

# 8NM60A

**Power MOSFET**

## 8A, 600V N-CHANNEL POWER MOSFET

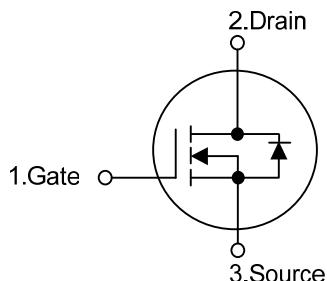
### ■ DESCRIPTION

The UTC **8NM60A** is a high voltage super junction 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 switching power supplies and adaptors.

### ■ FEATURES

- \*  $R_{DS(ON)} \leq 0.65\Omega$  @  $V_{GS}=10V$ ,  $I_D=4.0A$
- \* Fast Switching Capability
- \* Improved dv/dt Capability, High Ruggedness

### ■ SYMBOL



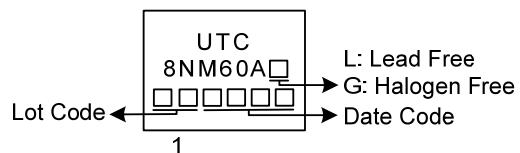
### ■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
8NM60AL-TF1-T	8NM60AG-TF1-T	TO-220F1	G	D	S	Tube
8NM60AL-TM3-T	8NM60AG-TM3-T	TO-251	G	D	S	Tube
8NM60AL-TN3-R	8NM60AG-TN3-R	TO-252	G	D	S	Tape Reel
8NM60AL-TQ2-T	8NM60AG-TQ2-T	TO-263	G	D	S	Tube
8NM60AL-TQ2-R	8NM60AG-TQ2-R	TO-263	G	D	S	Tape Reel

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

8NM60AG-TF1-T 	(1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TM3: TO-251, TN3: TO-252 TQ2: TO-263 (3) 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	8.0	A
	Pulsed (Note 2)	$I_{DM}$	16	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	51.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.5	V/ns
Power Dissipation	TO-263	$P_D$	80	W
	TO-220F1		28	W
	TO-251/TO-252		54	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=10mH,  $I_{AS}=3.2\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 8.0\text{A}$ ,  $dI/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-263/TO-220F1	$\theta_{JA}$	62.5	$^\circ\text{C/W}$
	TO-251/TO-252		110	$^\circ\text{C/W}$
Junction to Case	TO-263	$\theta_{JC}$	1.56	$^\circ\text{C/W}$
	TO-220F1		4.46	$^\circ\text{C/W}$
	TO-251/TO-252		2.31 (Note)	$^\circ\text{C/W}$

