



7N70

Power MOSFET

7A, 700V N-CHANNEL POWER MOSFET

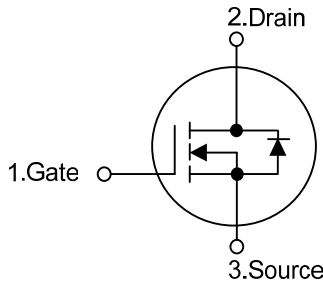
■ DESCRIPTION

The **UTC 7N70** is a high voltage power 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

- * $R_{DS(ON)} < 1.6\Omega @ V_{GS} = 10V$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

■ SYMBOL

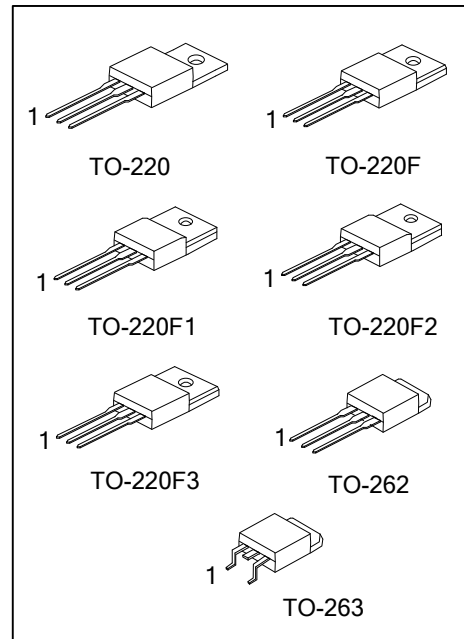


■ ORDERING INFORMATION

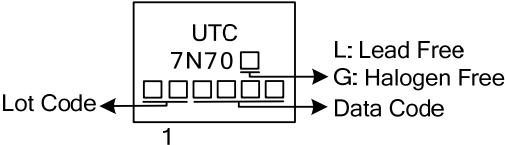
Order Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N70L-TA3-T	7N70G-TA3-T	TO-220	G	D	S	Tube
7N70L-TF3-T	7N70G-TF3-T	TO-220F	G	D	S	Tube
7N70L-TF1-T	7N70G-TF1-T	TO-220F1	G	D	S	Tube
7N70L-TF2-T	7N70G-TF2-T	TO-220F2	G	D	S	Tube
7N70L-TF3T-T	7N70G-TF3T-T	TO-220F3	G	D	S	Tube
7N70L-T2Q-T	7N70G-T2Q-T	TO-262	G	D	S	Tube
7N70L-TQ2-T	7N70G-TQ2-T	TO-263	G	D	S	Tube
7N70L-TQ2-R	7N70G-TQ2-R	TO-263	G	D	S	Tape Reel

Note: Pin Assignment: G: Gate D: Drain S: Source

<p>7N70L-TA3-T</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220 ,TF3: TO-220F, TF1: TO-220F1, TF3T: TO-220F3, T2Q: TO-262, TQ2: TO-263 (3) L: Lead Free, G: Halogen Free</p>
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MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	700	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	I_D	7.0	A
	$T_C = 100^\circ\text{C}$		4.7	A
Drain Current Pulsed (Note 2)		I_{DM}	28	A
Avalanche Energy, Single Pulsed (Note 3)		E_{AS}	530	mJ
Avalanche Energy, Repetitive, Limited by T_{JMAX}		E_{AR}	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation ($T_C = 25^\circ\text{C}$)	TO-220F/TO-220F1 TO-220F3	P_D	48	W
	TO-220/TO-262 TO-263		142	W
	TO-220F2		50	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ\text{C}$

Notes: 1. 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.

