



10NM70

Power MOSFET

10A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

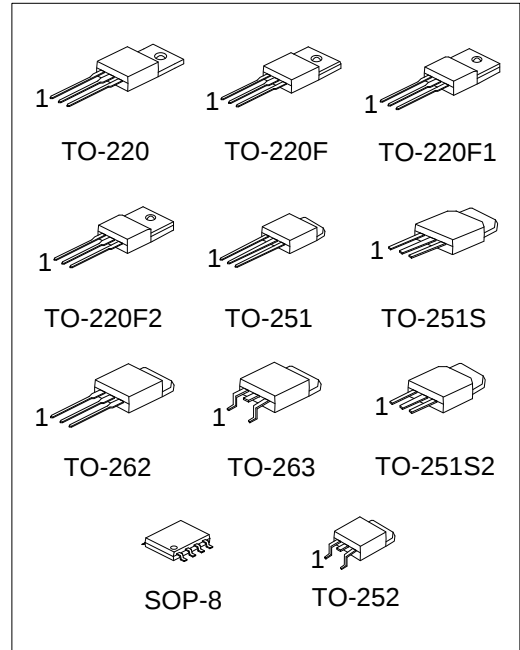
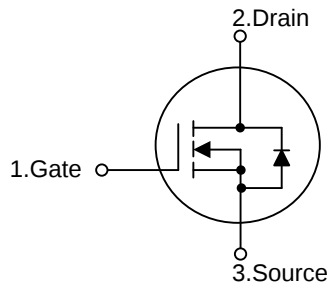
■ DESCRIPTION

The **UTC 10NM70** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

■ FEATURES

- * $R_{DS(ON)} \leq 0.6 \Omega$ @ $V_{GS}=10V$, $I_D=5.0A$
- * By using Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested

■ SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
10NM70L-TA3-T	10NM70G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
10NM70L-TF1-T	10NM70G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
10NM70L-TF2-T	10NM70G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	Tube
10NM70L-TF3-T	10NM70G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
10NM70L-TM3-T	10NM70G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
10NM70L-TMS-T	10NM70G-TMS-T	TO-251S	G	D	S	-	-	-	-	-	Tube
10NM70L-TMS2-T	10NM70G-TMS2-T	TO-251S2	G	D	S	-	-	-	-	-	Tube
10NM70L-TN3-R	10NM70G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
10NM70L-T2Q-T	10NM70G-T2Q-T	TO-262	G	D	S	-	-	-	-	-	Tube
10NM70L-TQ2-T	10NM70G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	Tube
10NM70L-TQ2-R	10NM70G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	Tape Reel
10NM70L-S08-R	10NM70G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel

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

10NM70G-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TN3: TO-252, T2Q: TO-262, S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

TO-220 / TO-220F / TO-220F1 TO-220F2 / TO-251 / TO-251S TO-251S2 / TO-252 / TO-262 / TO-263	SOP-8
UTC 10NM70 L: Lead Free G: Halogen Free Date Code Lot Code 1	8 7 6 5 UTC 10NM70 Date Code L: Lead Free G: Halogen Free Lot Code 1 2 3 4

■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V _{DSS}	700	V
Gate to Source Voltage		V _{GSS}	±30	V
Continuous Drain Current	Continuous	I _D	10	A
Pulsed Drain Current	Pulsed (Note 2)	I _{DM}	40	A
Avalanche Current		I _{AR}	3.8	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	72	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.5	V/ns
Power Dissipation	TO-220/TO-262 TO-263	P _D	84	W
	TO-220F/TO-220F1 TO-220F2		29	W
	TO-251/TO-251S2 TO-251S/TO-252		58	W
	SOP-8		1.5	W
Junction Temperature		T _J	+150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°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 maximum junction temperature.

