



## 3N90-C

## Power MOSFET

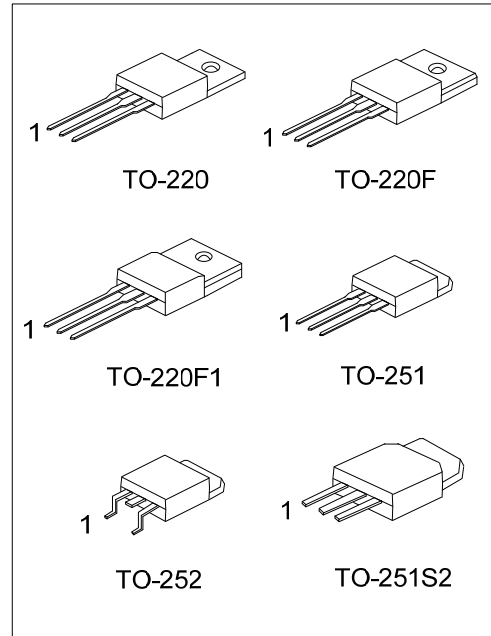
### 3A, 900V N-CHANNEL POWER MOSFET

#### DESCRIPTION

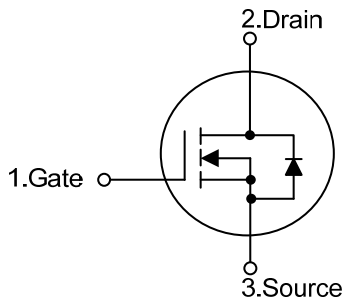
The UTC **3N90-C** provide excellent  $R_{DS(ON)}$ , low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

#### FEATURES

- \*  $R_{DS(ON)} \leq 4.8\Omega$  @  $V_{GS}=10V, I_D=1.5A$
- \* Low Reverse Transfer Capacitance
- \* Fast Switching Capability
- \* Avalanche Energy Specified
- \* Improved  $dv/dt$  Capability, High Ruggedness



#### SYMBOL



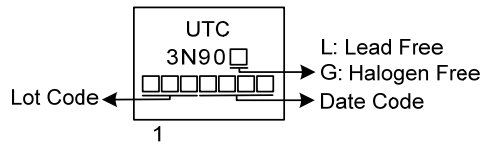
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N90L-TA3-T	3N90G-TA3-T	TO-220	G	D	S	Tube
3N90L-TF3-T	3N90G-TF3-T	TO-220F	G	D	S	Tube
3N90L-TF1-T	3N90G-TF1-T	TO-220F1	G	D	S	Tube
3N90L-TM3-T	3N90G-TM3-T	TO-251	G	D	S	Tube
3N90L-TMS2-T	3N90G-TMS2-T	TO-251S2	G	D	S	Tube
3N90L-TN3-R	3N90G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>3N90G-TA3-T</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TM3: TO-251, TMS2: TO-251S2, TN3: TO-252</p> <p>(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		$V_{DSS}$	900	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	3	A
	Pulsed (Note 2)	$I_{DM}$	6	A
Avalanche Energy		$E_{AS}$	92	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.6	V/ns
Power Dissipation	TO-220	$P_D$	90	W
	TO-220F/TO-220F1		25	W
	TO-251/TO-251S2		45	W
	TO-252			
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.  $L=10\text{mH}$ ,  $I_{AS}=4.3\text{A}$ ,  $V_{DD}=90\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD}\leq 3.0\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , 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-251/TO-251S2		110	$^\circ\text{C}/\text{W}$
	TO-252			
Junction to Case	TO-220	$\theta_{JC}$	1.38	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S2		2.7 (Note)	$^\circ\text{C}/\text{W}$
	TO-252			

