



## 6N60-TC

Power MOSFET

### 6A, 600V N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC 6N60-TC is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

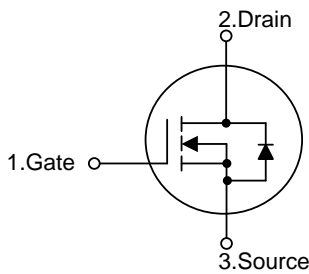
The UTC 6N60-TC is generally applied in high efficiency switch mode power supplies.

#### FEATURES

\*  $R_{DS(ON)} \leq 1.65 \Omega @ V_{GS}=10V, I_D=3.0A$

\* High Switching Speed

#### SYMBOL

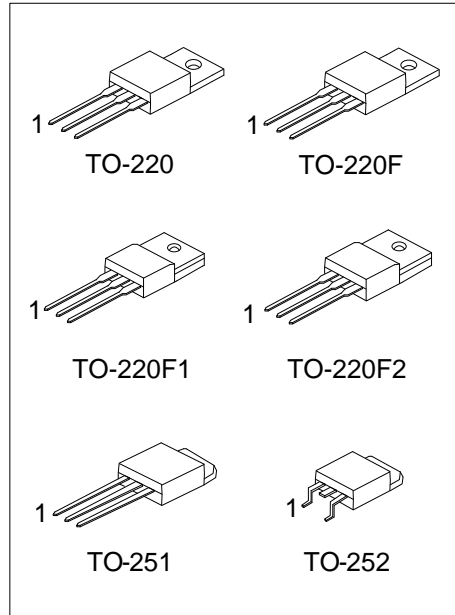


#### ORDERING INFORMATION

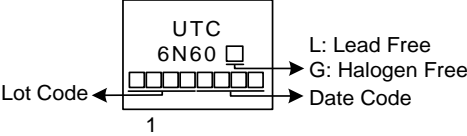
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N60L-TA3-T	6N60G-TA3-T	TO-220	G	D	S	Tube
6N60L-TF1-T	6N60G-TF1-T	TO-220F1	G	D	S	Tube
6N60L-TF2-T	6N60G-TF2-T	TO-220F2	G	D	S	Tube
6N60L-TF3-T	6N60G-TF3-T	TO-220F	G	D	S	Tube
6N60L-TM3-T	6N60G-TM3-T	TO-251	G	D	S	Tube
6N60L-TN3-R	6N60G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>6N60G-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2 TF3: TO-220F, TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead 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		$V_{DSS}$	600	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	6	A
	Pulsed (Note 2)	$I_{DM}$	12	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	211	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.66	V/ns
Power Dissipation	TO-220	$P_D$	85	W
	TO-220F/TO-220F1		34	W
	TO-220F2			
	TO-251/TO-252		51	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.  $L = 10\text{mH}$ ,  $I_{AS} = 6.5\text{A}$ ,  $V_{DD} = 90\text{V}$ ,  $R_G = 25\ \Omega$  Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 6.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-251/TO-252		110	
Junction to Case	TO-220	$\theta_{JC}$	1.47	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.68	
	TO-220F2			
	TO-251/TO-252		2.45 (Note)	