2. Repetitive Rating : Pulse width limited by T_J

3. $L=19.5\text{mH}$, $I_{AS}=7.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=0\ \Omega$, Starting $T_J=25^\circ\text{C}$

4. $I_{SD} \leq 7.0\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1 TO-220F3	θ_{JC}	2.6	$^\circ\text{C}/\text{W}$
	TO-220/TO-262 TO-263		0.88	$^\circ\text{C}/\text{W}$
	TO-220F2		2.5	$^\circ\text{C}/\text{W}$

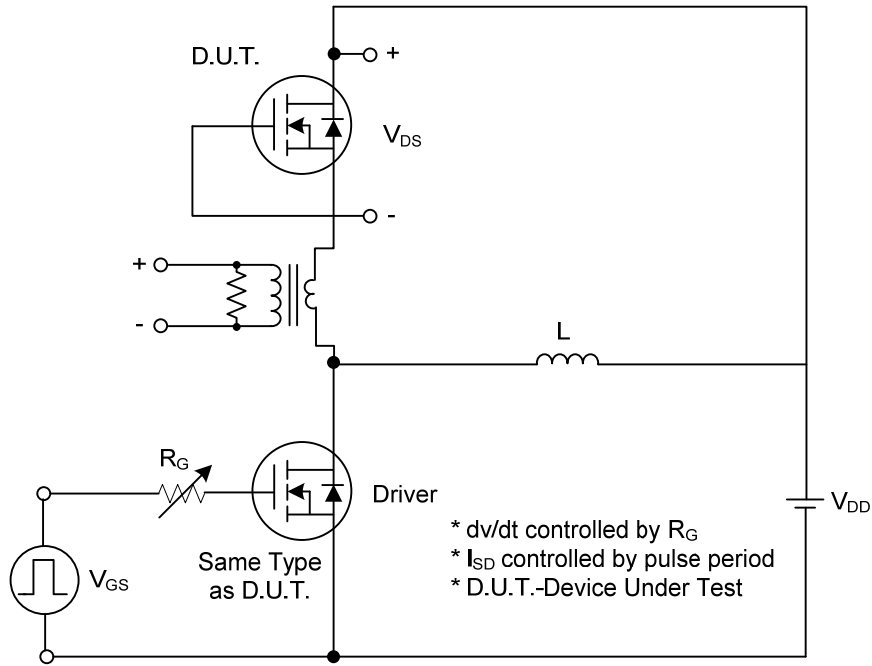
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	700			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 700V, V _{GS} = 0V			1	μA
		V _{DS} = 560V, T _C = 125°C			1	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} = 30V, V _{DS} = 0V		100	nA
	Reverse			V _{GS} = -30V, V _{DS} = 0V		-100
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D = 250mA Referenced to 25°C		0.67		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250μA	2.0		4.0	V
Drain-Source ON-State Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 3.5A		1.4	1.6	Ω
Forward Transconductance (Note 1)	g _{FS}	V _{DS} = 40V, I _D = 3.5A		8.0		S
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz		1200	1600	pF
Output Capacitance	C _{OSS}			150	190	pF
Reverse Transfer Capacitance	C _{RSS}			60	80	pF
SWITCHING CHARACTERISTICS						
Turn-on Delay Time	t _{D(ON)}	V _{DD} = 30V, I _D = 1A (Note 1, 2)		60	80	ns
Turn-on Rise Time	t _R			200	230	ns
Turn-off Delay Time	t _{D(OFF)}			280	350	ns
Turn-off Fall Time	t _F			250	300	ns
Total Gate Charge	Q _G	V _{DS} = 100V, I _D = 7.0A, V _{GS} = 10V (Note 1, 2)		163		nC
Gate-Source Charge	Q _{GS}			12		nC
Gate-Drain Charge	Q _{DD}			30		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 7.0A			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} = 0V, I _S = 7.0A, dI _F /dt = 100 A/μs (Note 1)		320		ns
Reverse Recovery Charge	Q _{RR}				2.4	