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

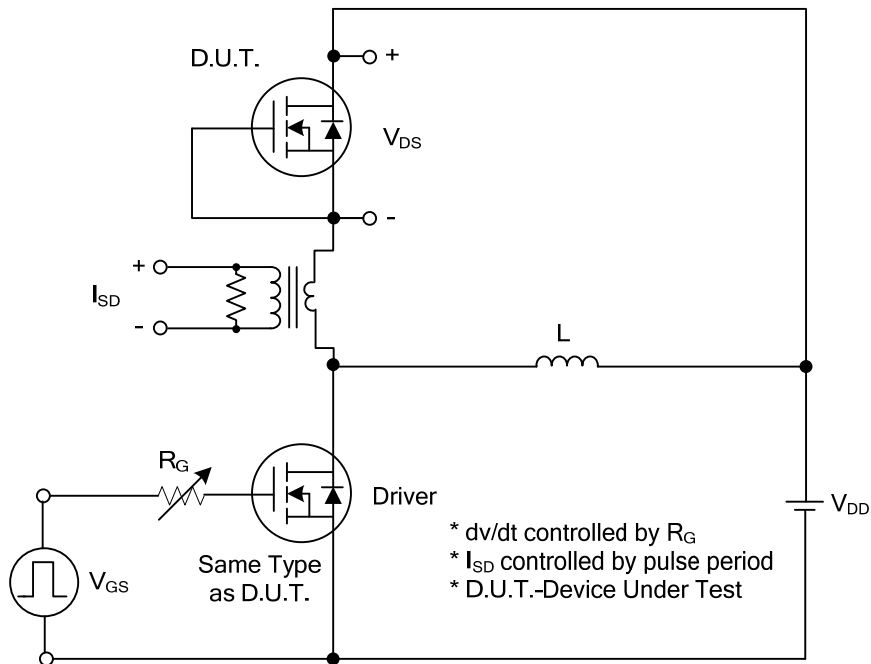
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	900			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=900V, V_{GS}=0V$			1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0		5.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=1.5A$			4.8	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$		455		pF
Output Capacitance	$C_{OSS}$			65		pF
Reverse Transfer Capacitance	$C_{RSS}$			8.6		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=400V, V_{GS}=10V, I_D=3A$ $I_G=3\text{mA}$ (Note 1, 2)		20		nC
Gate-Source Charge	$Q_{GS}$			9		nC
Gate-Drain Charge	$Q_{GD}$			6		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=400V, V_{GS}=10V, I_D=3A,$ $R_G=25\Omega$ (Note 1, 2)		43		ns
Turn-On Rise Time	$t_R$			48		ns
Turn-Off Delay Time	$t_{D(OFF)}$			88		ns
Turn-Off Fall Time	$t_F$			41		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				3	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				6	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=3.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=3.0A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$		540		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$				3.4	

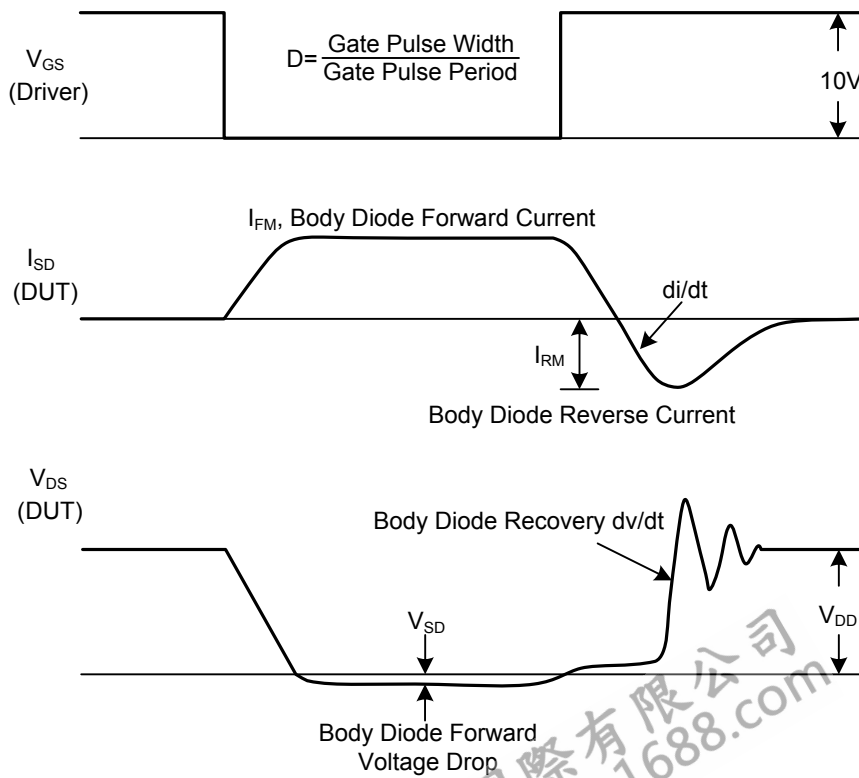
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