3. L=10mH, I_{AS}=3.8A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C.

4. I_{SD}≤10A, di/dt ≤200A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-262/TO-263	θ _{JA}	62.5	°C/W
	SOP-8		125 (Note)	
	TO-251/TO-251S2 TO-251S/TO-252		110	
Junction to Case	TO-220/TO-262 TO-263	θ _{JC}	1.48	°C/W
	TO-220F/TO-220F1 TO-220F2		5.95	
	TO-251/TO-251S2 TO-251S/TO-252		2.15 (Note)	
	SOP-8		83.3 (Note)	

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

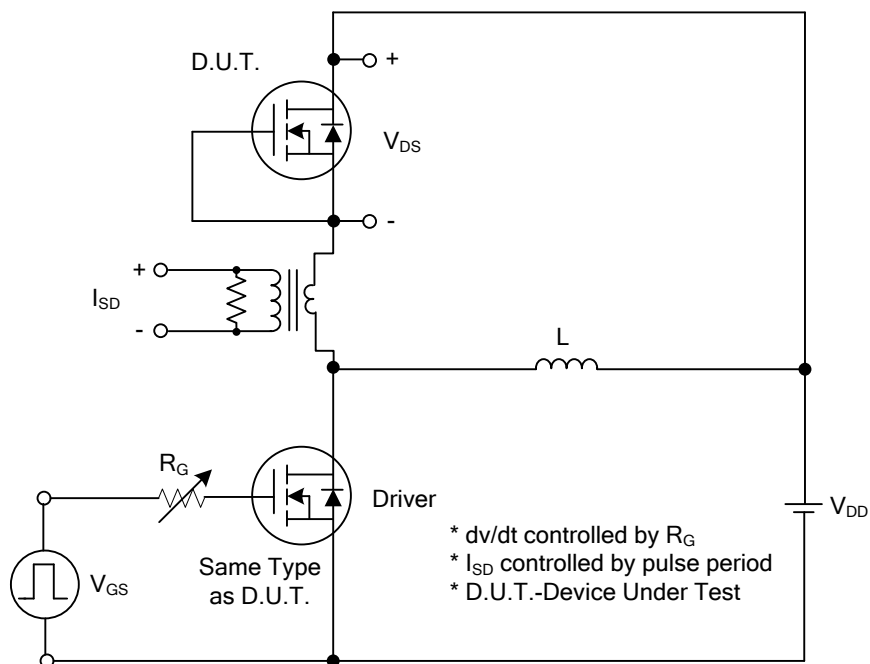
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

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			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{DS} =0V ,V _{GS} =±30V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =5.0A			0.6	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} =25V,V _{GS} =0V, f=1.0MHz		660		pF
Output Capacitance	C _{OSS}			400		pF
Reverse Transfer Capacitance	C _{RSS}			35		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =560V, V _{GS} =10V I _D =10A, I _G =1mA (Note 1,2)		24		nC
Gate to Source Charge	Q _{GS}			4.6		nC
Gate to Drain Charge	Q _{GD}			8.1		nC
Turn-ON Delay Time (Note 1)	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =10A, R _G =25Ω (Note 1, 2)		9		ns
Rise Time	t _R			21		ns
Turn-OFF Delay Time	t _{D(OFF)}			70		ns
Fall-Time	t _F			46		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				10	A
Maximum Body-Diode Pulsed Current	I _{SM}				40	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =10A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =10A, V _{GS} =0V		420		ns
Body Diode Reverse Recovery Charge	Q _{rr}	dl _F /dt=100A/μs		5.44		μC