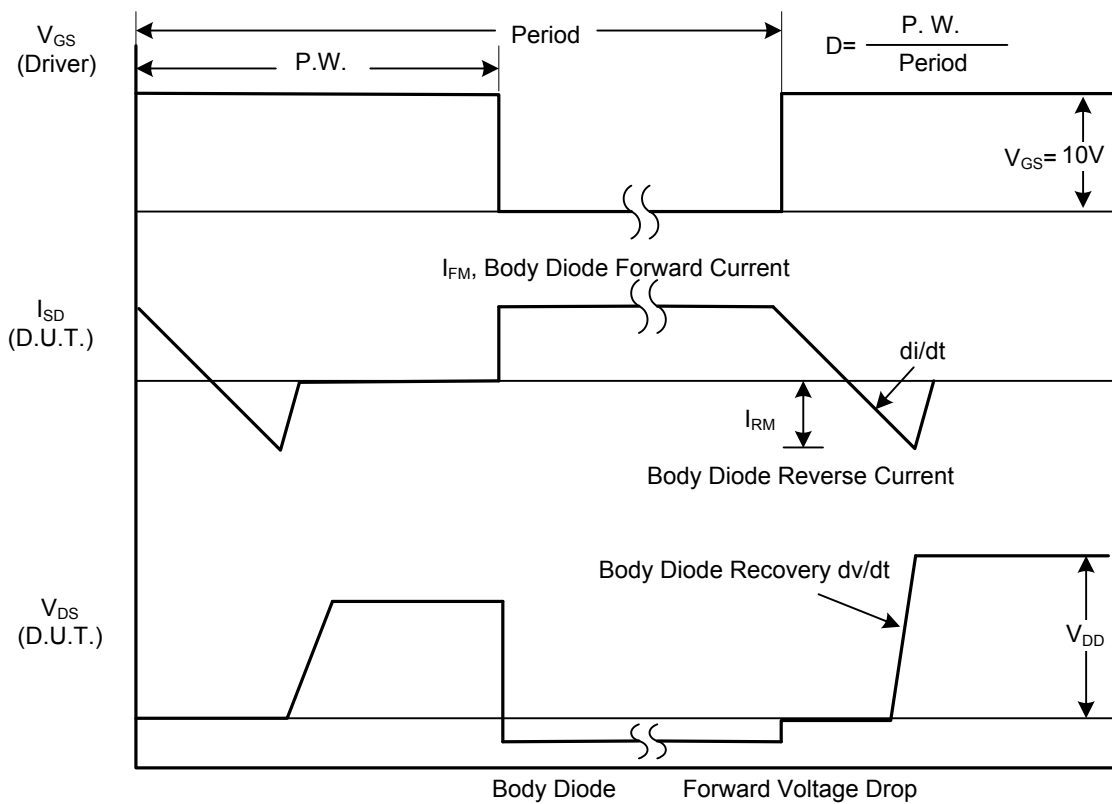
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

