



## 5N50-TC3

Power MOSFET

### 5A, 500V N-CHANNEL POWER MOSFET

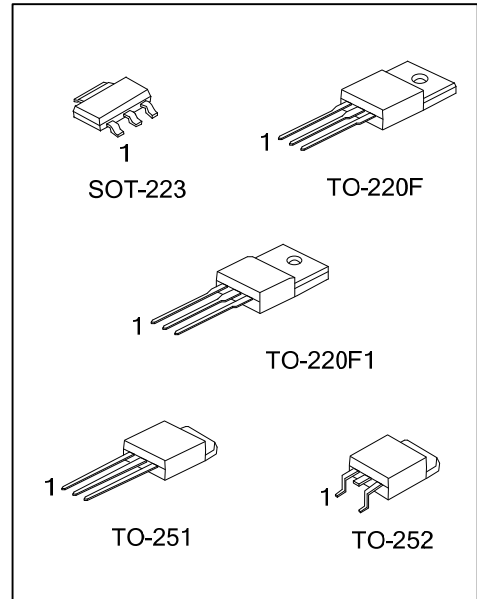
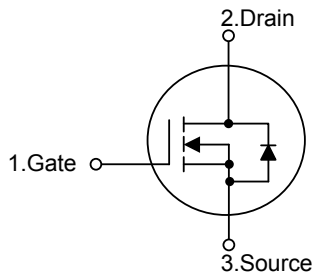
#### DESCRIPTION

The UTC **5N50-TC3** 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

- \*  $R_{DS(ON)} \leq 1.75 \Omega @ V_{GS}=10V, I_D=2.5A$
- \* High Switching Speed

#### SYMBOL



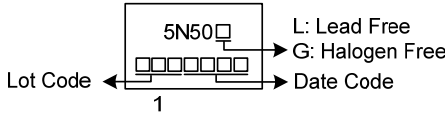
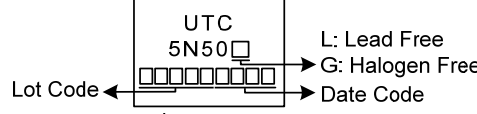
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N50L-AA3-R	5N50G-AA3-R	SOT-223	G	D	S	Tape Reel
5N50L-TF1-T	5N50G-TF1-T	TO-220F1	G	D	S	Tube
5N50L-TF3-T	5N50G-TF3-T	TO-220F	G	D	S	Tube
5N50L-TM3-T	5N50G-TM3-T	TO-251	G	D	S	Tube
5N50L-TN3-R	5N50G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>6NM70G-AA3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) AA3: SOT-223, TF3: TO-220F, TF1: TO-220F1, TM3: TO-251, TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

SOT-223	TO-220F / TO-220F1 TO-251 / TO-252
 <p>Diagram of SOT-223 marking: A rectangular package with '5N50' at the top, '1' at the bottom, and a Lot Code on the left and Date Code on the right. Arrows point from 'L: Lead Free' and 'G: Halogen Free' to the top right, and from 'Date Code' to the right side.</p>	 <p>Diagram of TO-220F / TO-251 marking: A rectangular package with 'UTC' and '5N50' at the top, '1' at the bottom, and a Lot Code on the left and Date Code on the right. Arrows point from 'L: Lead Free' and 'G: Halogen Free' to the top right, and from 'Date Code' to the right side.</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	5	A
	Pulsed (Note 2)	$I_{DM}$	10	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	133	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.25	V/ns
Power Dissipation	SOT-223	$P_D$	5	W
	TO-220F/TO-220F1		31	W
	TO-251/TO-252		52	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.  $L = 10\text{mH}$ ,  $I_{AS} = 5.15\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$  Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 5.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223	$\theta_{JA}$	75 (Note)	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	$\theta_{JC}$	25 (Note)	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		4	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.4 (Note)	$^\circ\text{C}/\text{W}$