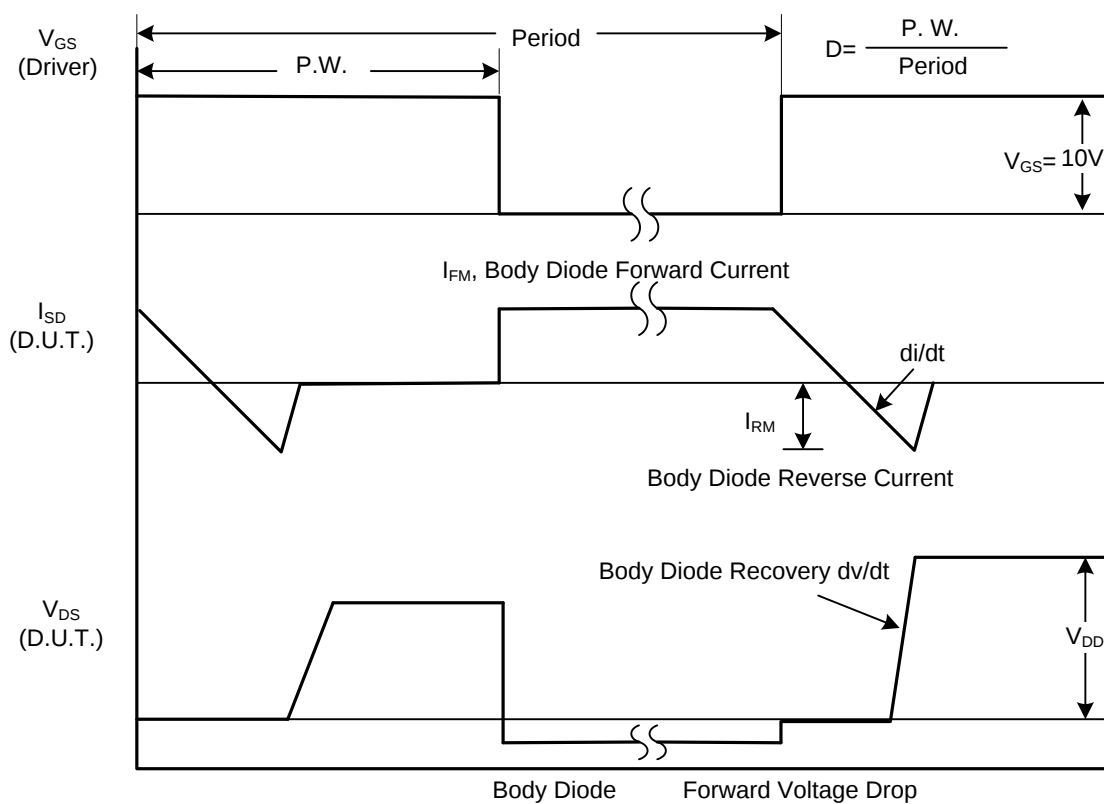
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS