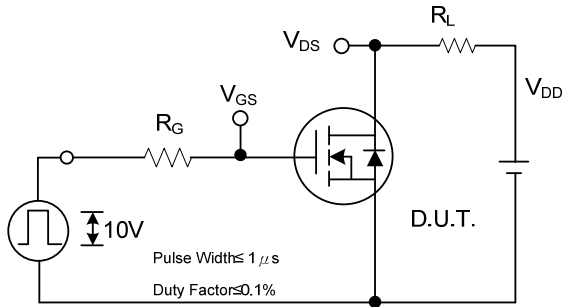


Peak Diode Recovery dv/dt Test Circuit

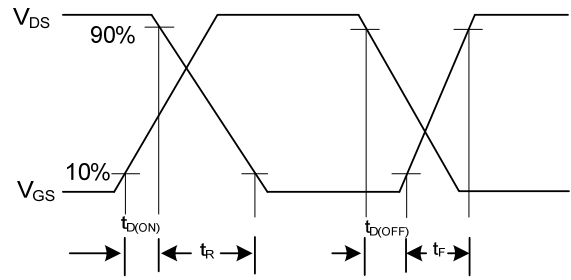


Peak Diode Recovery dv/dt Waveforms

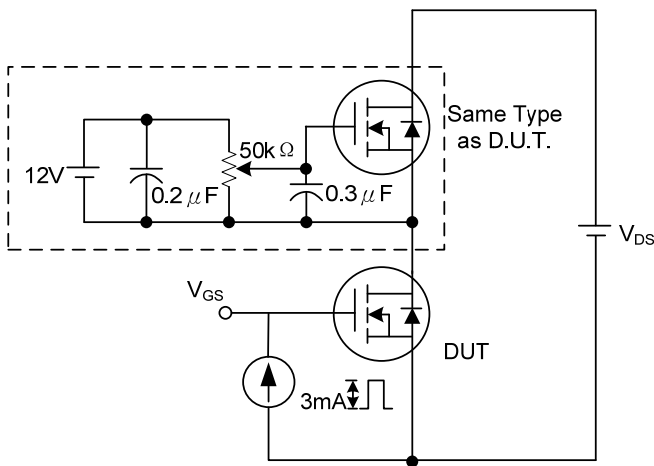
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