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

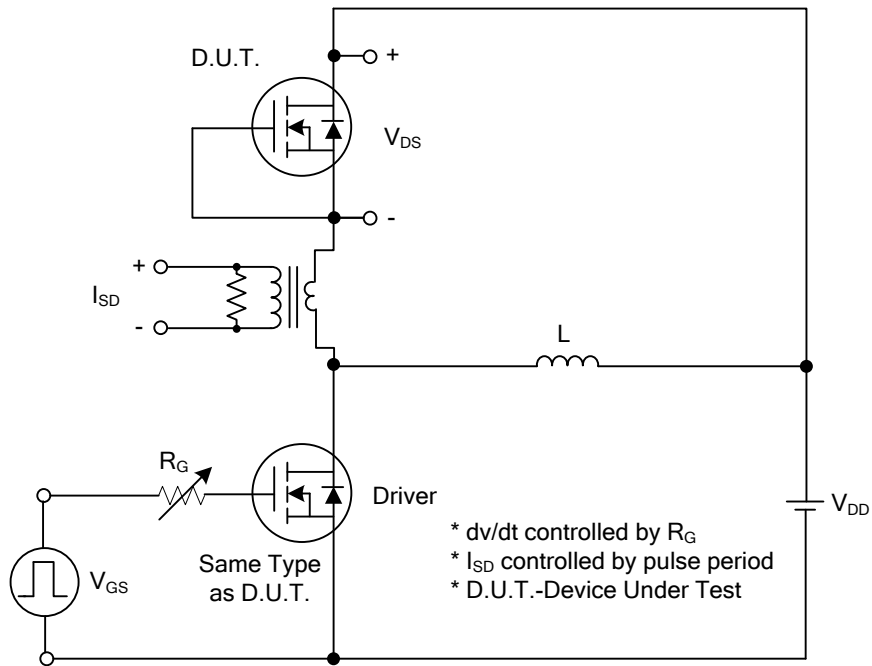
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$			10	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.5A$			1.75	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=25V, f=1.0\text{ MHz}$		438		pF
Output Capacitance	$C_{OSS}$			61		pF
Reverse Transfer Capacitance	$C_{RSS}$			4.6		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=100V, V_{GS}=10V, I_D=5.0A$ $I_G=1mA$ (Note 1, 2)		13		nC
Gate-source Charge	$Q_{GS}$			5.5		nC
Gate-drain Charge	$Q_{GD}$			2		nC
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=5.0A,$ $R_G=25\Omega$ (Note 1, 2)		7		ns
Rise Time	$t_R$			18		ns
Turn-off Delay Time	$t_{D(OFF)}$			32		ns
Fall-Time	$t_F$			20		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				5	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				10	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$V_{GS}=0V, I_S=5.0A$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$V_{GS}=0V, I_S=5.0A,$ $dI_F/dt=100A/\mu s$ (Note1)		250		ns
Reverse Recovery Charge	$Q_{rr}$			1.78		$\mu C$

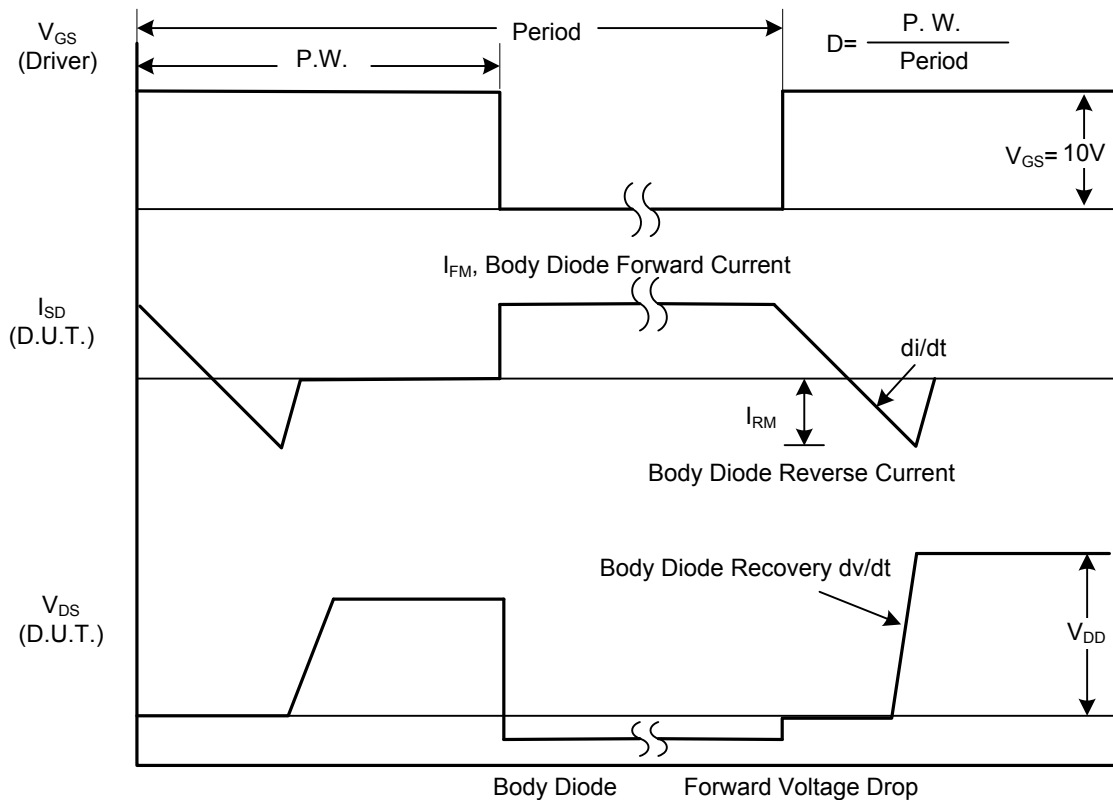
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