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

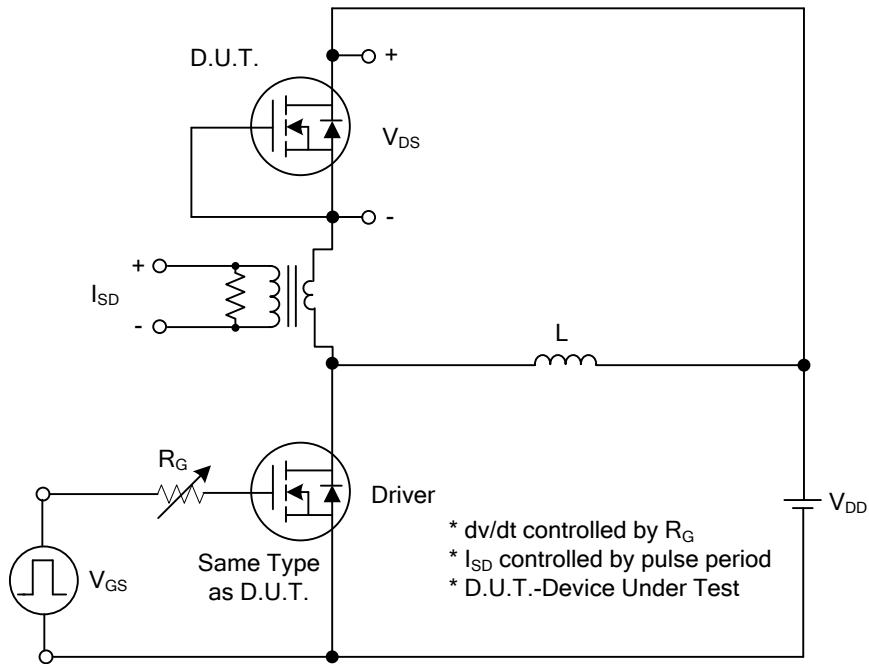
■ **ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$			10	$\mu A$
Gate-Source Leakage Current	Forward	$V_{GS}=30V, V_{DS}=0V$			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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.0A$			1.65	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=25V, f=1.0\text{ MHz}$		661		pF
Output Capacitance	$C_{OSS}$			77		pF
Reverse Transfer Capacitance	$C_{RSS}$			4.3		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=100V, V_{GS}=10V, I_D=6.0A$ $I_G=1\text{ mA}$ (Note 1, 2)		14.9		nC
Gate-source Charge	$Q_{GS}$			4.9		nC
Gate-drain Charge	$Q_{GD}$			4.5		nC
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=6.0A,$ $R_G=25\Omega$ (Note 1, 2)		8.8		ns
Rise Time	$t_R$			16.6		ns
Turn-off Delay Time	$t_{D(OFF)}$			33.3		ns
Fall-Time	$t_F$			22.4		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				6	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				12	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$V_{GS}=0V, I_S=6.0A$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$V_{GS}=0V, I_S=6.0A,$		292		ns
Reverse Recovery Charge	$Q_{rr}$	$di_F/dt=100A/\mu s$ (Note1)		2.9		$\mu C$

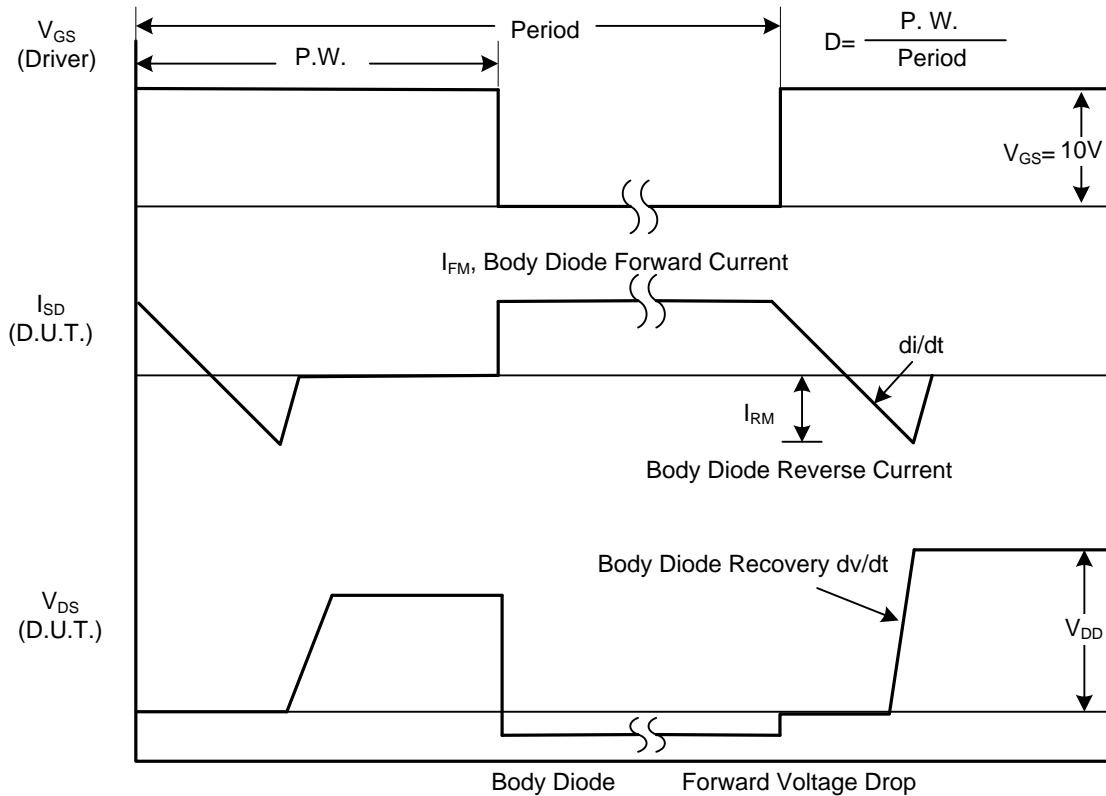
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