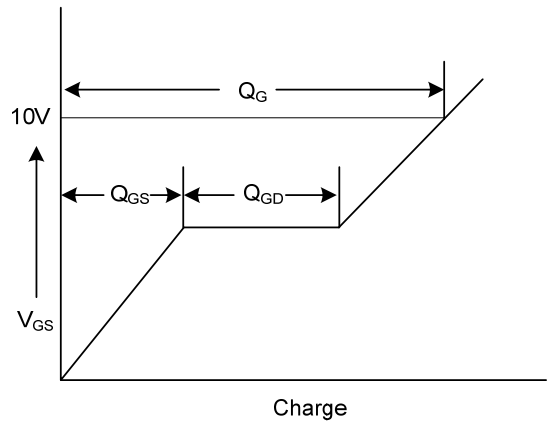
Switching Test Circuit



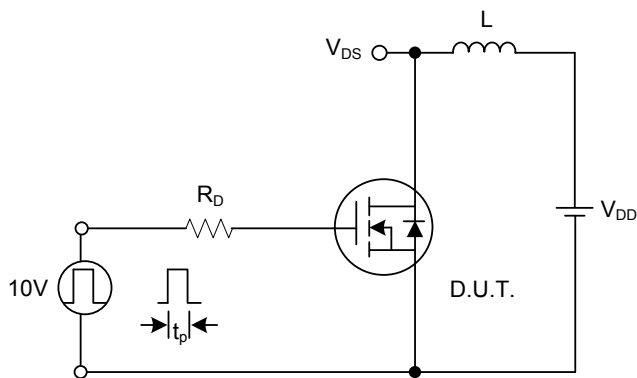
Switching Waveforms



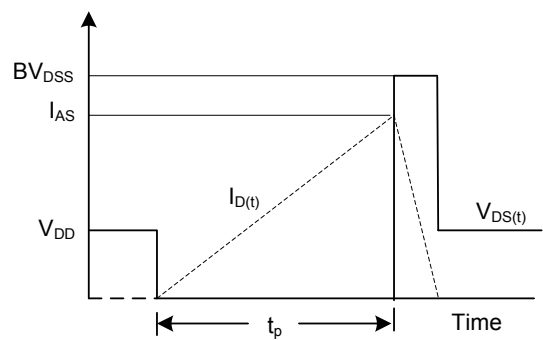
Gate Charge Test Circuit



Gate Charge Waveform

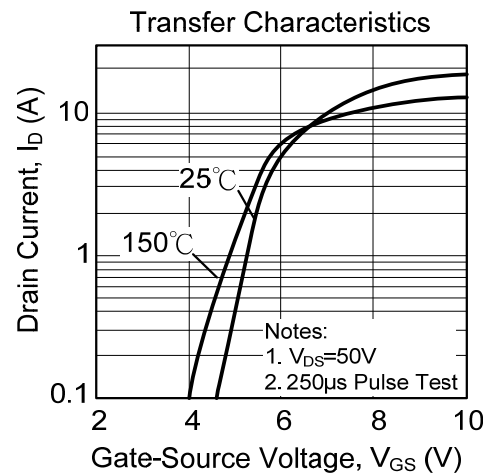
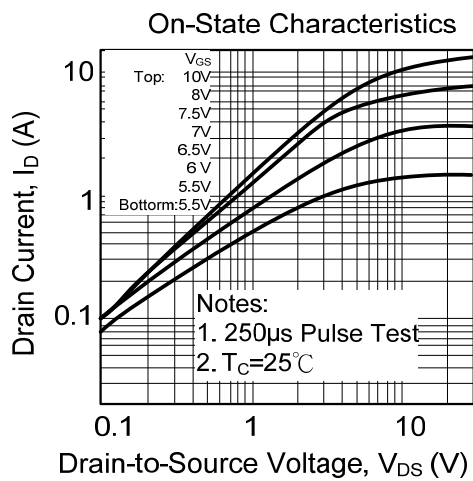
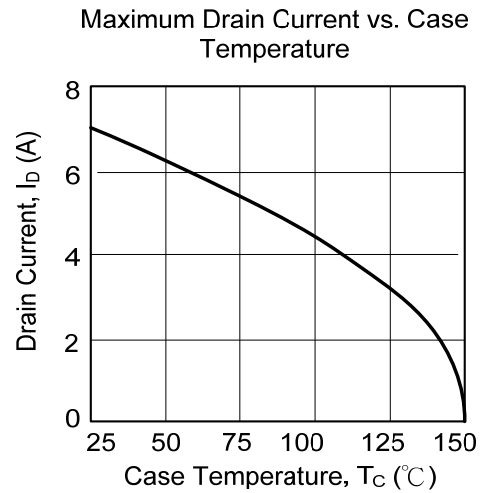
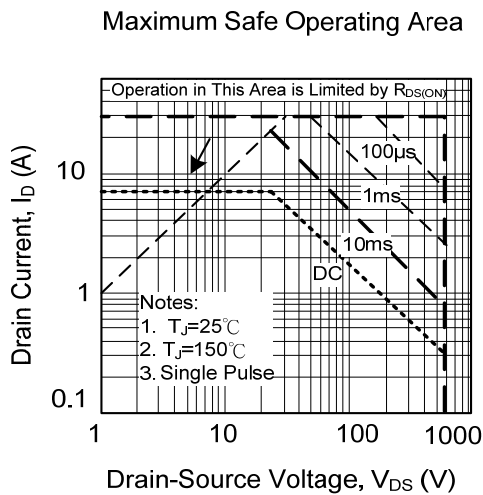
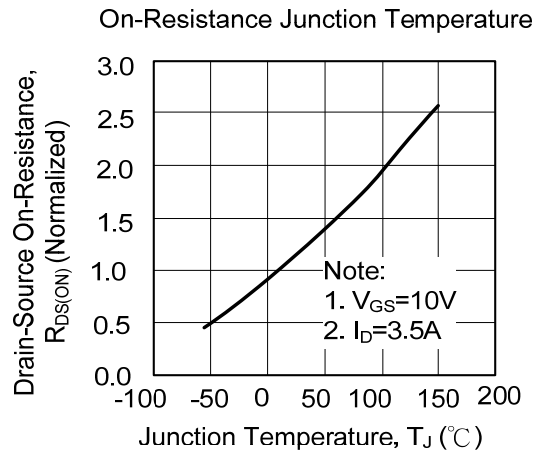
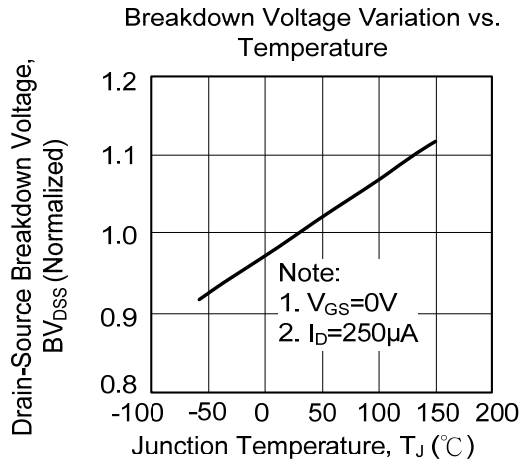