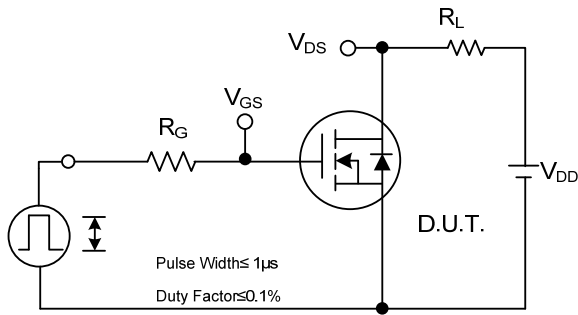


Peak Diode Recovery  $dv/dt$  Test Circuit

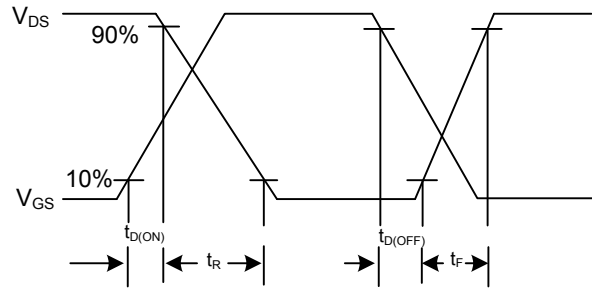


Peak Diode Recovery  $dv/dt$  Waveforms

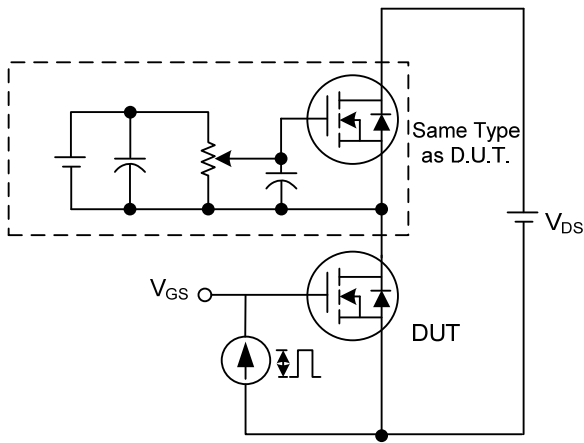
■ TEST CIRCUITS AND WAVEFORMS



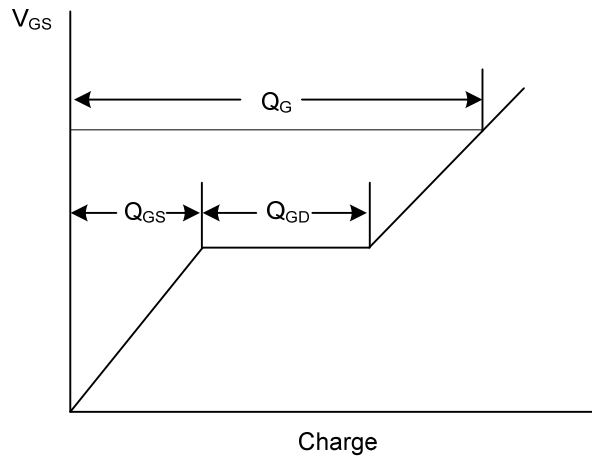
Switching Test Circuit



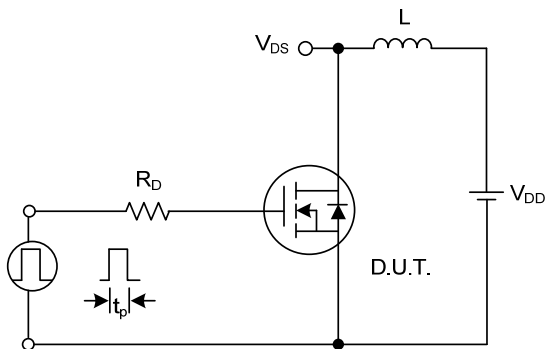
