



7N70

Power MOSFET

7 Amps, 700 Volts N-CHANNEL POWER MOSFET

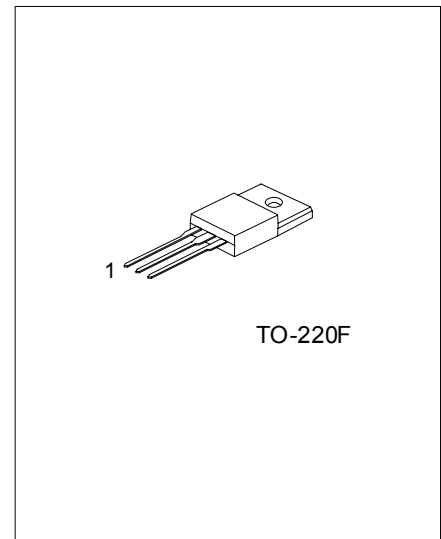
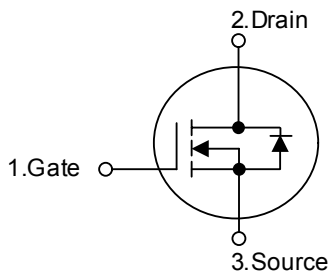
DESCRIPTION

The UTC 7N70 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} = 1.5\Omega @ V_{GS} = 10V$
- * Ultra low gate charge (typical 30 nC)
- * Low reverse transfer capacitance ($C_{RSS} =$ typical 18 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



*Pb-free plating product number: 7N70L

ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
7N70-TF3-T	7N70L-TF3-T	TO-220F	G	D	S	Tube

<p>7N70L-TF3-T</p>	<p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Plating</p>	<p>(1) T: Tube</p> <p>(2) TF3: TO-220F</p> <p>(3) L: Lead Free Plating Blank: Pb/Sn</p>
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■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	700	V
Gate-Source Voltage	V_{GSS}	± 30	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	7.0
		$T_C = 100^\circ\text{C}$	4.7
Drain Current Pulsed (Note 1)	I_{DM}	28	A
Avalanche Energy, Single Pulsed (Note 2)	E_{AS}	530	mJ
Avalanche Energy, Repetitive, Limited by T_{JMAX}	E_{AR}	14.2	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	142	W
Junction Temperature	T_J	+150	
Storage Temperature	T_{STG}	-55 ~ +150	

Note Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Junction-to-Ambient	θ_{JA}			62.5	$^\circ\text{C/W}$
Junction-to-Case	θ_{JC}			0.88	$^\circ\text{C/W}$

■ ELECTRICAL CHARACTERISTICS ($T_C = 25$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF Characteristics							
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	700			V	
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 700\text{ V}, V_{GS} = 0\text{ V}$			1	μA	
		$V_{DS} = 560\text{ V}, T_C = 125^\circ\text{C}$			1	μA	
Gate-Source Leakage Current	Forward	I_{GSS}	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$			100	nA
	Reverse			$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$			-100
Breakdown Voltage Temperature Coefficient	BV_{DSS}/T_J	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		0.67		V/	
ON Characteristics							
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V	
Drain-Source ON-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$		1.35	1.5	Ω	
Forward Transconductance	g_{FS}	$V_{DS} = 40\text{ V}, I_D = 3.5\text{ A}$ (Note 4)		8.0		S	
Dynamic Characteristics							
Input Capacitance	C_{ISS}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{MHz}$		1200	1600	pF	
Output Capacitance	C_{OSS}			150	190	pF	
Reverse Transfer Capacitance	C_{RSS}			18	25	pF	
Switching Characteristics							
Turn-on Delay Time	$t_{D(ON)}$	$V_{DD} = 350\text{V}, I_D = 7.0\text{ A}$ (Note 4, 5)		35	80	ns	
Turn-on Rise Time	t_R			79	165	ns	
Turn-off Delay Time	$t_{D(OFF)}$			80	160	ns	
Turn-off Fall Time	t_F			52	120	ns	
Total Gate Charge	Q_G	$V_{DS} = 560\text{V}, I_D = 7.0\text{A}, V_{GS} = 10\text{ V}$ (Note 4, 5)		30		nC	
Gate-Source Charge	Q_{GS}			6.5		nC	
Gate-Drain Charge	Q_{DD}			13		nC	