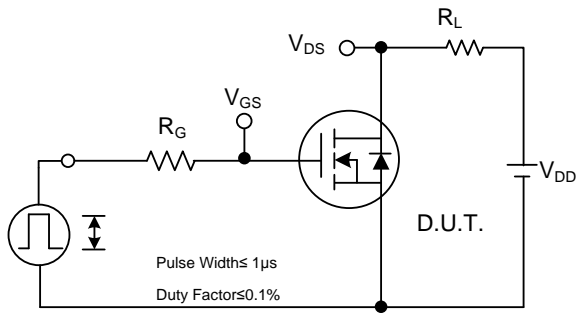


Peak Diode Recovery dv/dt Test Circuit

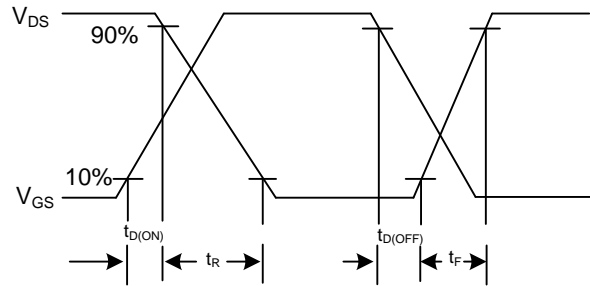


Peak Diode Recovery dv/dt Waveforms

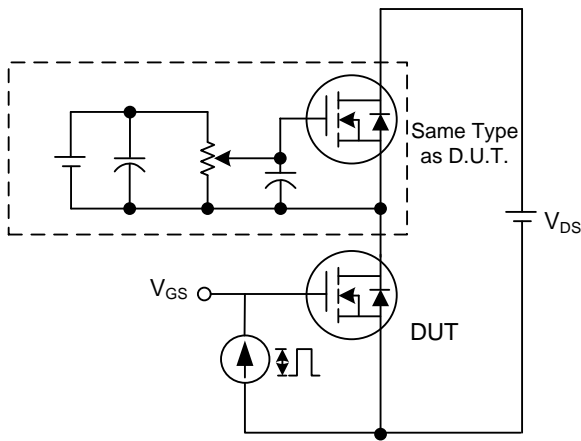
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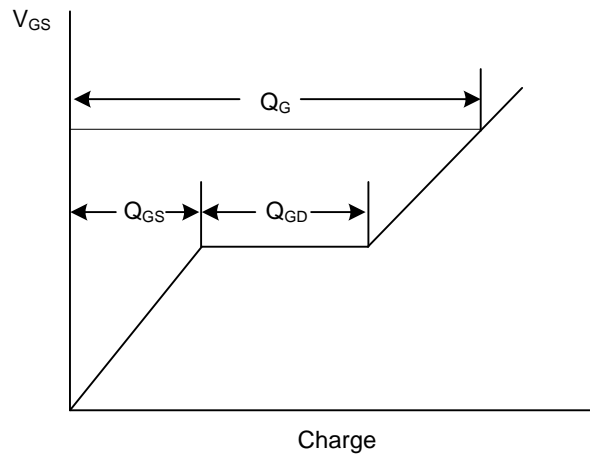
Switching Test Circuit