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

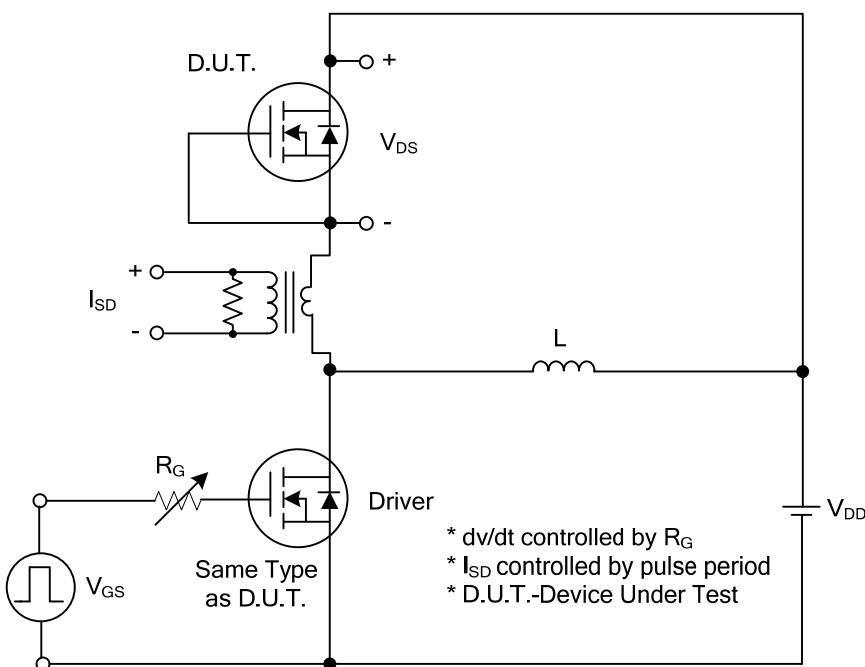
■ ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	$V_{\text{GS}} = 0\text{V}, I_{\text{D}} = 250\mu\text{A}$	600			V
Drain-Source Leakage Current	$I_{\text{DSS}}$	$V_{\text{DS}} = 600\text{V}, V_{\text{GS}} = 0\text{V}$		10		$\mu\text{A}$
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
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{DS}} = V_{\text{GS}}, I_{\text{D}} = 250\mu\text{A}$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{\text{DS}(\text{ON})}$	$V_{\text{GS}} = 10\text{V}, I_{\text{D}} = 4.0\text{A}$			0.65	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{\text{ISS}}$	$V_{\text{DS}}=25\text{V}, V_{\text{GS}}=0\text{V}, f=1.0 \text{ MHz}$		510		pF
Output Capacitance	$C_{\text{OSS}}$			370		pF
Reverse Transfer Capacitance	$C_{\text{RSS}}$			40		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{\text{DS}}=480\text{V}, V_{\text{GS}}=10\text{V}, I_{\text{D}}=8\text{A}, I_G=1\text{mA}$ (Note 1, 2)		20		nC
Gate to Source Charge	$Q_{\text{GS}}$			4		nC
Gate to Drain Charge	$Q_{\text{GD}}$			7		nC
Turn-on Delay Time (Note 1)	$t_{\text{D}(\text{ON})}$	$V_{\text{DD}}=100\text{V}, V_{\text{GS}}=10\text{V}, I_{\text{D}}=8\text{A}, R_G=25\Omega$ (Note 1, 2)		7.2		ns
Rise Time	$t_R$			22		ns
Turn-off Delay Time	$t_{\text{D}(\text{OFF})}$			57		ns
Fall-Time	$t_F$			35		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Pulsed Current	$I_S$				8	A
Drain-Source Diode Forward Voltage (Note 1)	$I_{\text{SM}}$				16	A
Maximum Body-Diode Continuous Current	$V_{\text{SD}}$	$I_S=8.0\text{A}, V_{\text{GS}}=0\text{V}$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=8.0\text{A}, V_{\text{GS}}=0\text{V}$		346		ns
Reverse Recovery Charge	$Q_{rr}$	$dI_F/dt=100\text{A}/\mu\text{s}$		4.1		$\mu\text{C}$

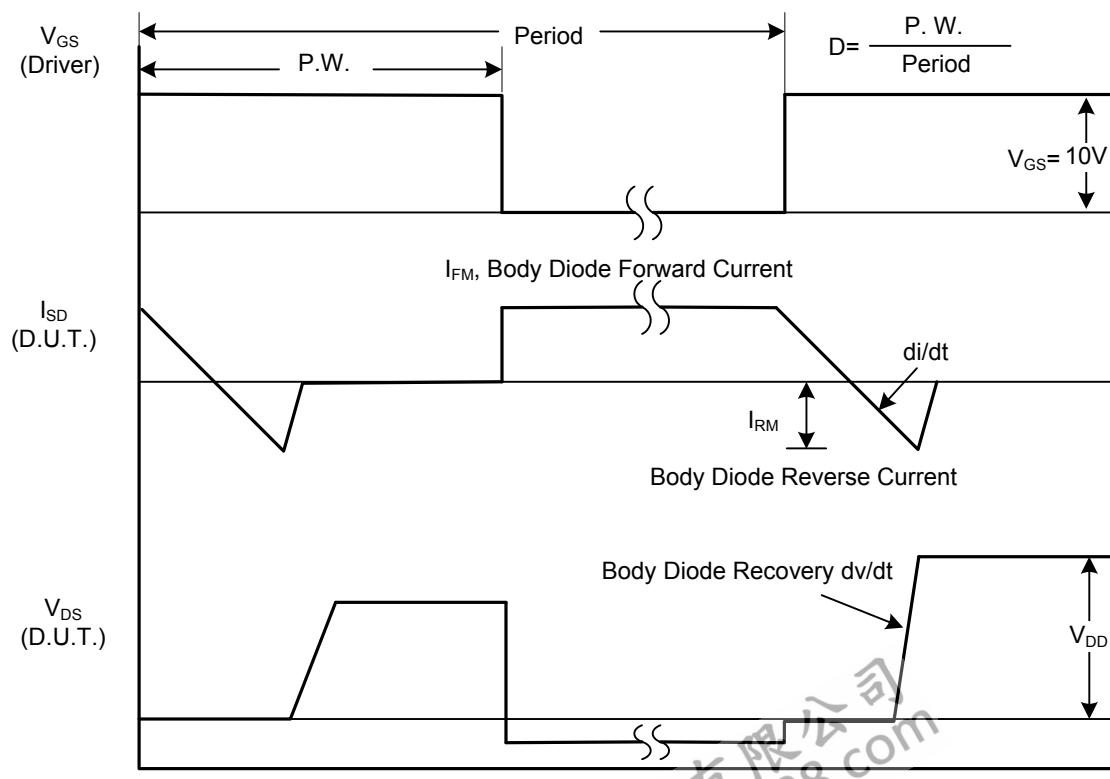
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

