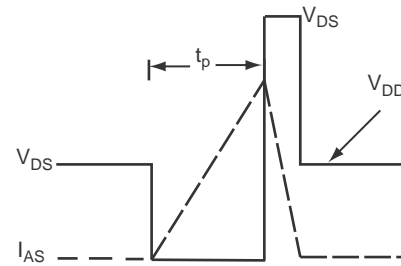


Fig. 12b - Unclamped Inductive Waveforms

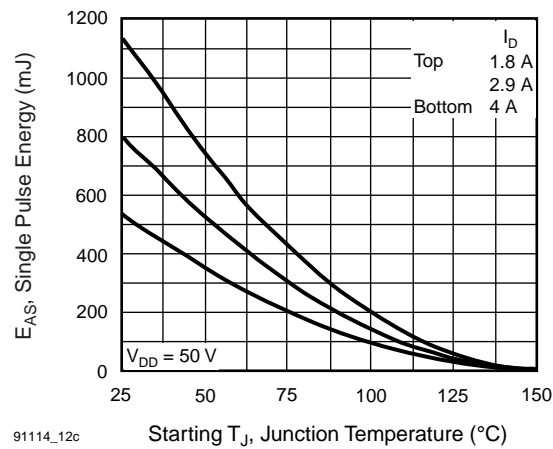


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

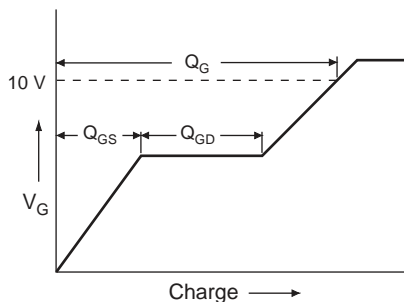


Fig. 13a - Basic Gate Charge Waveform

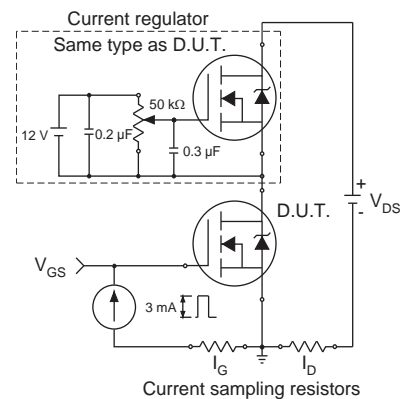
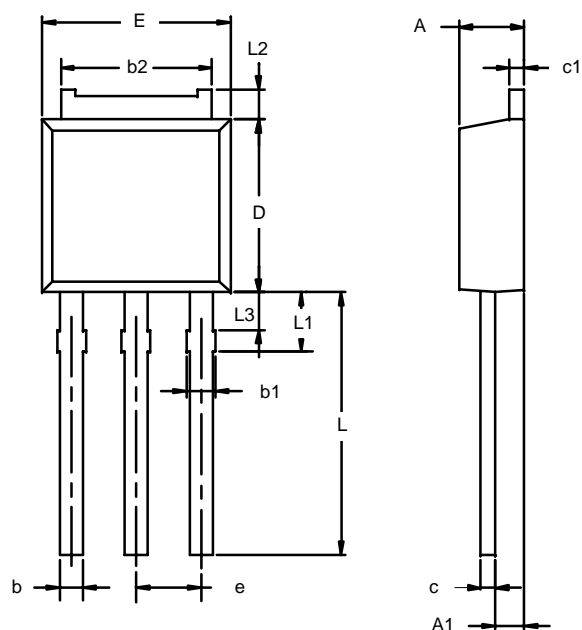


Fig. 13b - Gate Charge Test Circuit

TO-251AA (DPAK)

Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	8.89	9.53	0.350	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060
ECN: S-03946—Rev. E, 09-Jul-01 DWG: 5346				

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