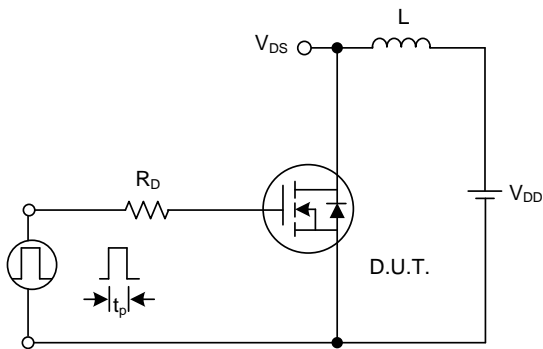
Switching Waveforms



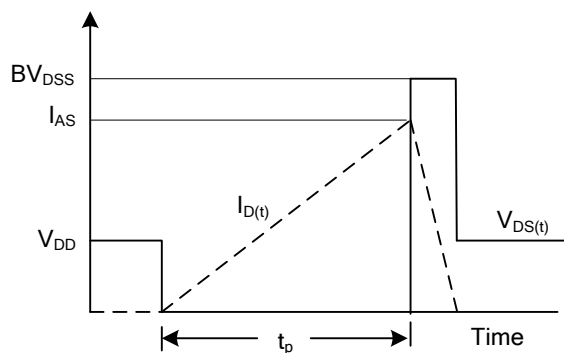
Gate Charge Test Circuit



Gate Charge Waveform

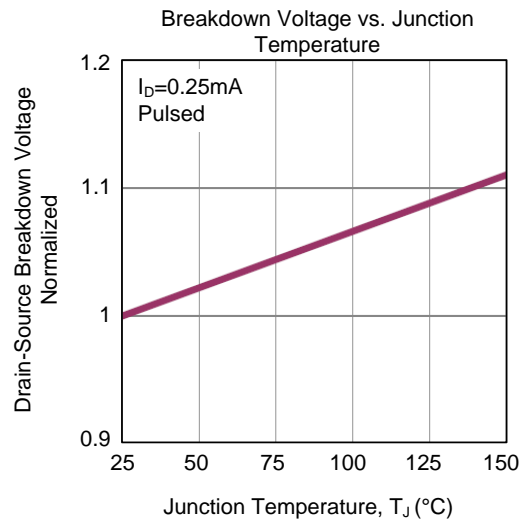