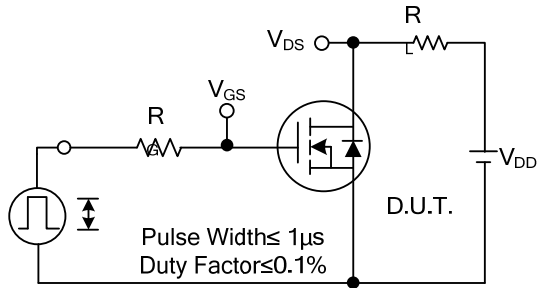


Peak Diode Recovery  $dv/dt$  Test Circuit

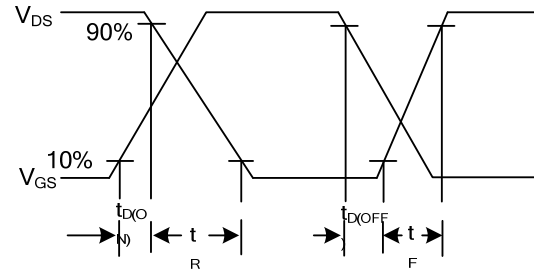


Peak Diode Recovery  $dv/dt$  Waveforms

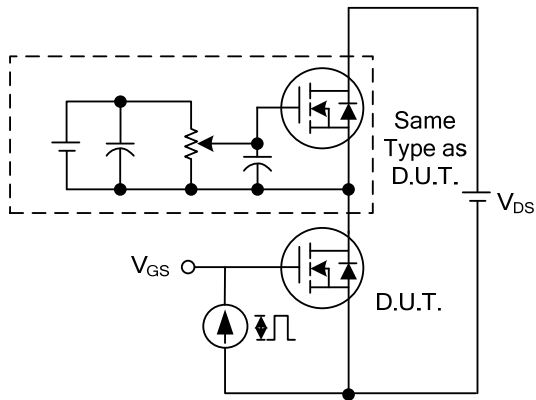
## TEST CIRCUITS AND WAVEFORMS



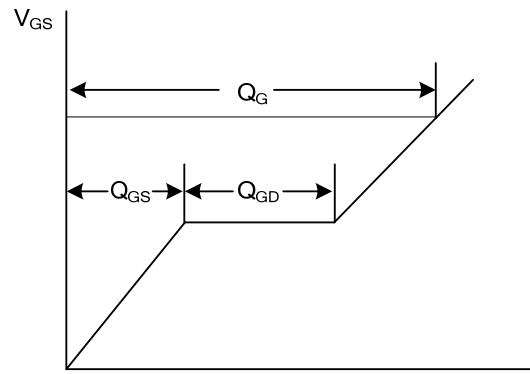
Switching Test Circuit



Switching Waveforms

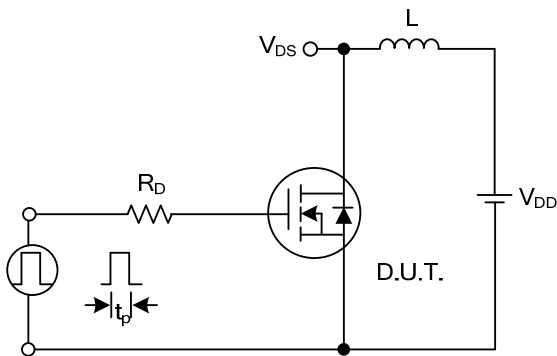


