

18N60-ML

Power MOSFET

18A, 600V N-CHANNEL POWER MOSFET

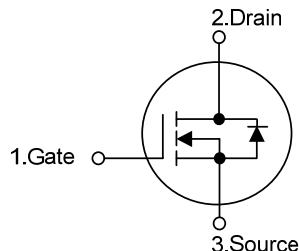
■ DESCRIPTION

The UTC **18N60-ML** is a high voltage power MOSFET combines advanced planar MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

■ FEATURES

- * $R_{DS(ON)} \leq 0.4 \Omega$ @ $V_{GS}=10V$, $I_D=9.0A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

■ SYMBOL



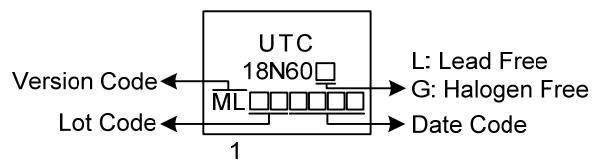
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
18N60L-ML-TF1-T	18N60G-ML-TF1-T	TO-220F1	G	D	S	Tube
18N60L-ML-TF2-T	18N60G-ML-TF2-T	TO-220F2	G	D	S	Tube
18N60L-ML-T3P-T	18N60G-ML-T3P-T	TO-3P	G	D	S	Tube
18N60L-ML-T3N-T	18N60G-ML-T3N-T	TO-3PN	G	D	S	Tube

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

18N60G-ML-TF1-T 	(1)Packing Type (2)Package Type (3)Version Code (4)Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, T3P: TO-3P, T3N: TO-3N (3) Version ML (4) G: Halogen Free and Lead Free, L: Lead Free
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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}	600	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current		I_D	18	A
Pulsed Drain Current (Note 2)		I_{DM}	36	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	1010	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3	V/ns
Power Dissipation	TO-220F1/TO-220F2	P_D	42	W
	TO-3P/TO-3PN		280	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 maximum junction temperature.

3. $L = 30\text{mH}$, $I_{AS} = 8.2\text{A}$, $V_{DD} = 100\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 18\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220F1/TO-220F2	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-3P/TO-3PN		40	$^\circ\text{C/W}$
Junction to Case	TO-220F1/TO-220F2	θ_{JC}	2.98	$^\circ\text{C/W}$
	TO-3P/TO-3PN		0.45	$^\circ\text{C/W}$