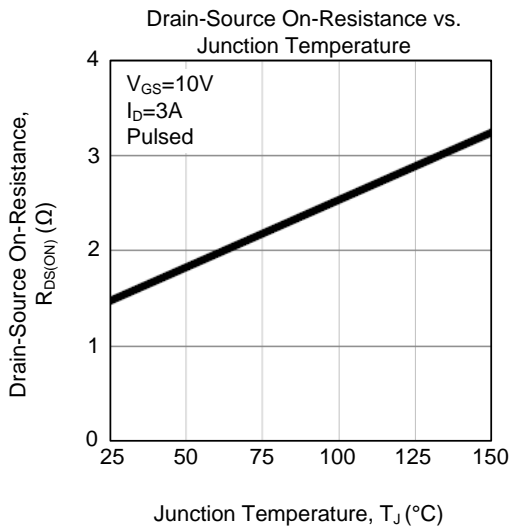
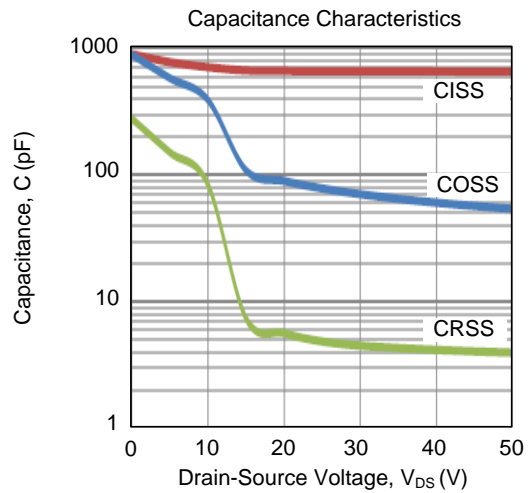
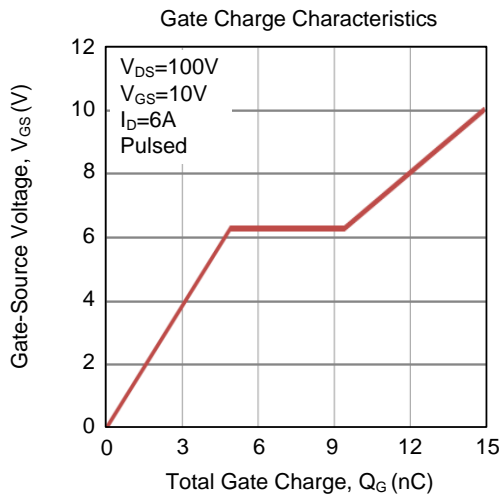
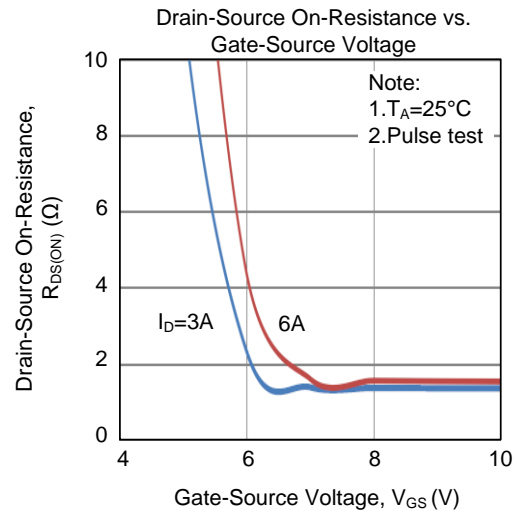
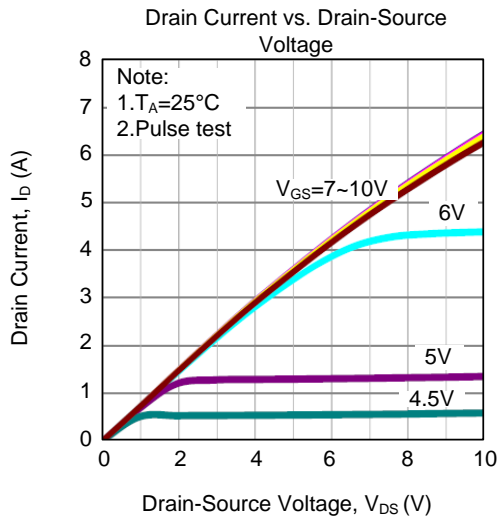