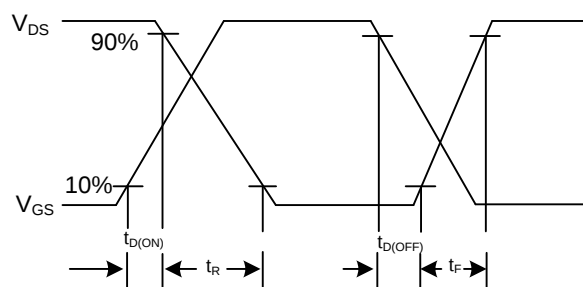
Peak Diode Recovery dv/dt Test Circuit



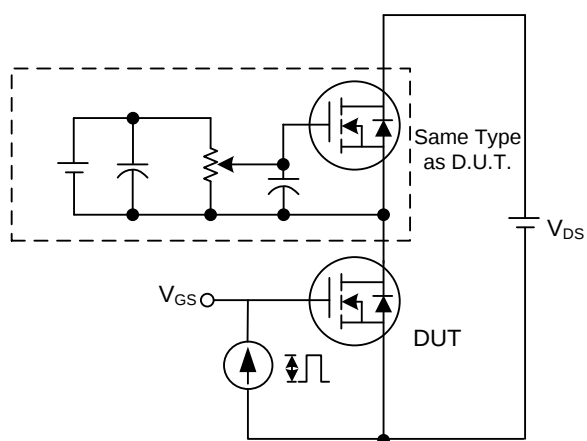
Peak Diode Recovery dv/dt Waveforms

Pulse Width $\leq 1\mu\text{s}$
Duty Factor $\leq 0.1\%$

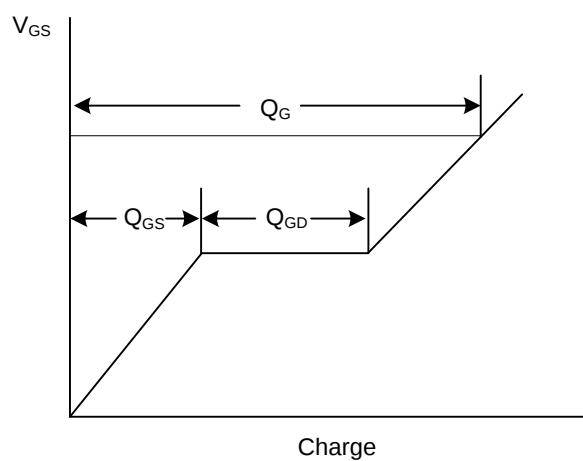
Switching Test Circuit



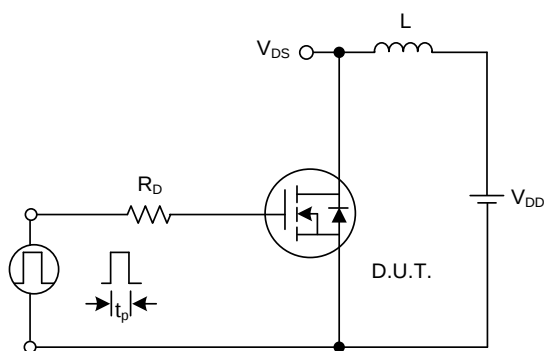
Switching Waveforms