Switching Waveforms



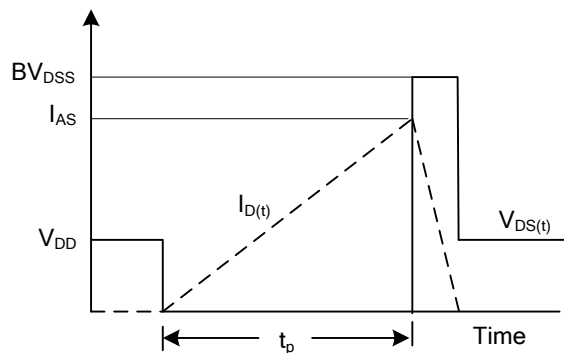
Gate Charge Test Circuit



Gate Charge Waveform

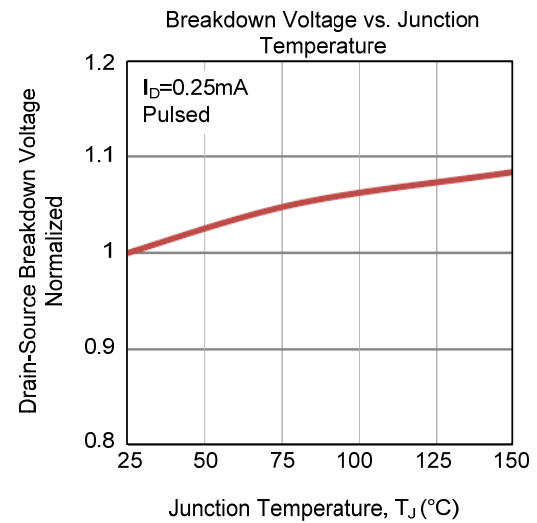
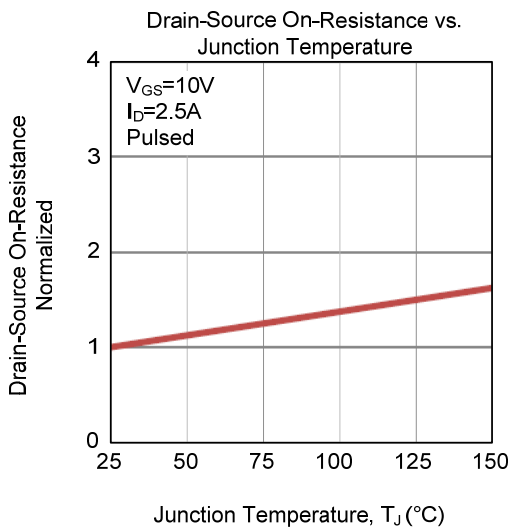
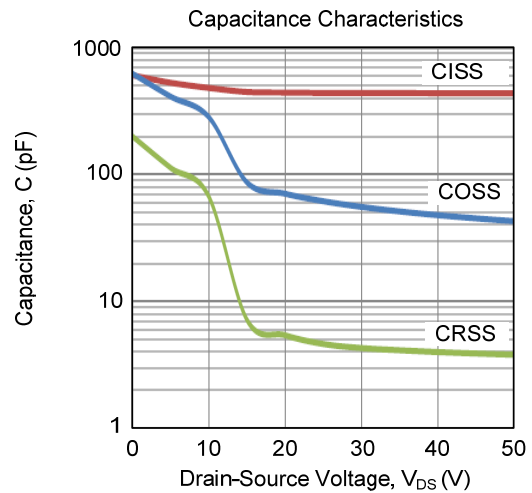
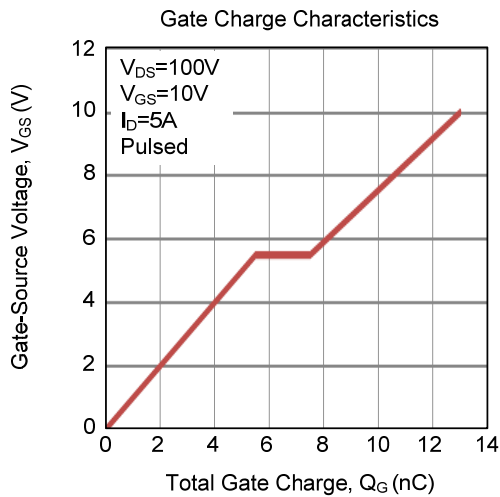
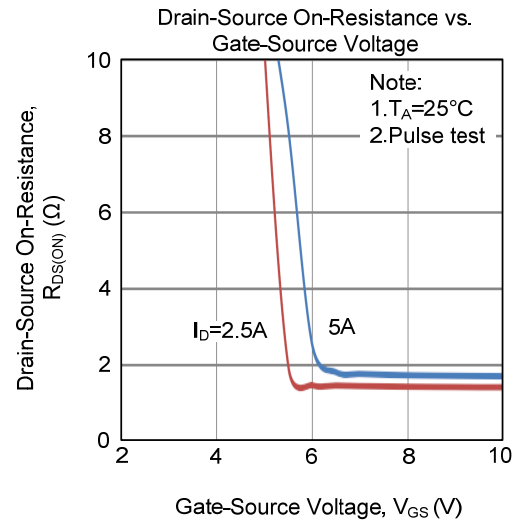
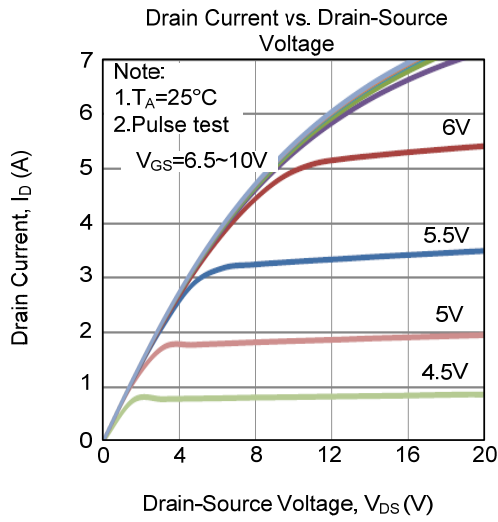