Gate Charge Test Circuit

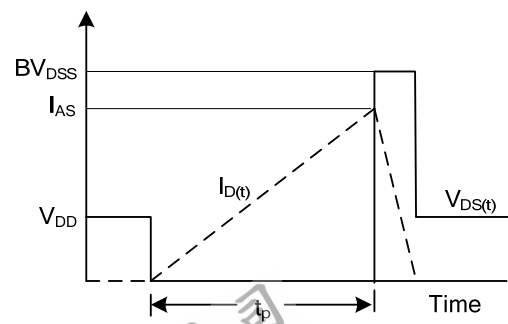


Charge

Gate Charge Waveform

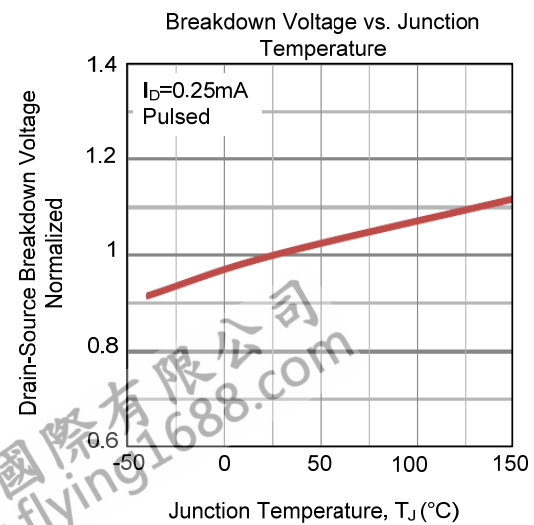
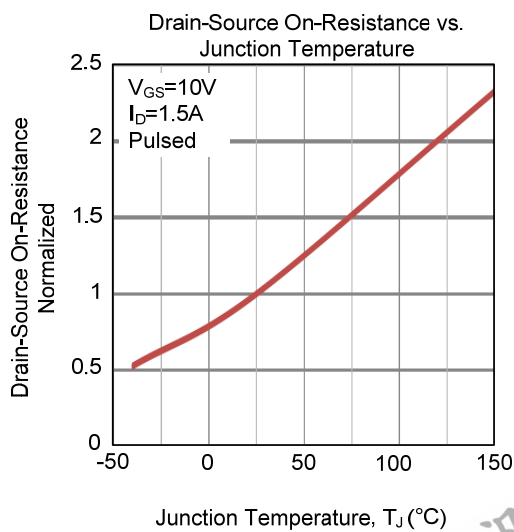
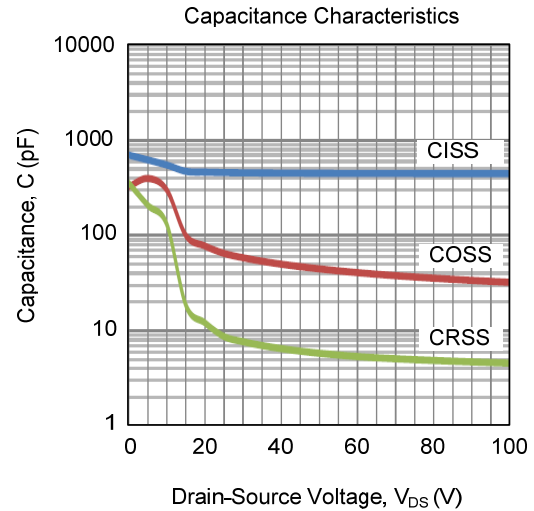
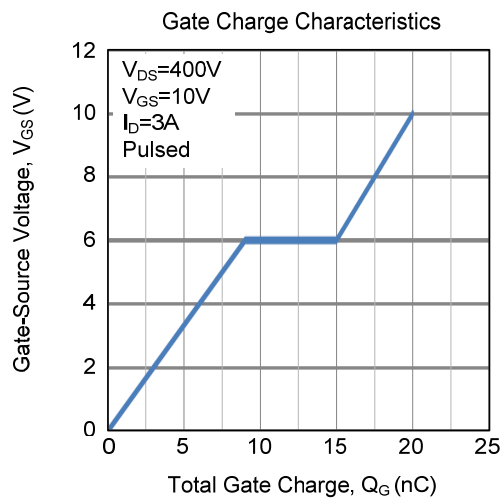
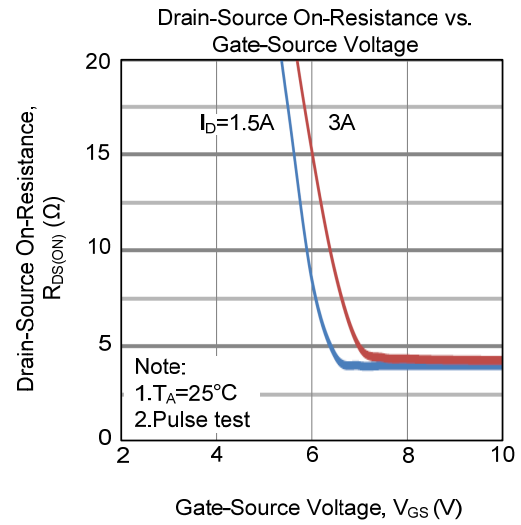
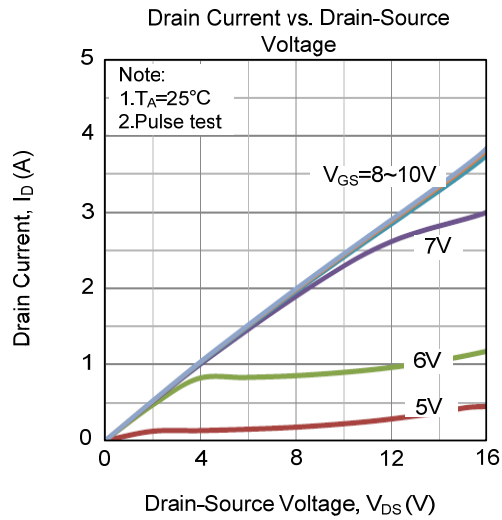