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Source- Drain Diode Ratings and Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 7.0\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				7.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				28	A
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, I_S = 7.0\text{ A},$		320		ns
Reverse Recovery Charge	Q_{RR}	$di_F/dt = 100\text{ A}/\mu\text{s}$ (Note 4)		2.4		μC

- Notes: 1. Repetitive Rating : Pulse width limited by T_J
 2. $L = 19.5\text{mH}, I_{AS} = 7.0\text{A}, V_{DD} = 50\text{V}, R_G = 0\ \Omega$, Starting $T_J = 25^\circ\text{C}$
 3. $I_{SD} \leq 7.0\text{A}, di/dt \leq 100\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
 4. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
 5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

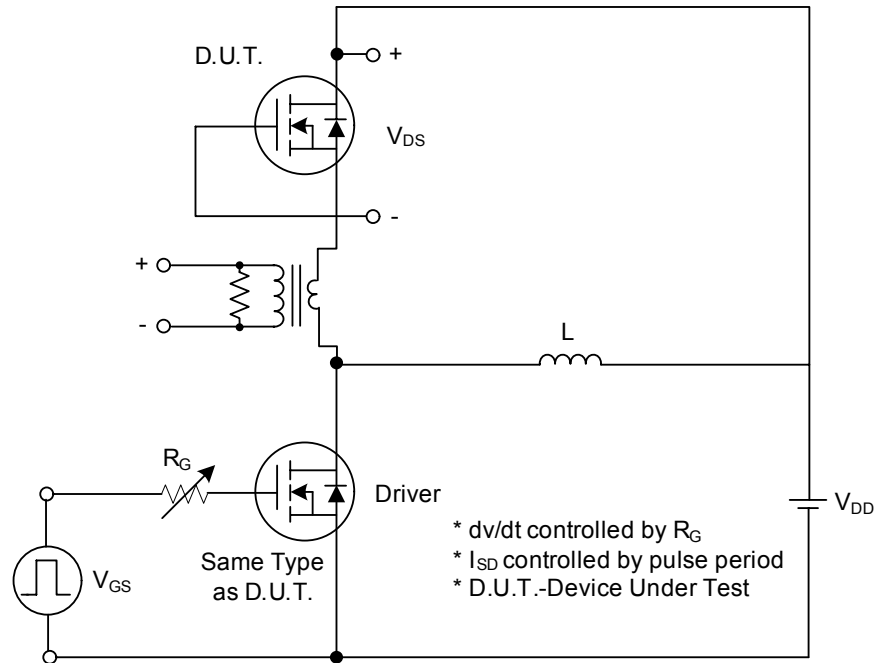


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