Unclamped Inductive Switching Test Circuit

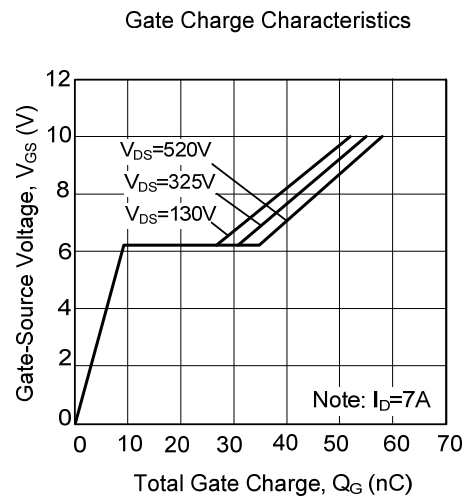
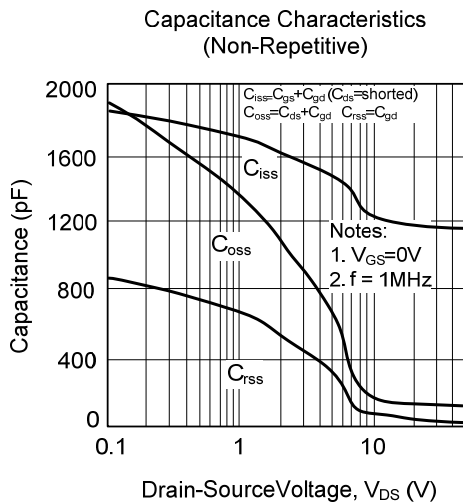
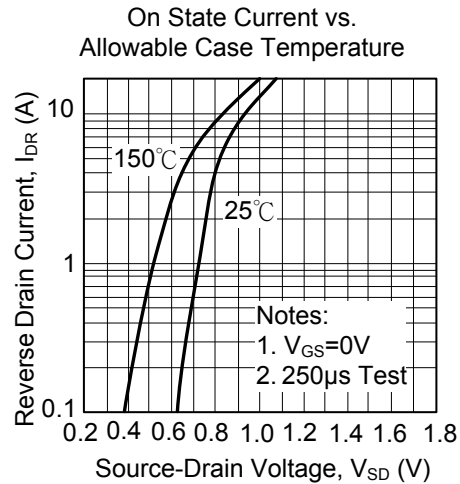
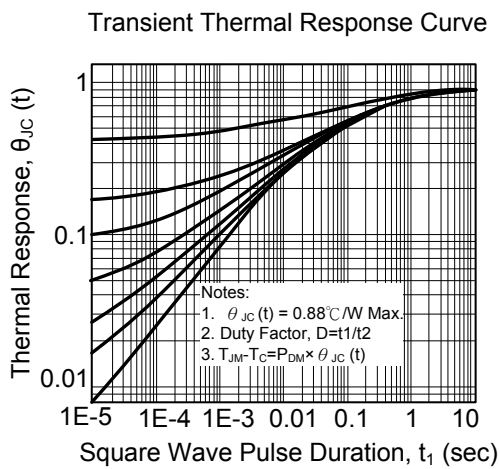


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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