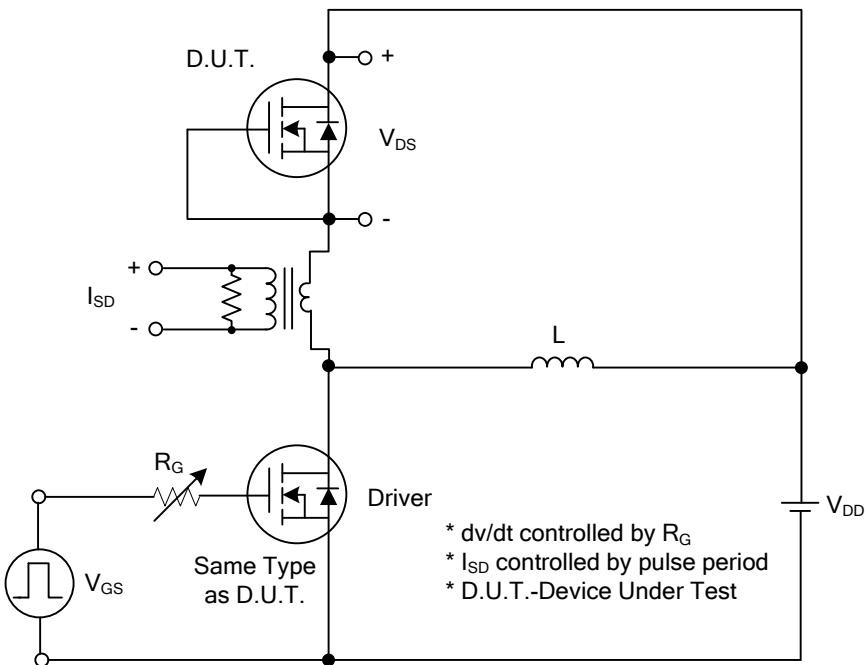
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{\text{GS}}=0\text{V}, I_{\text{D}}=250\mu\text{A}$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{\text{DS}}=600\text{V}, V_{\text{GS}}=0\text{V}$		10		μA
Gate- Source Leakage Current	Forward	$V_{\text{GS}}=30\text{V}, V_{\text{DS}}=0\text{V}$		100		nA
	Reverse	$V_{\text{GS}}=-30\text{V}, V_{\text{DS}}=0\text{V}$		-100		nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{\text{DS}(\text{ON})}$	$V_{\text{GS}}=10\text{V}, I_{\text{D}}=9.0\text{A}$			0.4	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{\text{DS}}=25\text{V}, V_{\text{GS}}=0\text{V}, f=1.0\text{MHz}$		3000		pF
Output Capacitance	C_{OSS}			272		pF
Reverse Transfer Capacitance	C_{RSS}			10		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{\text{DS}}=480\text{V}, V_{\text{GS}}=10\text{V}, I_{\text{D}}=18\text{A}$ $I_G=1\text{mA}$ (Note 1, 2)		67		nC