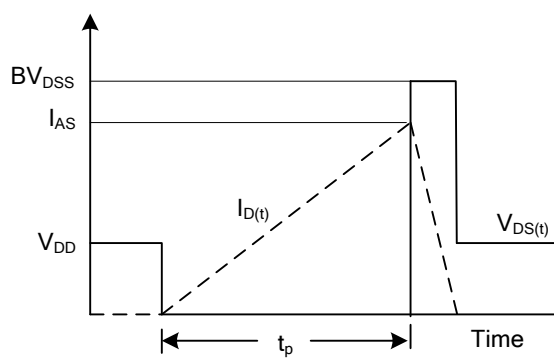
Gate Charge Test Circuit



Gate Charge Waveform

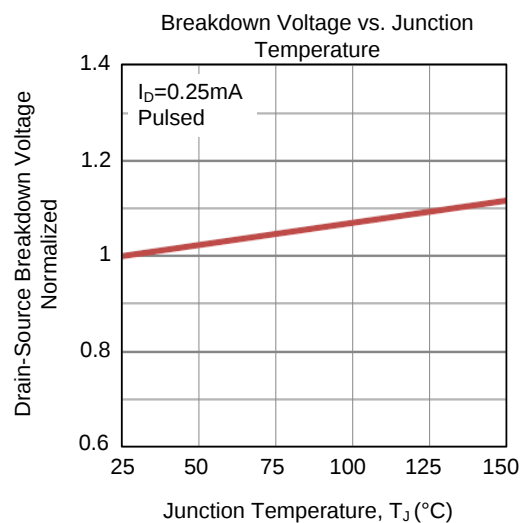
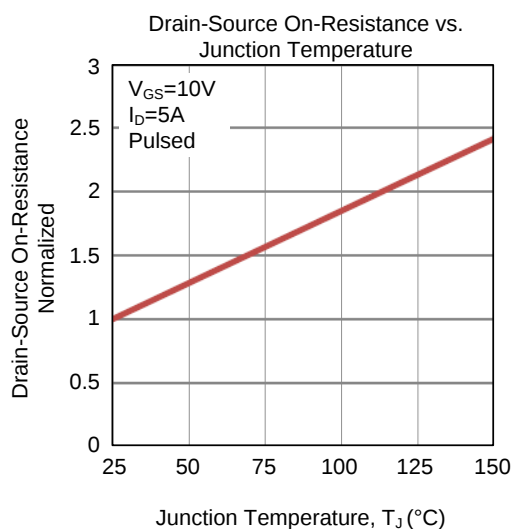
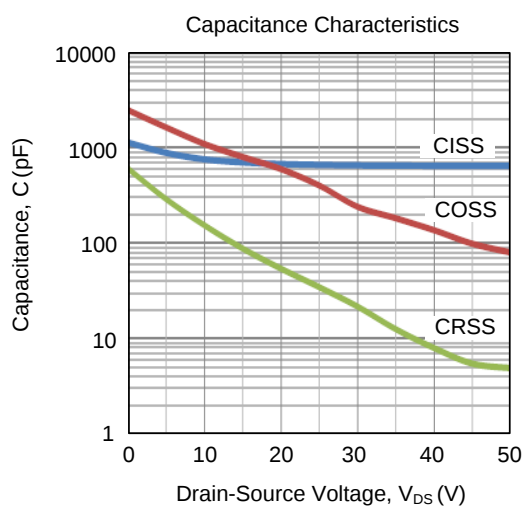
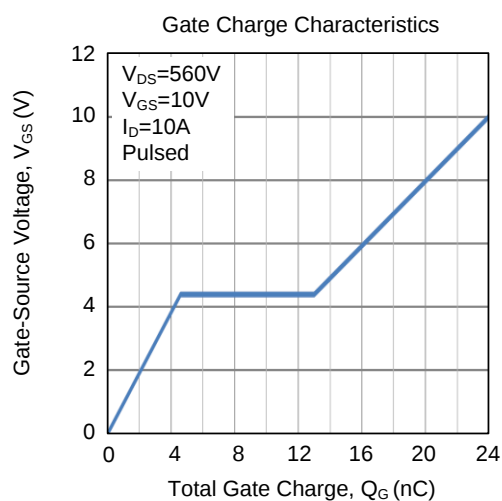
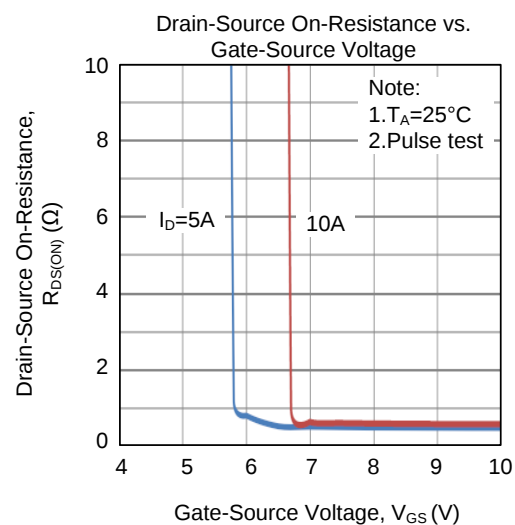
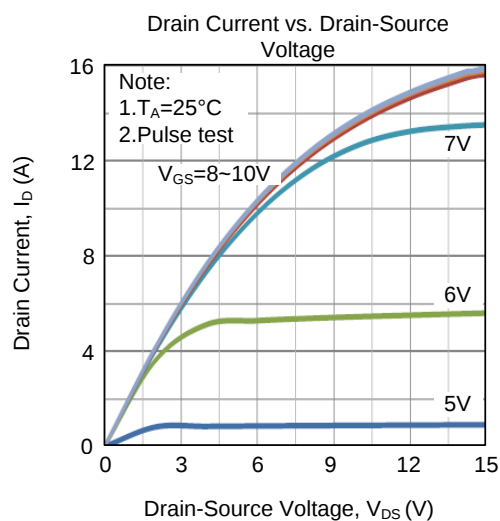