Unclamped Inductive Switching Test Circuit

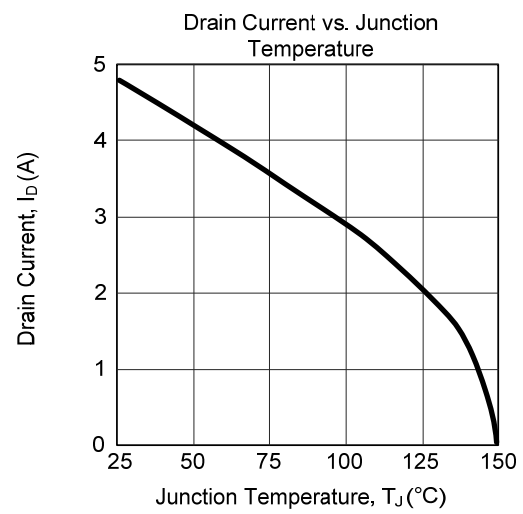
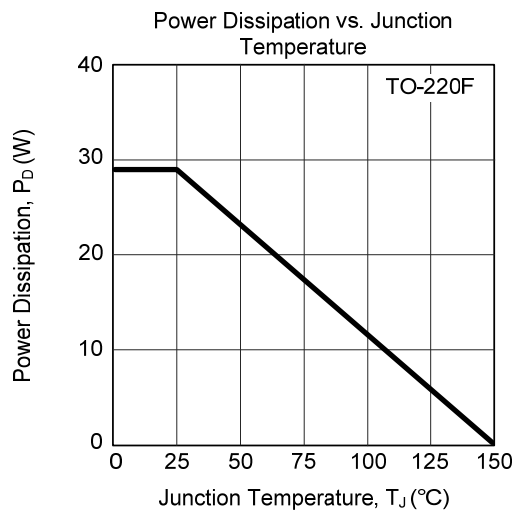
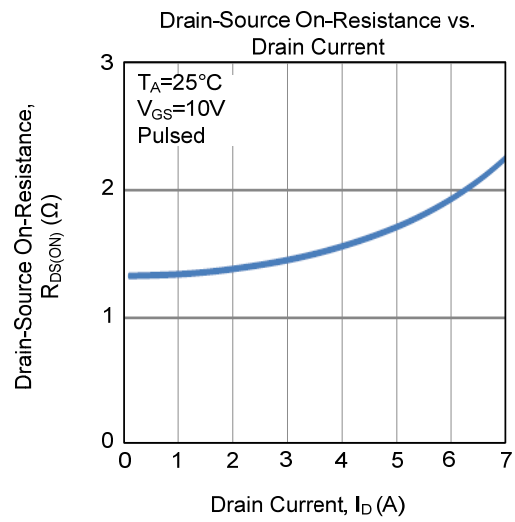
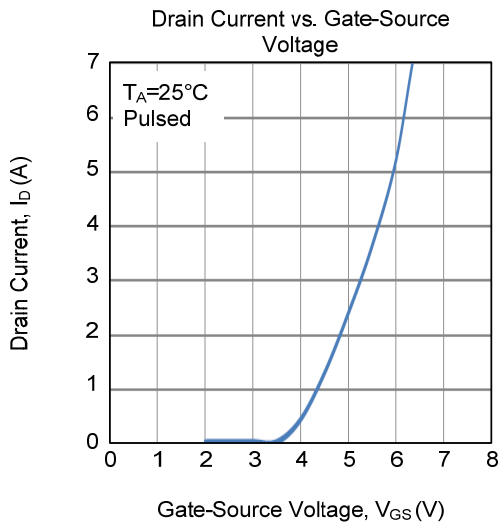
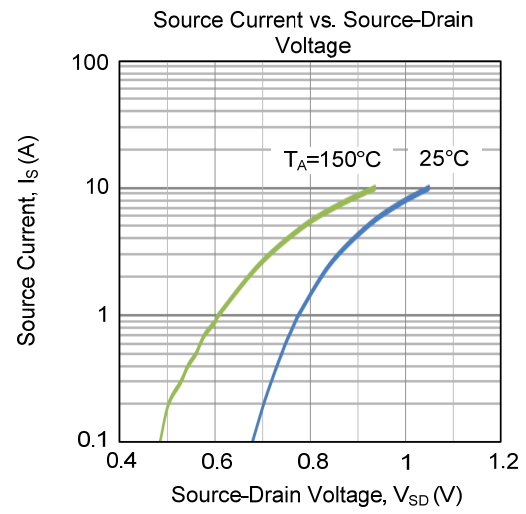