Unclamped Inductive Switching Test Circuit

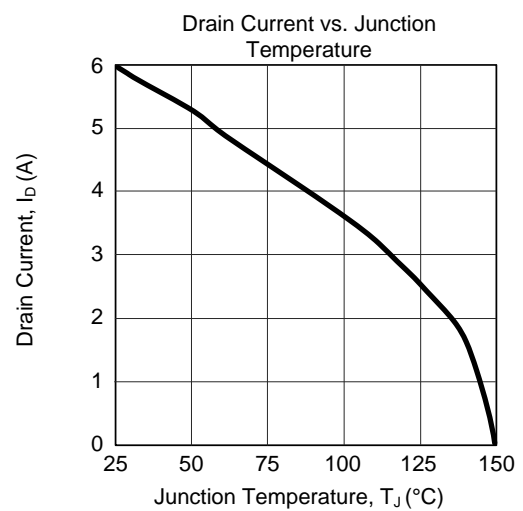
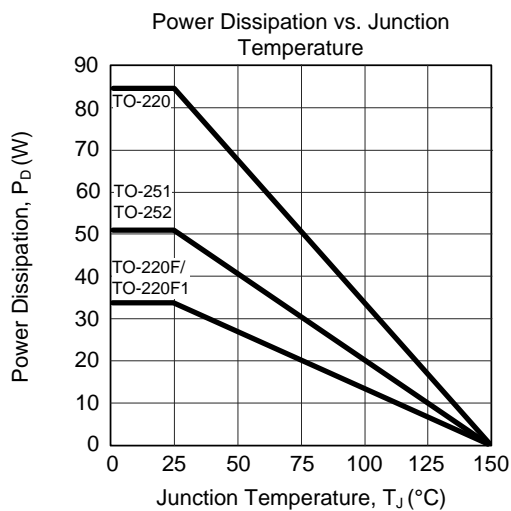
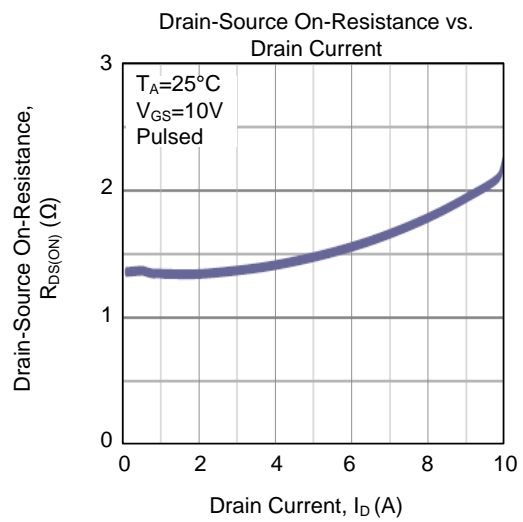
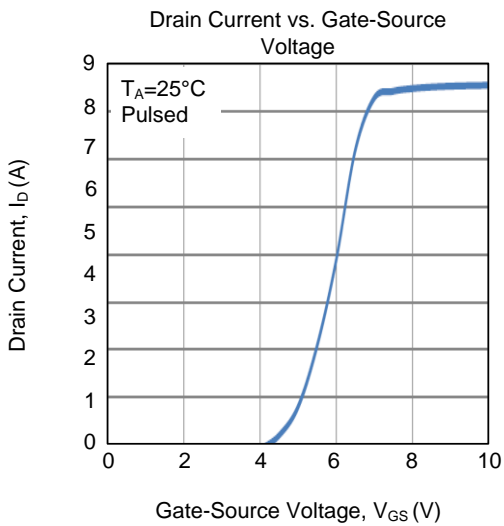
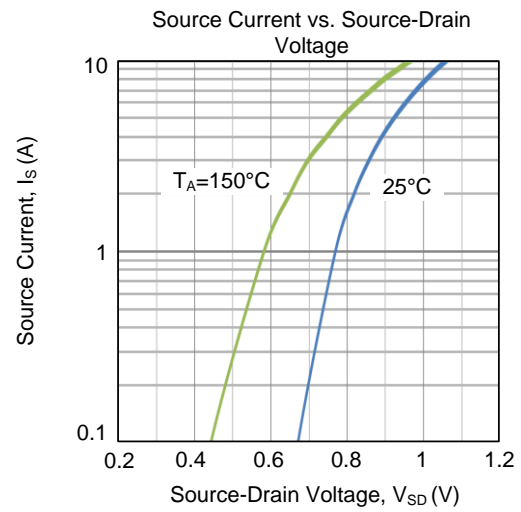
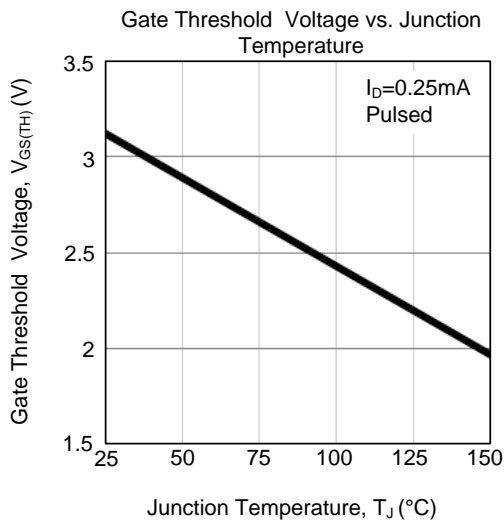


