

N-Channel 700V (D-S) Super Junction Power MOSFET



RoHS
COMPLIANT

PRODUCT SUMMARY		
V _{DS} (V) at T _J max.	700	
R _{DS(on)} max. at 25 °C (Ω)	V _{GS} = 10 V	0.45
Q _g max. (nC)	70	
Q _{gs} (nC)	9	
Q _{gd} (nC)	16	
Configuration	Single	

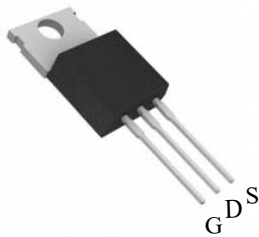
FEATURES

- Low figure-of-merit (FOM) R_{on} x Q_g
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)

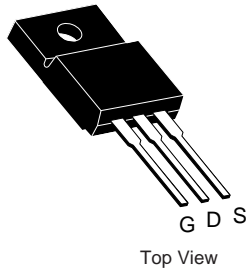
APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting

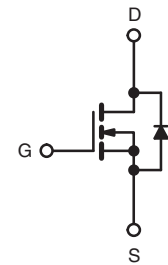
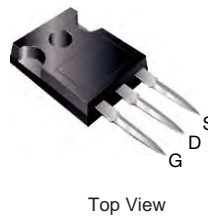
TO-220 Pin Configuration



TO-220 FULLPAK



TO-247AC




N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V _{DS}	700	V
Gate-Source Voltage		V _{GS}	± 30	
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 10 V	I _D	T _C = 25 °C	11
			T _C = 100 °C	8
Pulsed Drain Current ^a		I _{DM}	28	A
Linear Derating Factor			1.4	
Single Pulse Avalanche Energy ^b		E _{AS}	226	mJ
Maximum Power Dissipation		P _D	156	W
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +150	°C
Drain-Source Voltage Slope	T _J = 125 °C	dV/dt	37	V/ns
Reverse Diode dV/dt ^d			28	
Soldering Recommendations (Peak Temperature) ^c	for 10 s		300	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- V_{DD} = 50 V, starting T_J = 25 °C, L = 28.2 mH, R_g = 25 Ω, I_{AS} = 4 A.
- 1.6 mm from case.
- I_{SD} ≤ I_D, dI/dt = 100 A/μs, starting T_J = 25 °C.

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.8	

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		700	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.78	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2	-	4	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
		$V_{GS} = \pm 30\text{ V}$		-	-	± 1	μA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 700\text{ V}, V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 520\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 6\text{ A}$	-	0.45	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 30\text{ V}, I_D = 6\text{ A}$		-	3.5	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 100\text{ V},$ $f = 1\text{ MHz}$		-	1224	-	pF
Output Capacitance	C_{oss}			-	65	-	
Reverse Transfer Capacitance	C_{rss}			-	4	-	
Effective Output Capacitance, Energy Related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 520\text{ V}, V_{GS} = 0\text{ V}$		-	50	-	pF
Effective Output Capacitance, Time Related ^b	$C_{o(tr)}$			-	160	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 6\text{ A}, V_{DS} = 520\text{ V}$	-	35	70	nC
Gate-Source Charge	Q_{gs}			-	9	-	
Gate-Drain Charge	Q_{gd}			-	16	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 520\text{ V}, I_D = 6\text{ A},$ $V_{GS} = 10\text{ V}, R_g = 9.1\text{ }\Omega$		-	16	32	ns
Rise Time	t_r			-	19	38	
Turn-Off Delay Time	$t_{d(off)}$			-	35	70	
Fall Time	t_f			-	18	36	
Gate Input Resistance	R_g	$f = 1\text{ MHz}, \text{ open drain}$		-	0.81	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	11	A
Pulsed Diode Forward Current	I_{SM}			-	-	28	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 6\text{ A}, V_{GS} = 0\text{ V}$		-	1.0	1.2	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 6\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s}, V_R = 25\text{ V}$		-	309	618	ns
Reverse Recovery Charge	Q_{rr}			-	3.8	7.6	μC
Reverse Recovery Current	I_{RRM}			-	21	-	A

Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
 b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

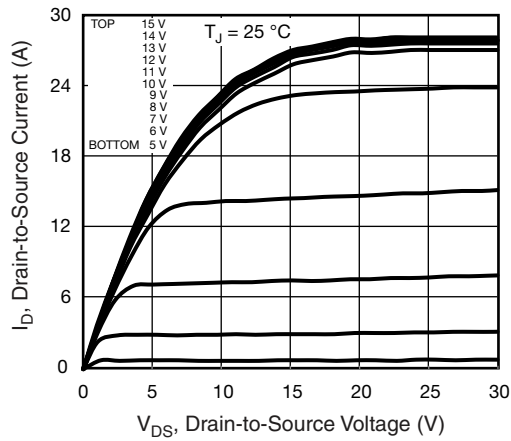


Fig. 1 - Typical Output Characteristics

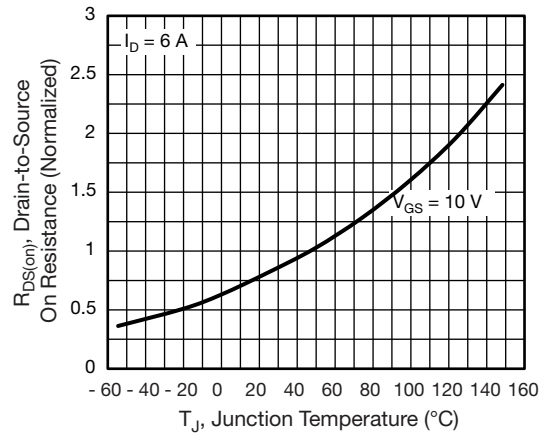


Fig. 4 - Normalized On-Resistance vs. Temperature

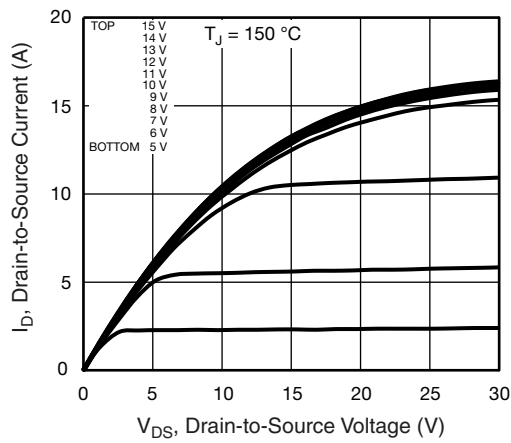


Fig. 2 - Typical Output Characteristics

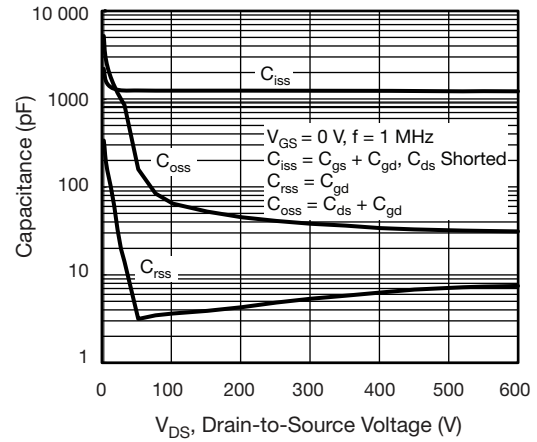


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