Unclamped Inductive Switching Test Circuit

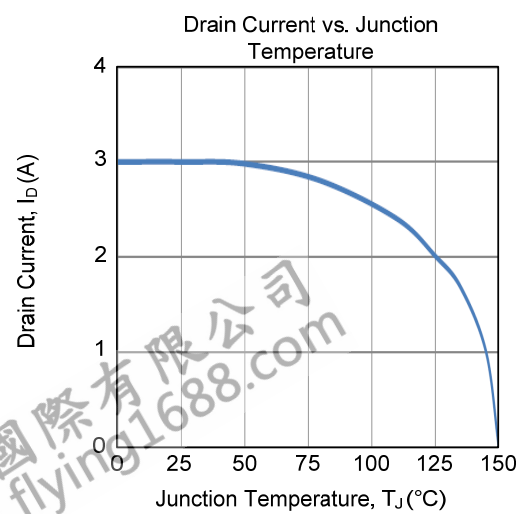
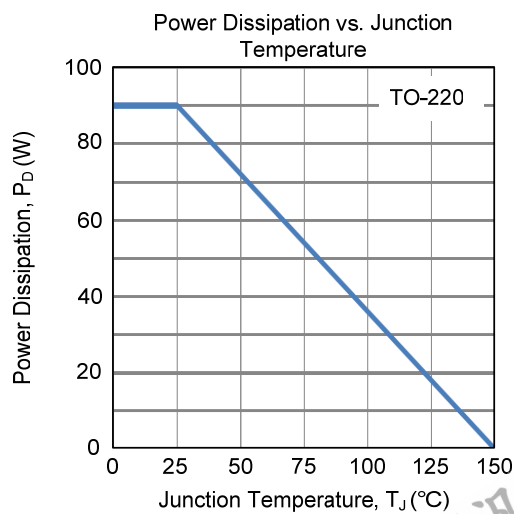
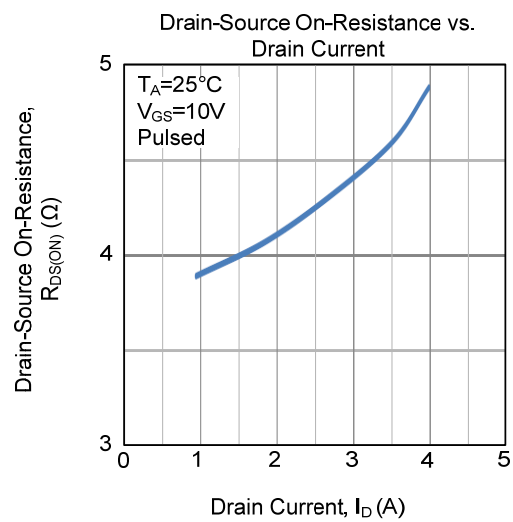
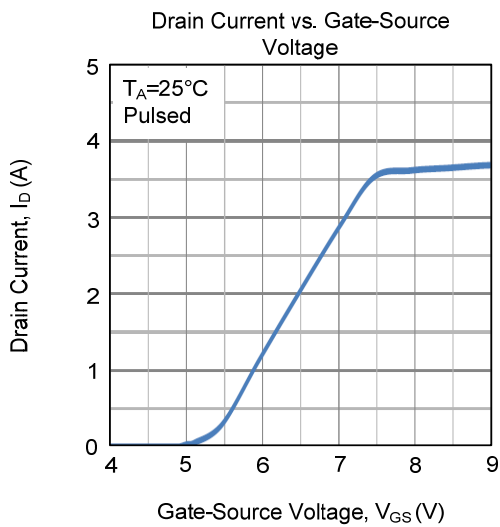
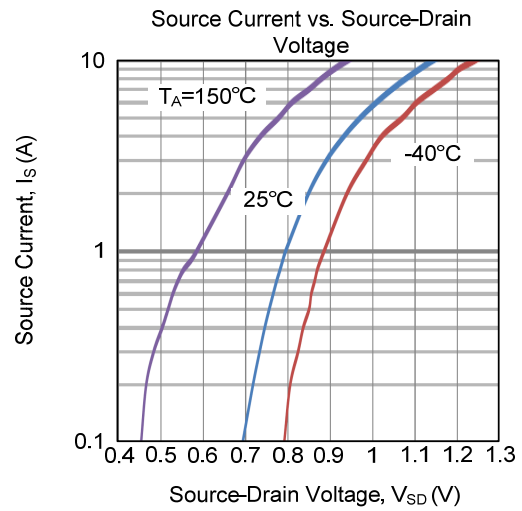