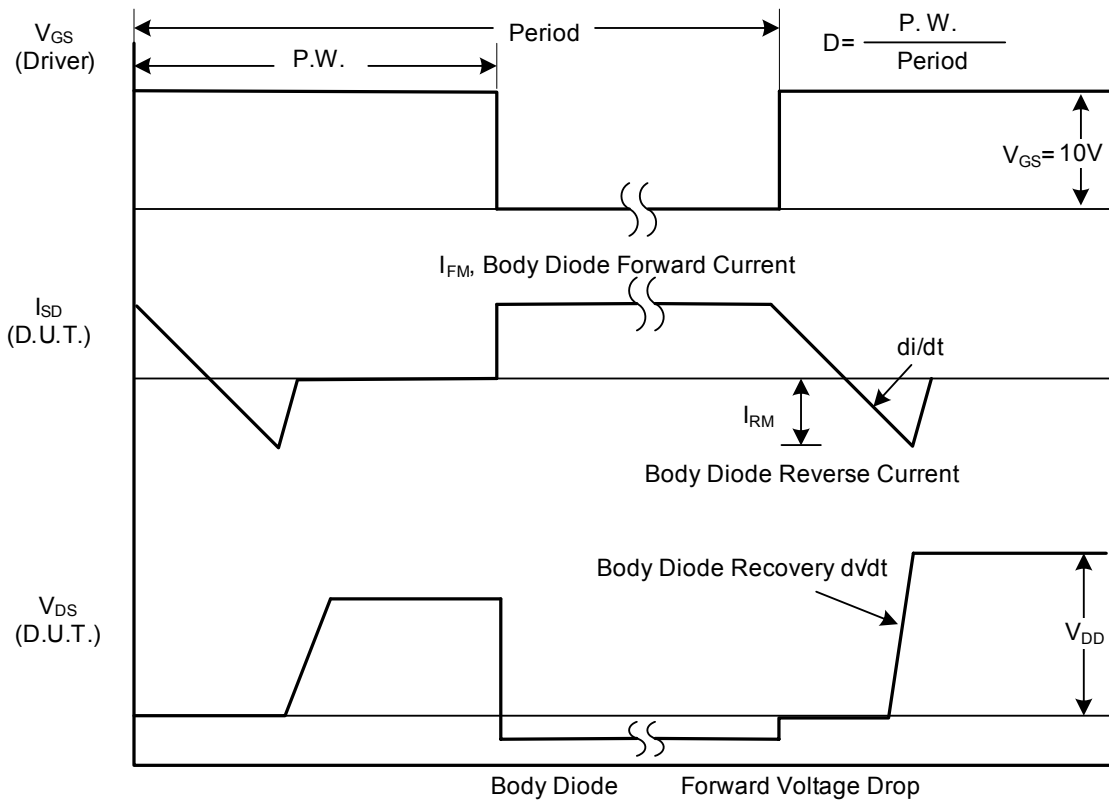


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

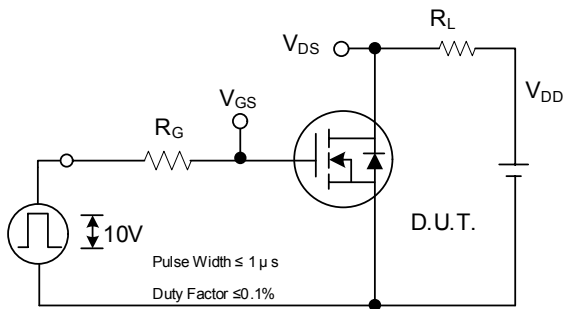


Fig. 2A Switching Test Circuit

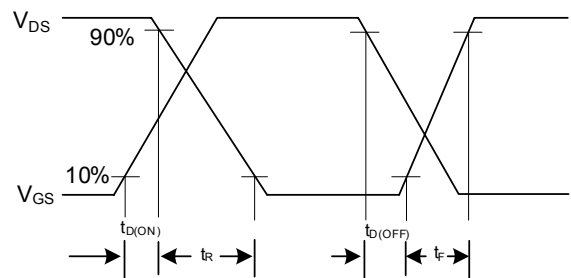


Fig. 2B Switching Waveforms

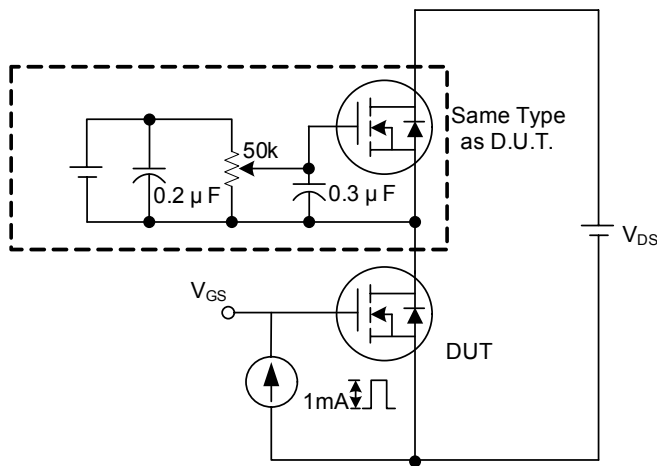


Fig. 3A Gate Charge Test Circuit

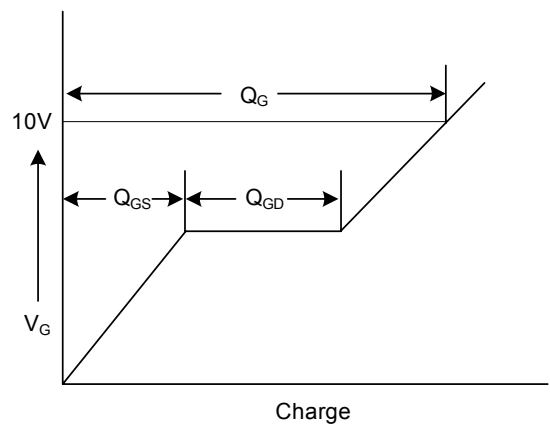


Fig. 3B Gate Charge Waveform

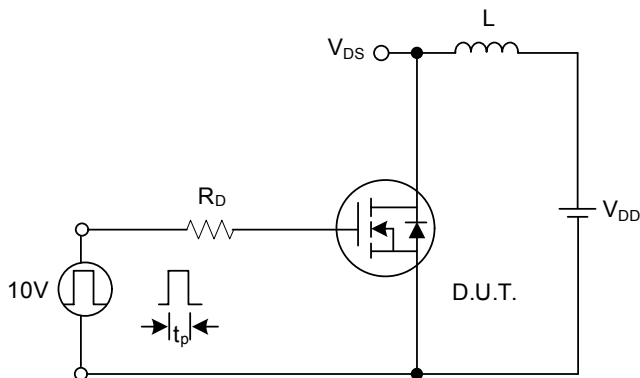