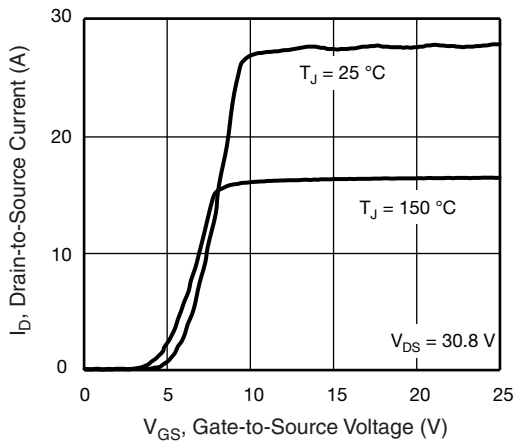


Fig. 3 - Typical Transfer Characteristics

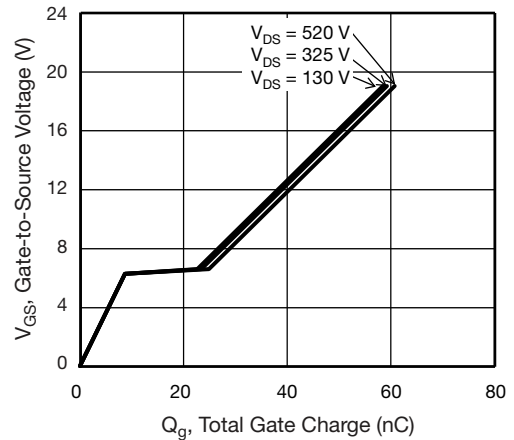


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

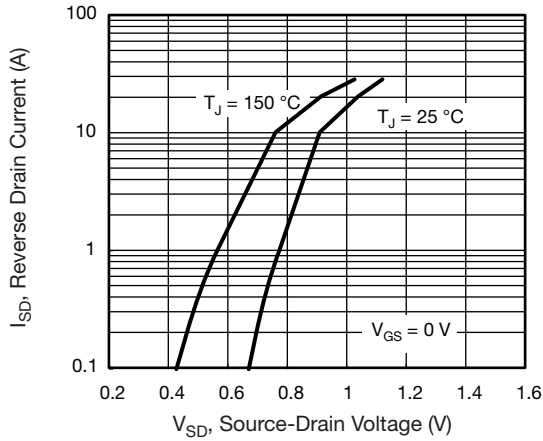


Fig. 7 - Typical Source-Drain Diode Forward Voltage

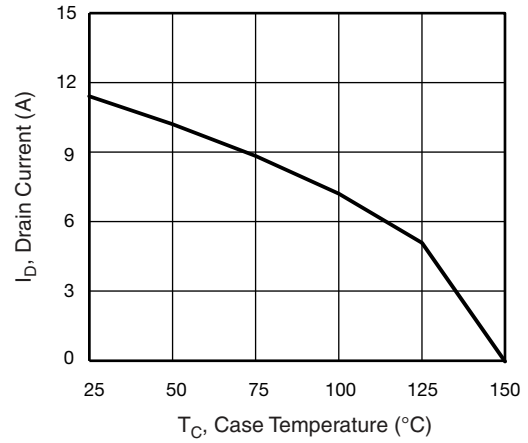


Fig. 9 - Maximum Drain Current vs. Case Temperature

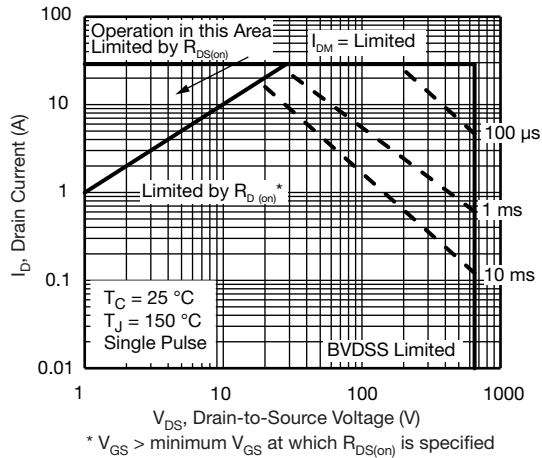


Fig. 8 - Maximum Safe Operating Area