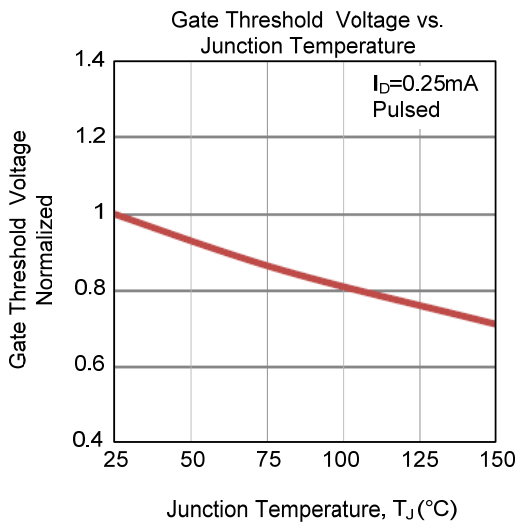


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

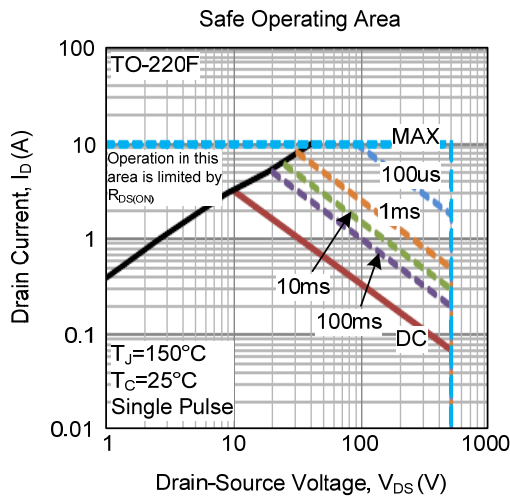


■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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