Gate-Source Charge	Q_{GS}			21		nC
Gate-Drain Charge	Q_{GD}			17		nC
Turn-On Delay Time (Note 1)	$t_{\text{D}(\text{ON})}$	$V_{\text{DS}}=100\text{V}, V_{\text{GS}}=10\text{V}, I_{\text{D}}=18\text{A},$ $R_G=25\Omega$ (Note 1, 2)		40		ns
Turn-On Rise Time	t_R			22		ns
Turn-Off Delay Time	$t_{\text{D}(\text{OFF})}$			180		ns
Turn-Off Fall Time	t_F			42		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Body-Diode Continuous Current	I_S				18	A
Maximum Body-Diode Pulsed Current	I_{SM}				36	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=18\text{A}, V_{\text{GS}}=0\text{V}$			1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	$I_S=18\text{A}, V_{\text{GS}}=0\text{V}$		450		ns
Reverse Recovery Charge	Q_{rr}	$dI/dt=100\text{A}/\mu\text{s}$		15.6		μC

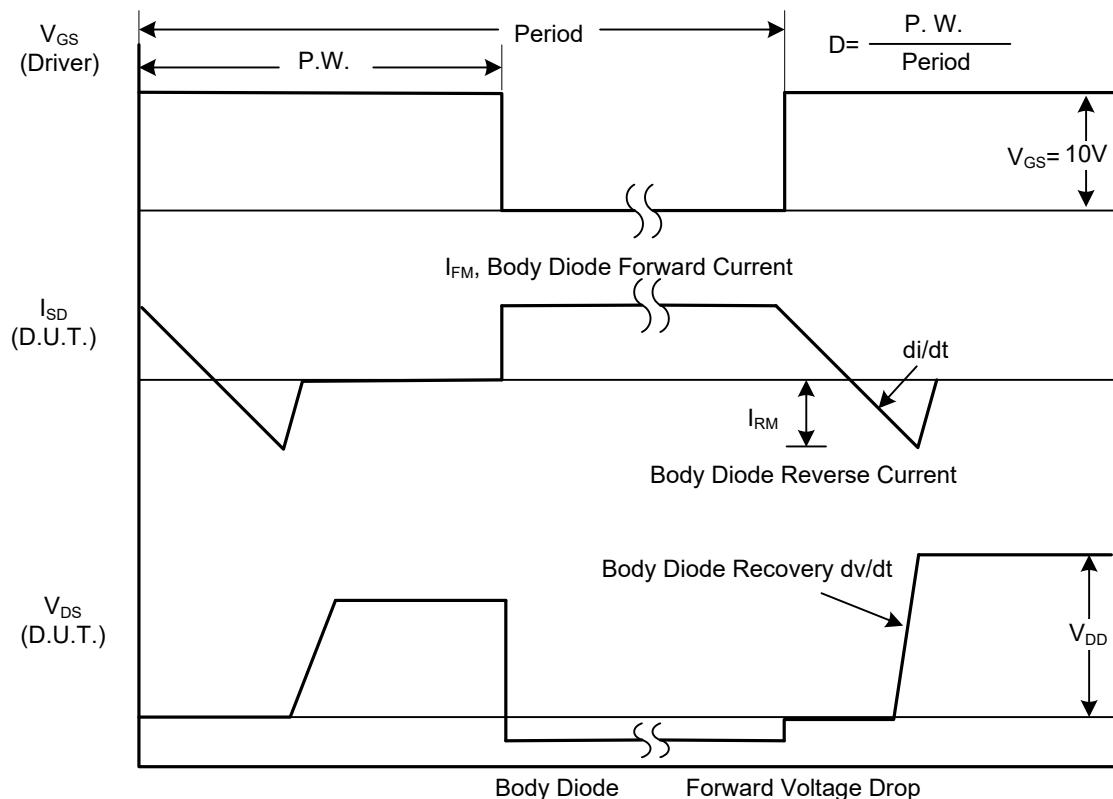
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