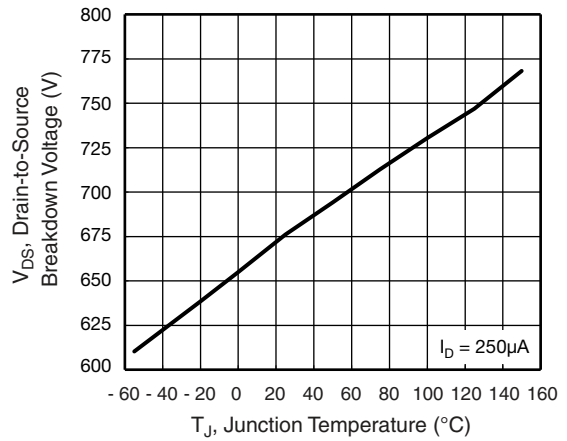


Fig. 10 - Temperature vs. Drain-to-Source Voltage

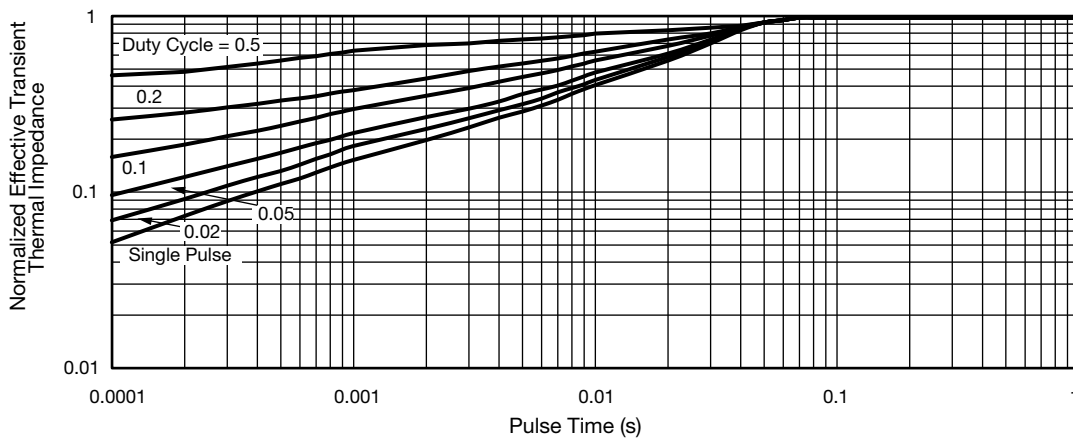


Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case

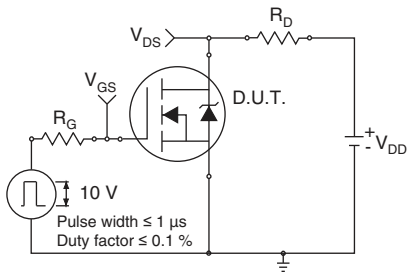


Fig. 12 - Switching Time Test Circuit

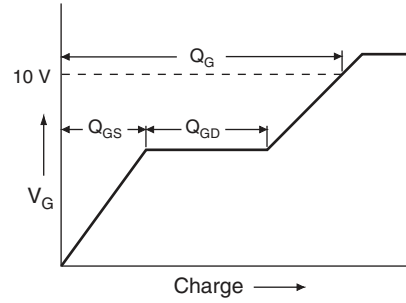


Fig. 16 - Basic Gate Charge Waveform

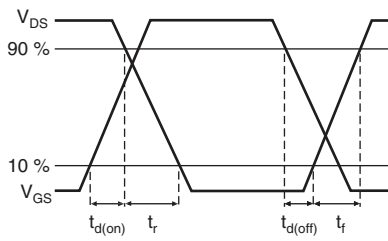


Fig. 13 - Switching Time Waveforms

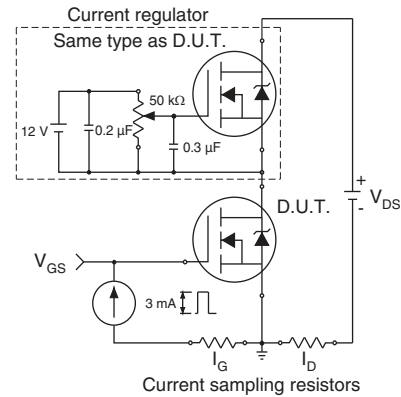