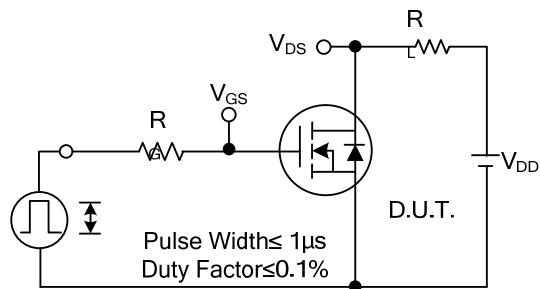


**Peak Diode Recovery dv/dt Test Circuit**

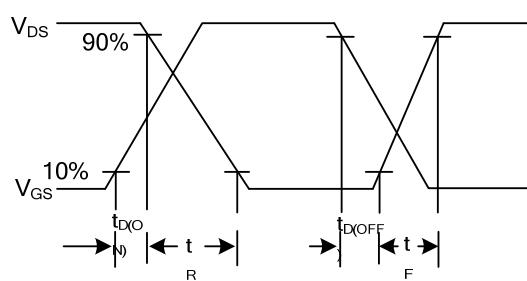


**Peak Diode Recovery dv/dt Waveforms**

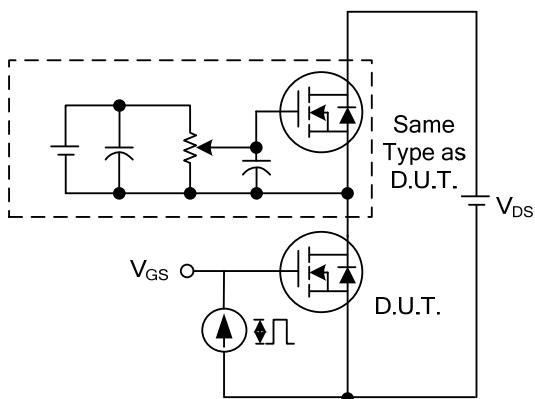
■ TEST CIRCUITS AND WAVEFORMS



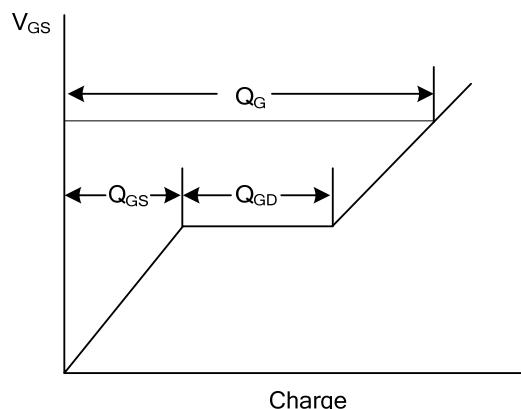
Switching Test Circuit



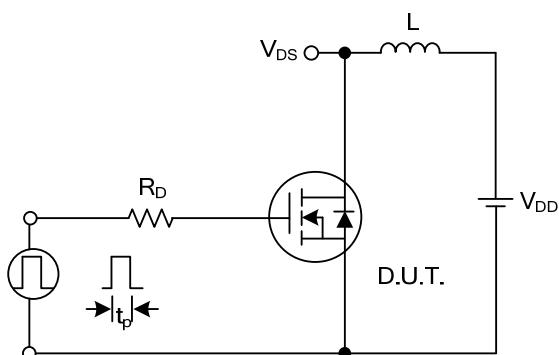