Fig. 4A Unclamped Inductive Switching Test Circuit

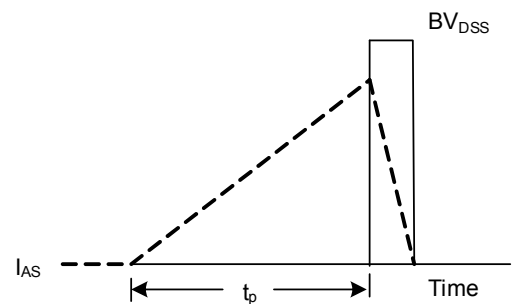
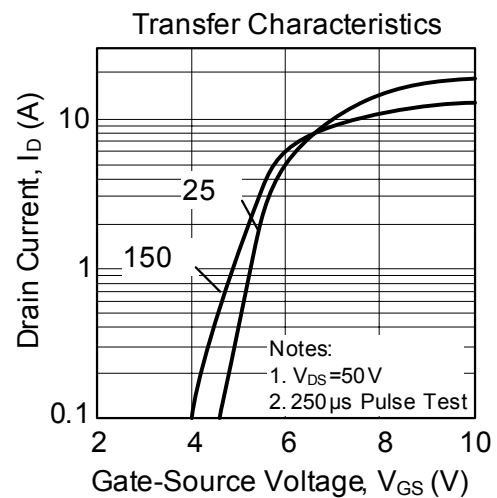
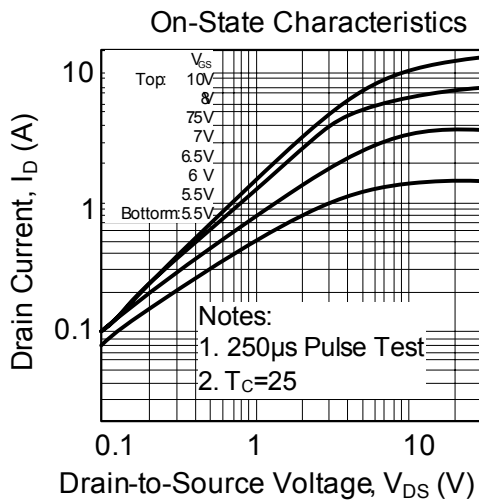
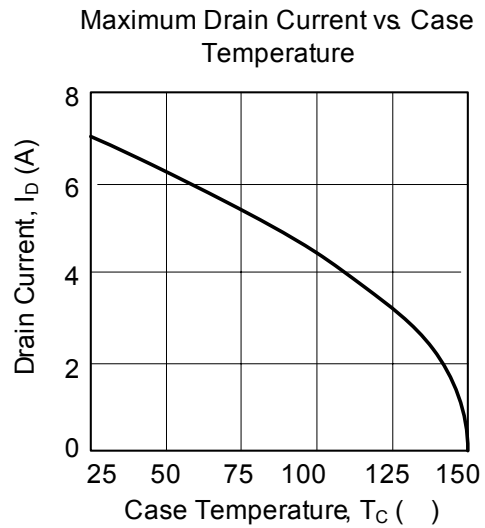
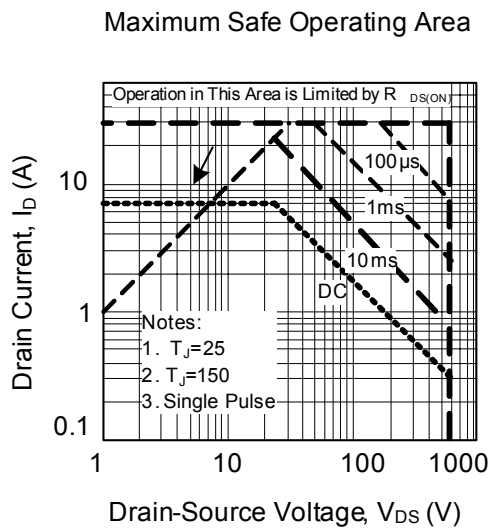
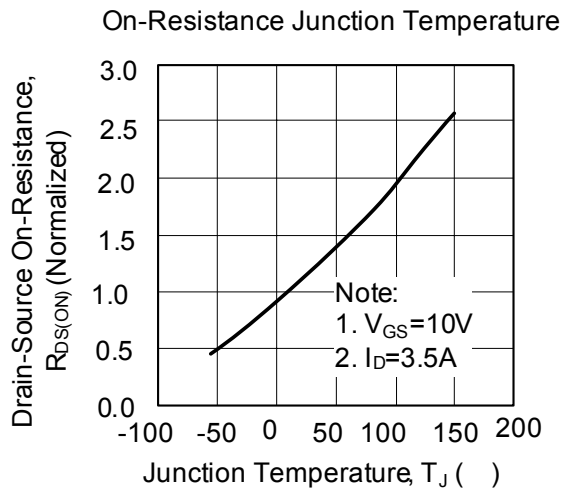
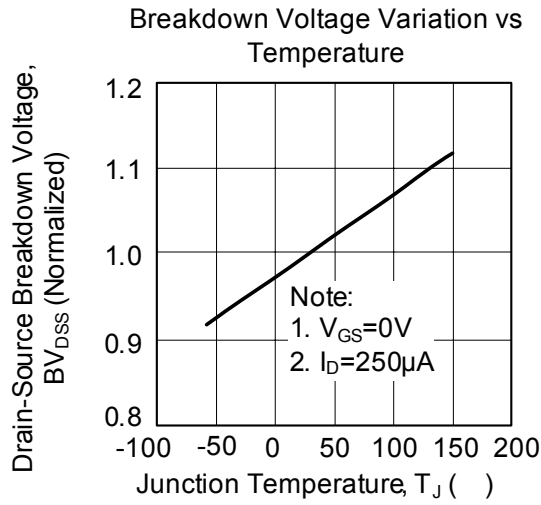


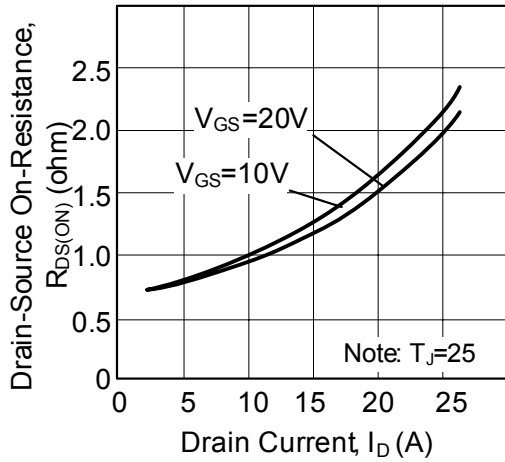
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