Fig. 17 - Gate Charge Test Circuit

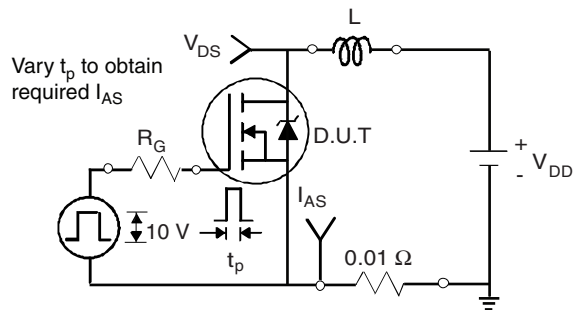


Fig. 14 - Unclamped Inductive Test Circuit

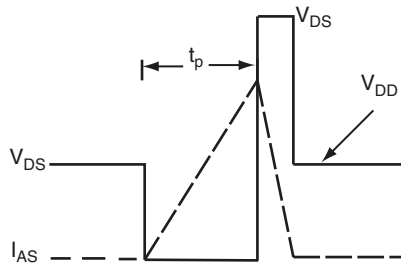
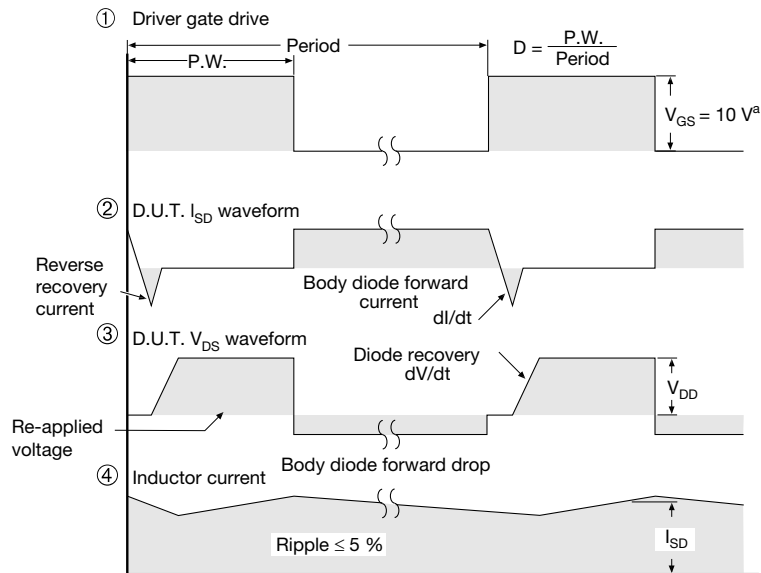
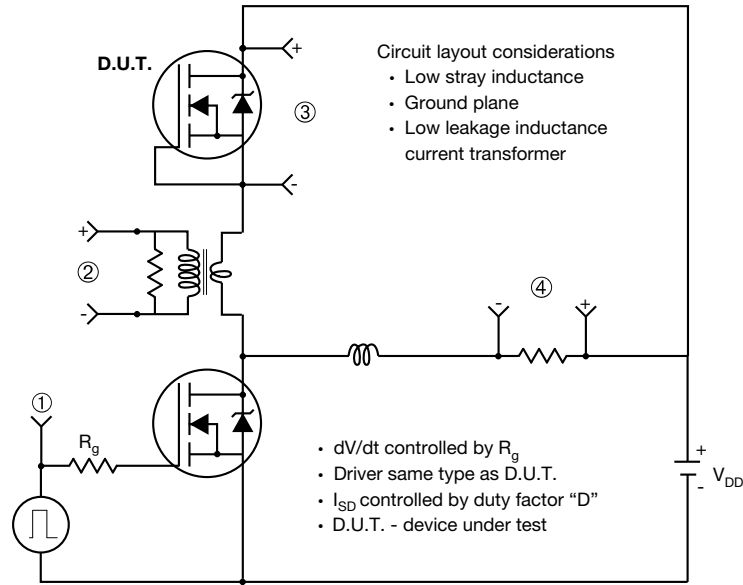


Fig. 15 - Unclamped Inductive Waveforms

Peak Diode Recovery dV/dt Test Circuit



Note

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

Fig. 18 - For N-Channel

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