Switching Waveforms



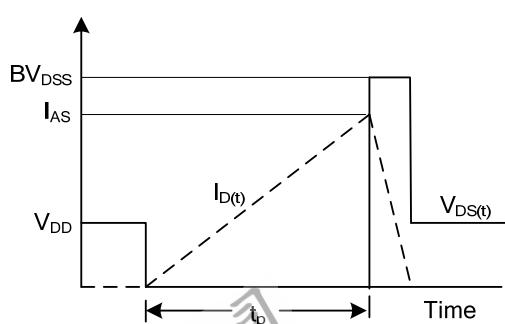
Gate Charge Test Circuit



Gate Charge Waveform

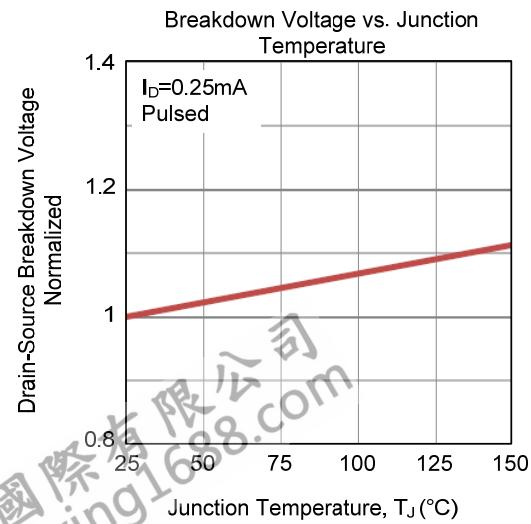
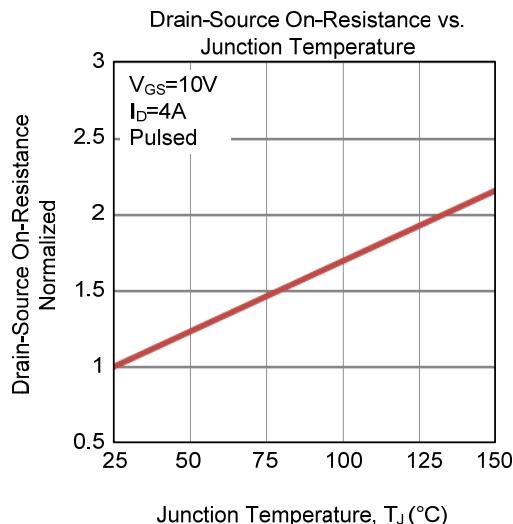
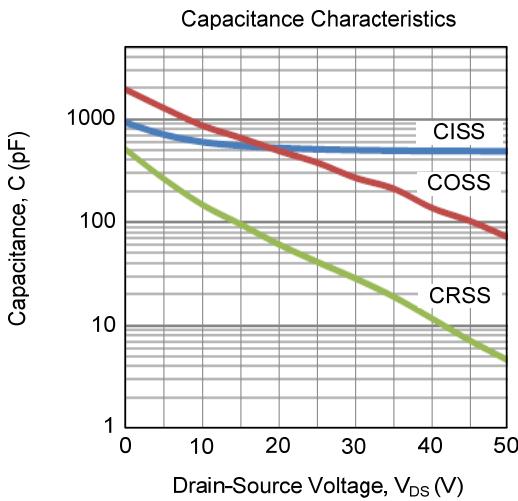
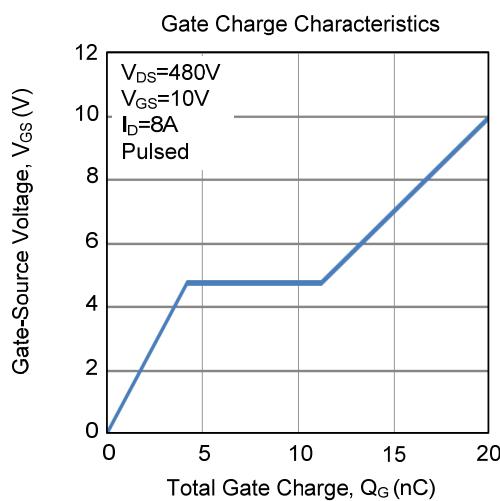
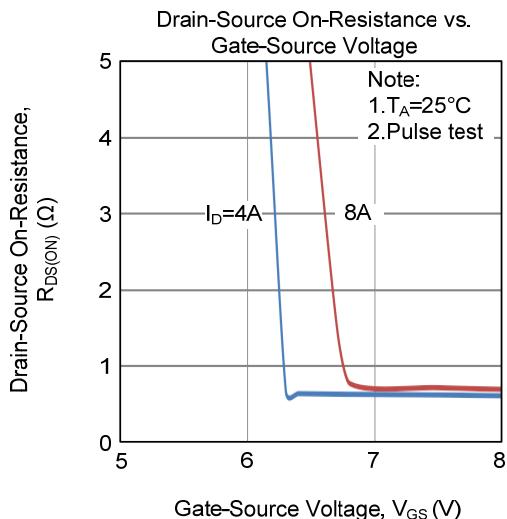
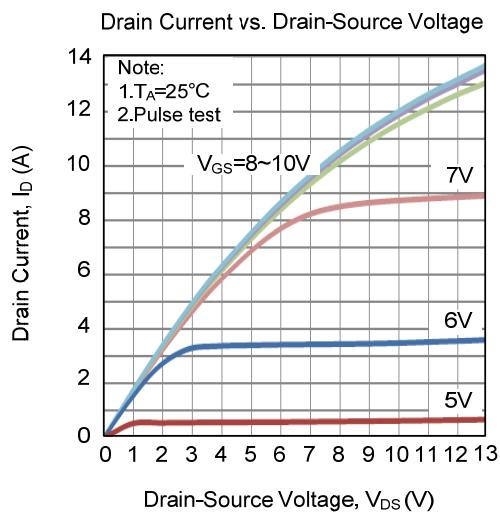