Unclamped Inductive Switching Test Circuit

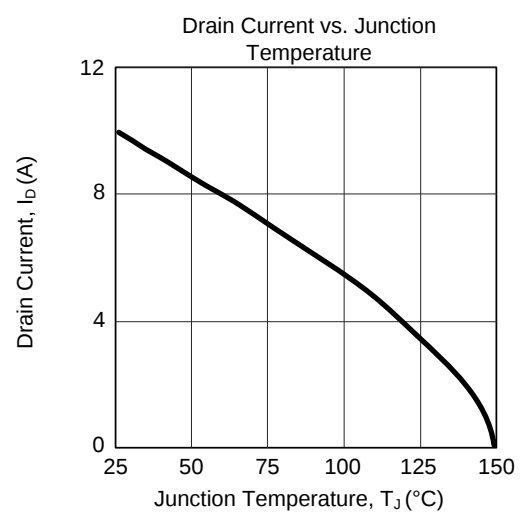
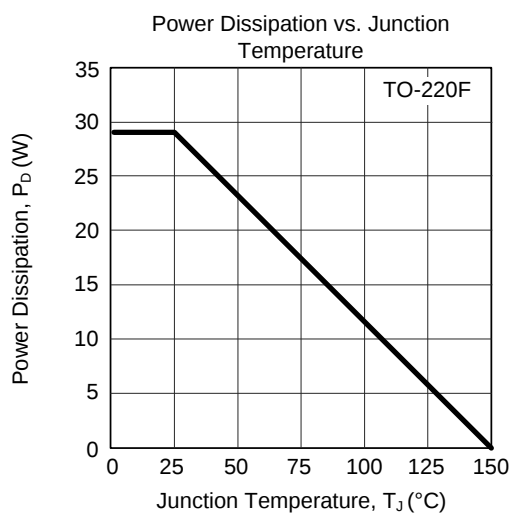
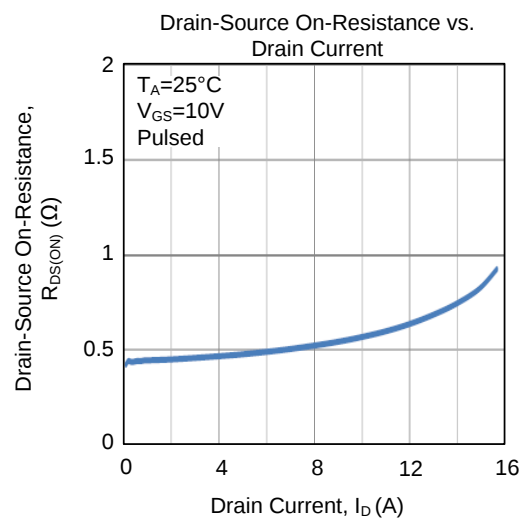
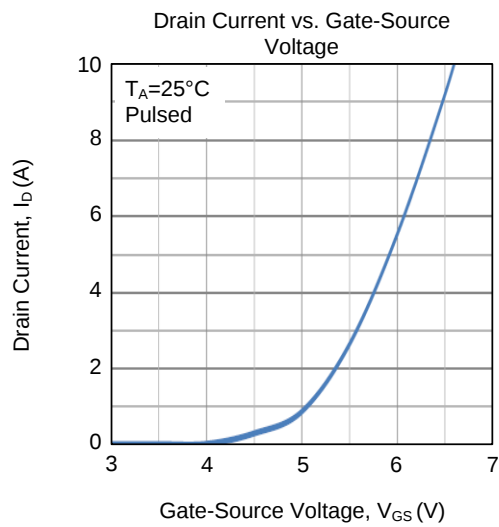
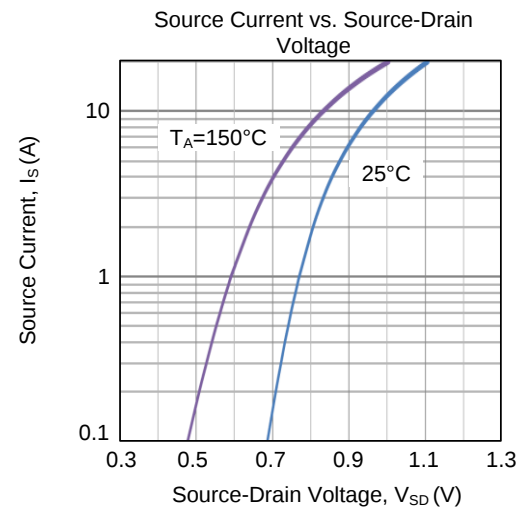
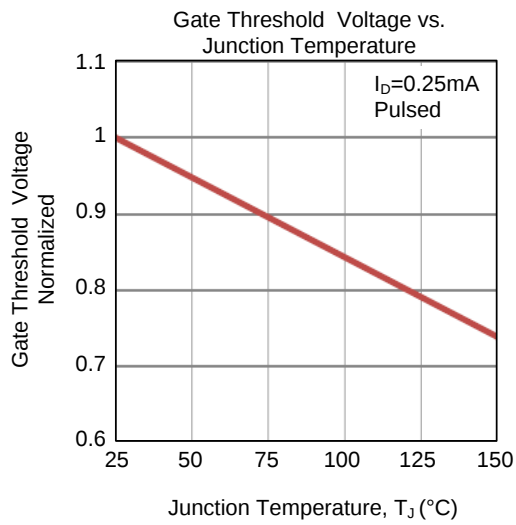


Unclamped Inductive Switching Waveforms

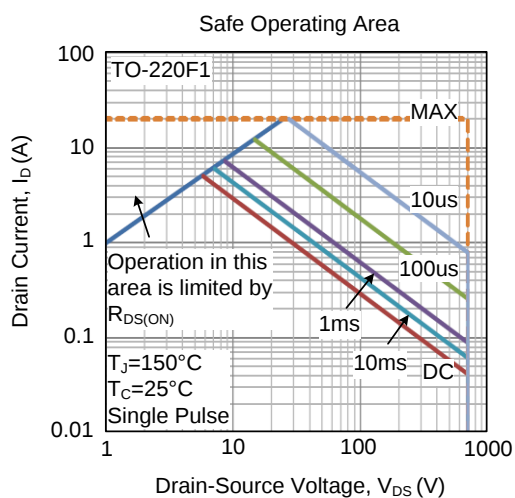
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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