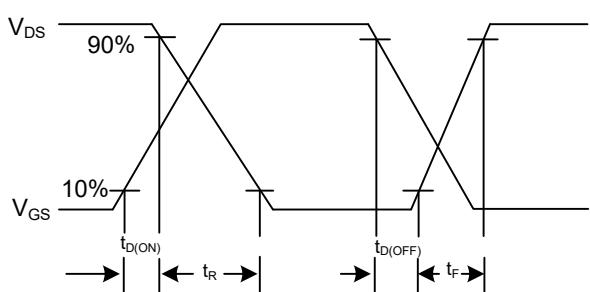
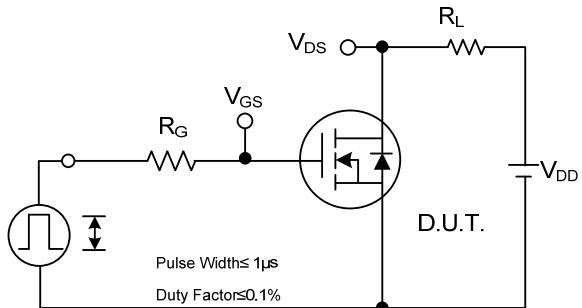


Peak Diode Recovery dv/dt Test Circuit



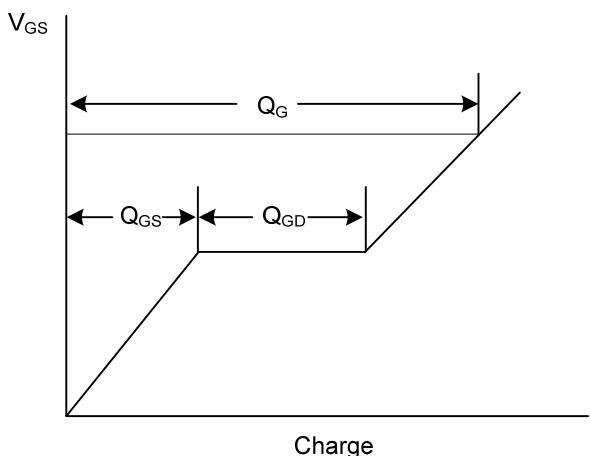
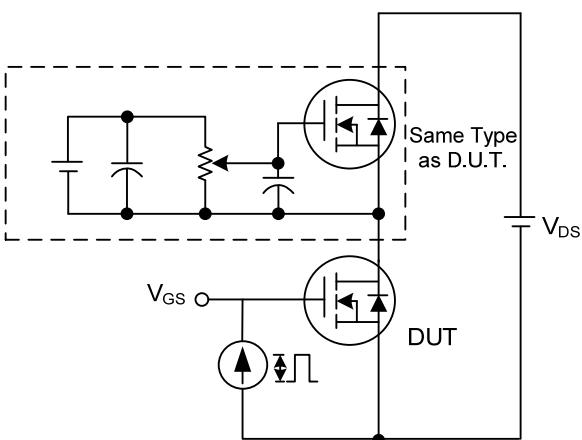
Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS



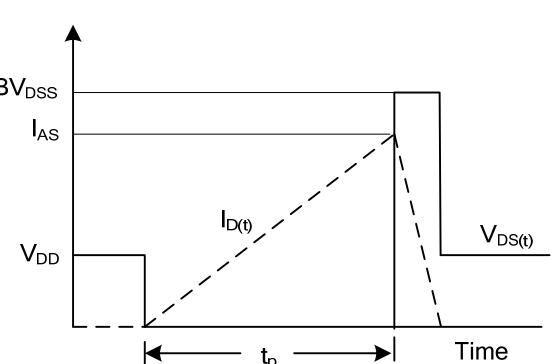
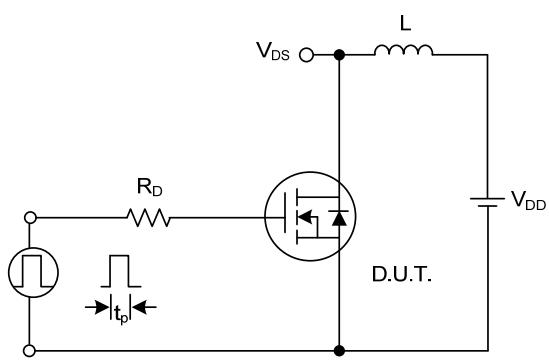
Switching Test Circuit

Switching Waveforms



Gate Charge Test Circuit

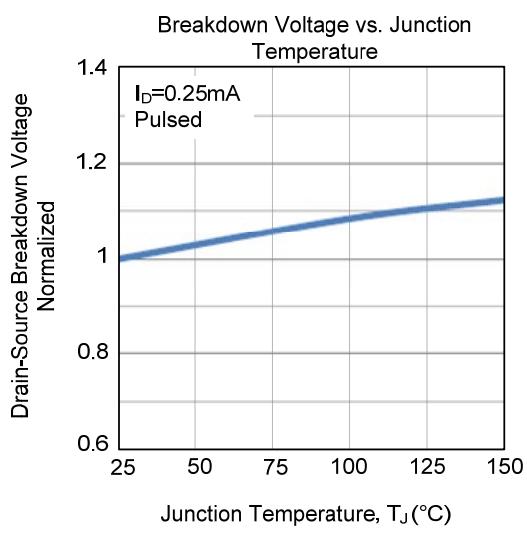
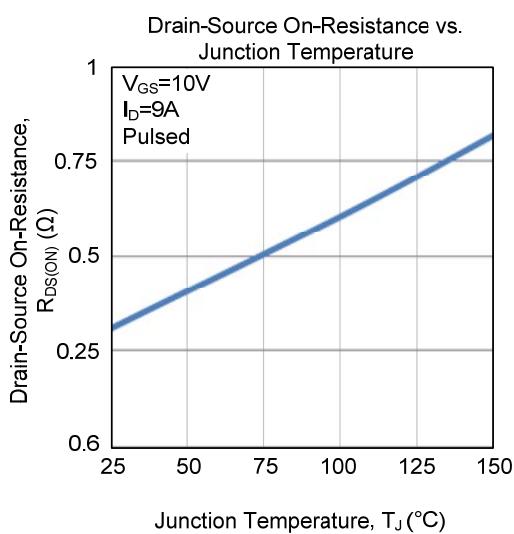
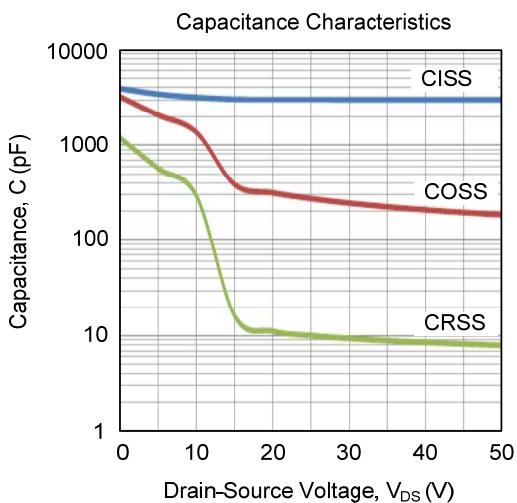
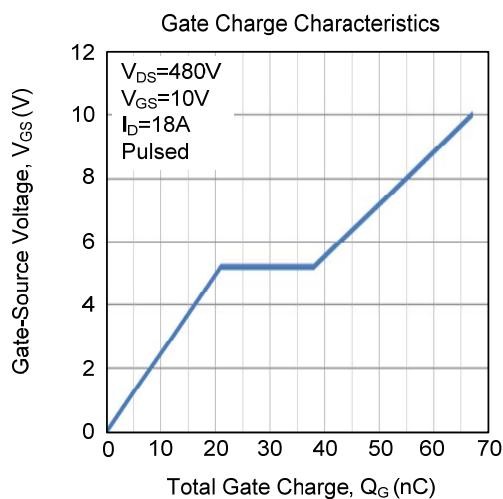
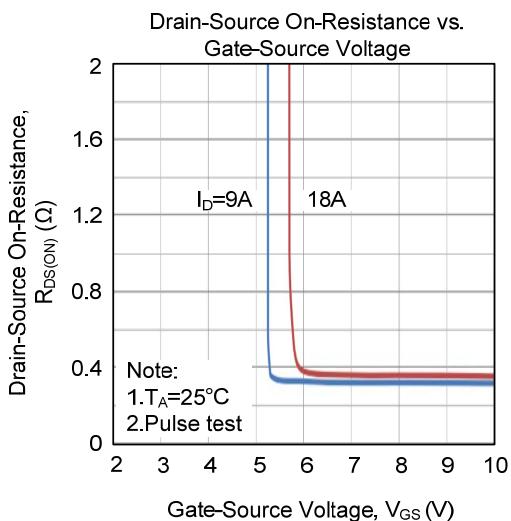
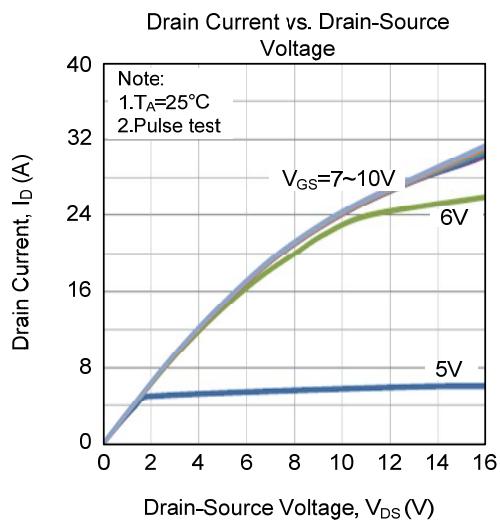
Gate Charge Waveform