Unclamped Inductive Switching Test Circuit

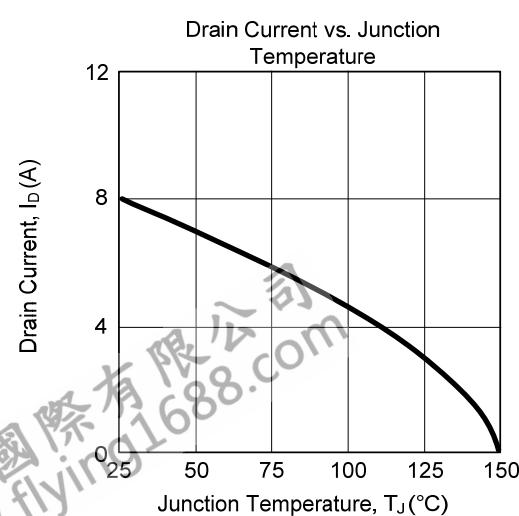
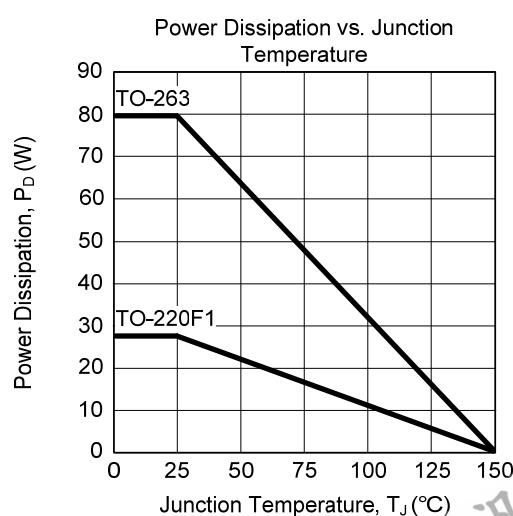
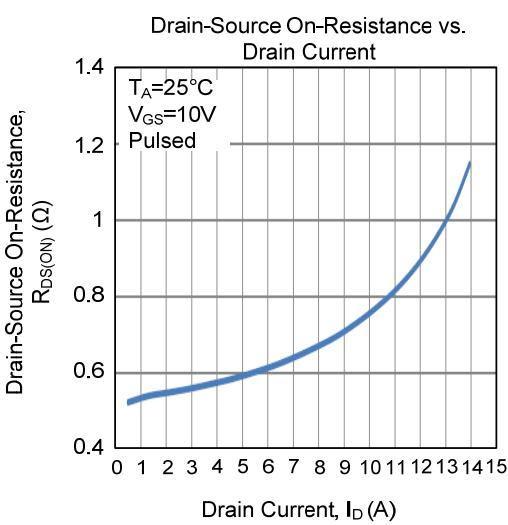
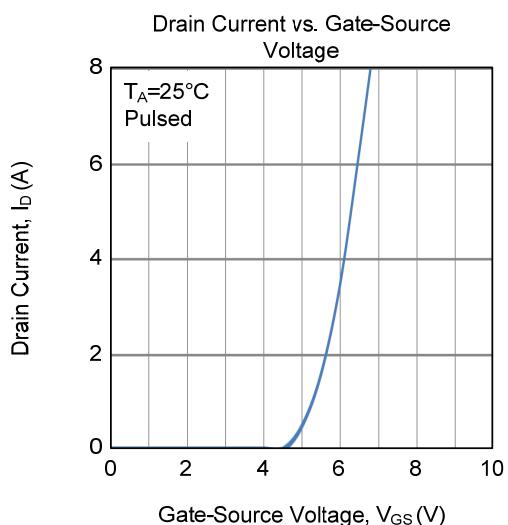
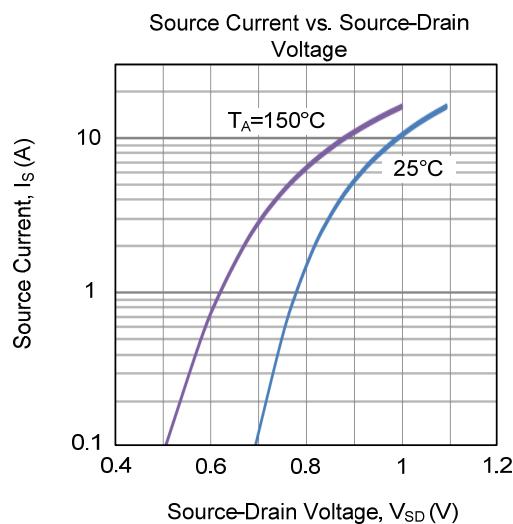
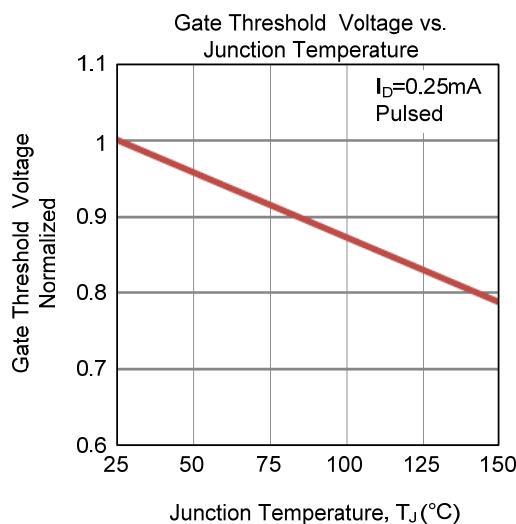