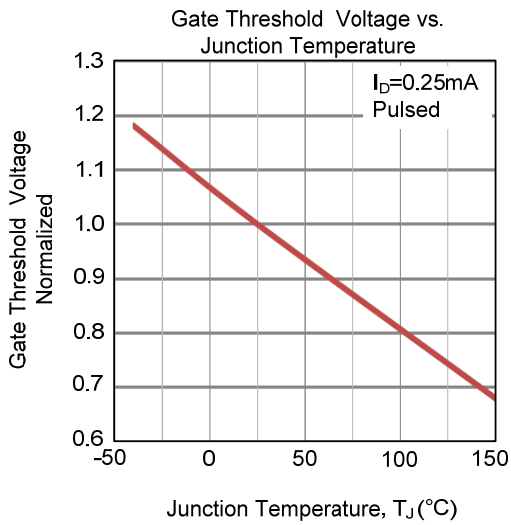


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

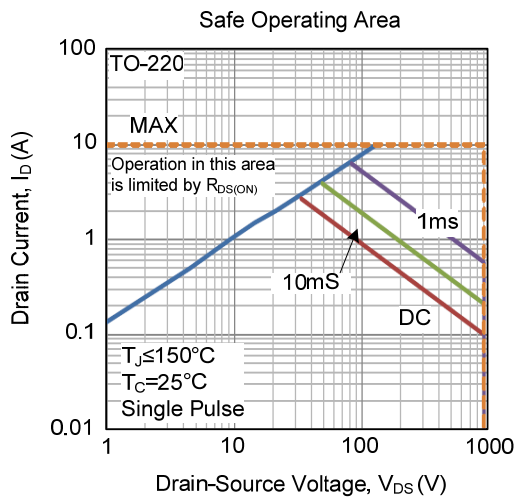


## TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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