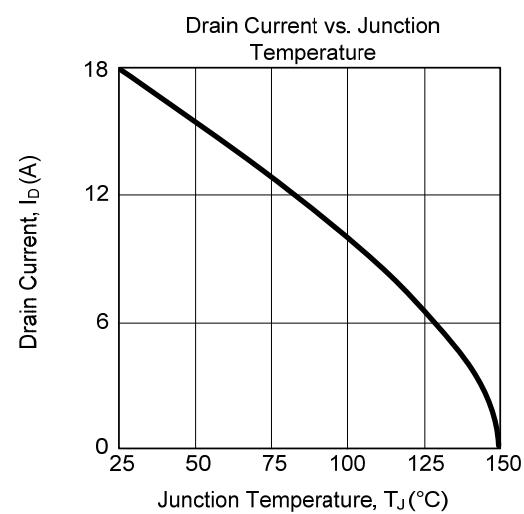
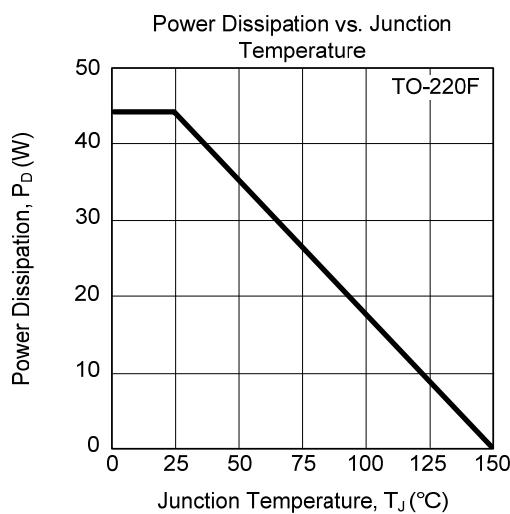
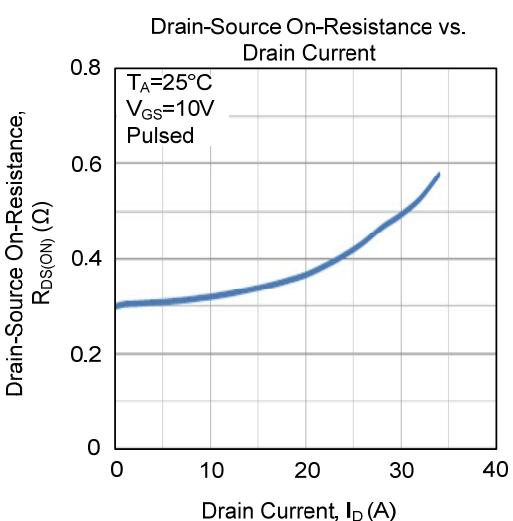
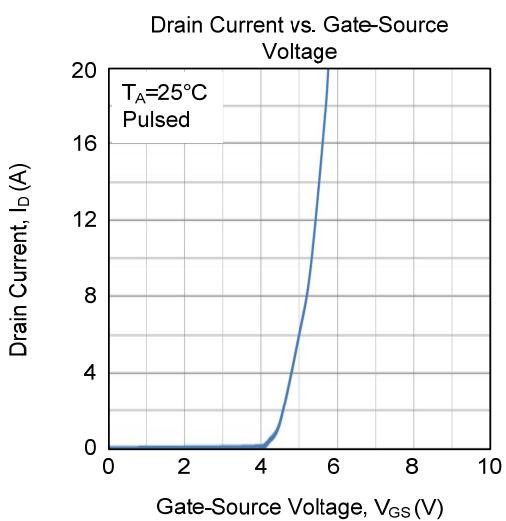
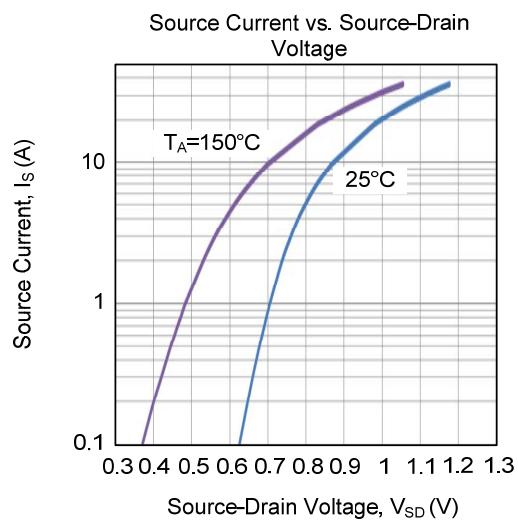
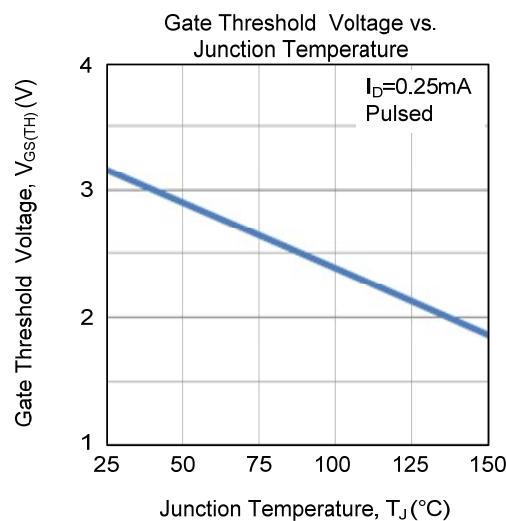
Unclamped Inductive Switching Test Circuit

Unclamped Inductive Switching Waveforms

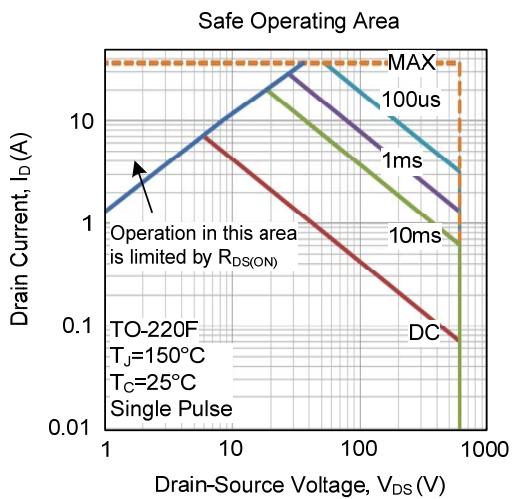
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



- TYPICAL CHARACTERISTICS (Cont.)



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