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

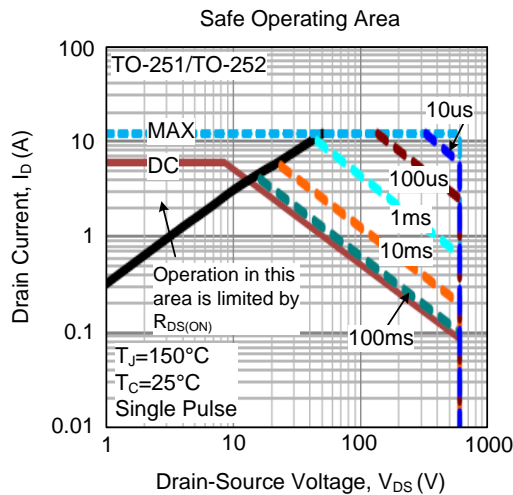
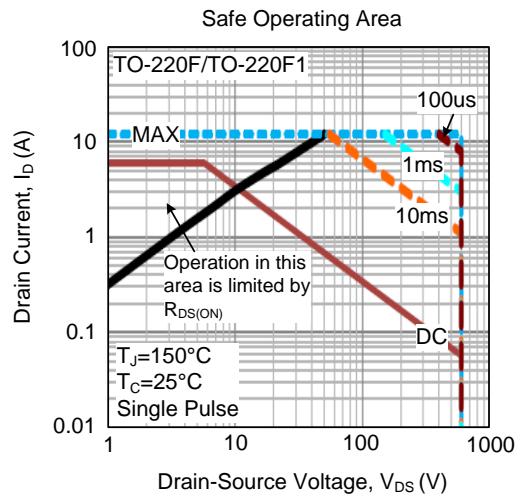
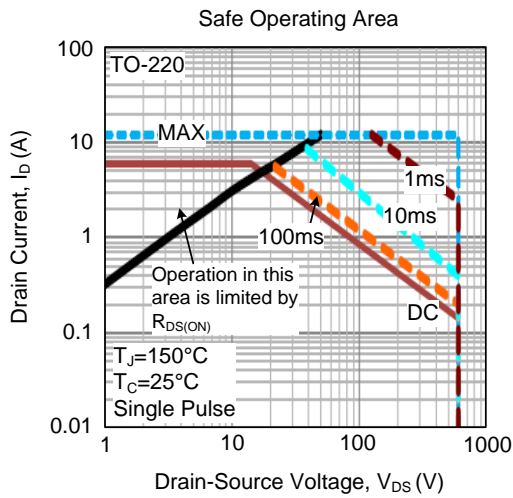


## ■ TYPICAL CHARACTERISTICS (Cont.)





## ■ TYPICAL CHARACTERISTICS (Cont.)



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