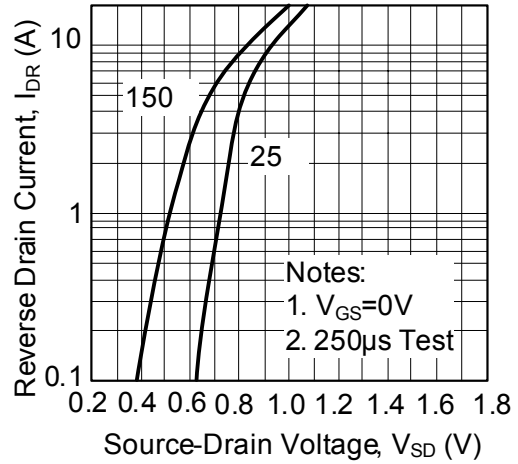


■ TYPICAL CHARACTERISTICS(Cont.)

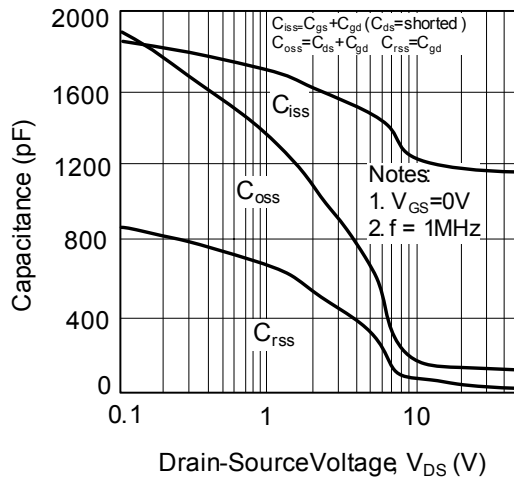
On-Resistance Variation vs Drain Current and Gate Voltage



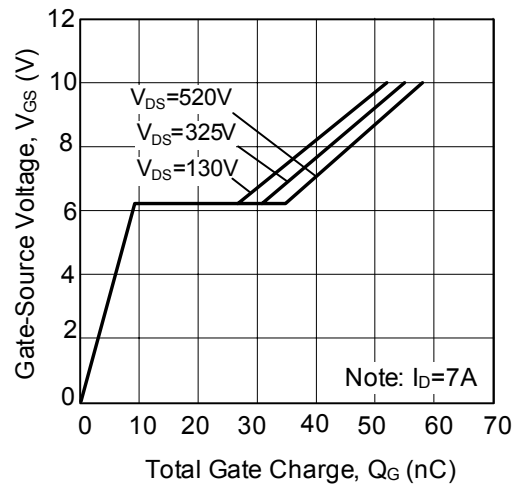
On State Current vs. Allowable Case Temperature



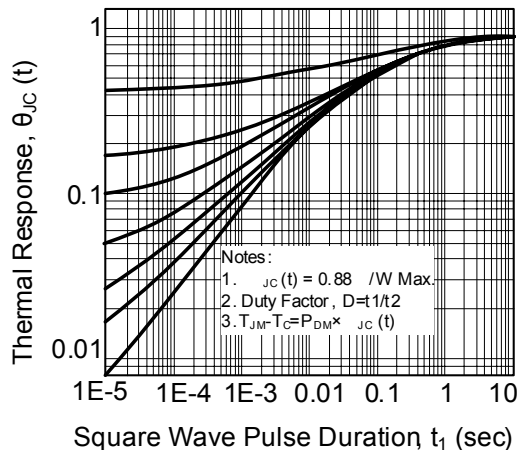
Capacitance Characteristics (Non-Repetitive)



Gate Charge Characteristics



Transient Thermal Response Curve



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