Unclamped Inductive Switching Waveforms

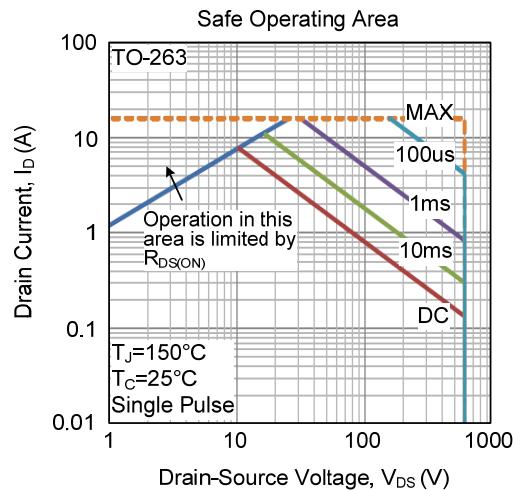
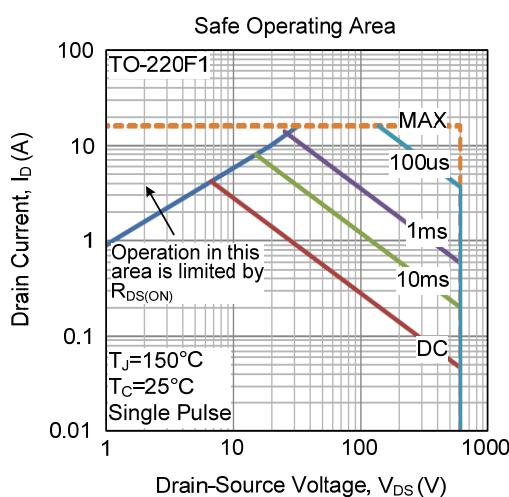
■ TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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