



## 3N90-C

Power MOSFET

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

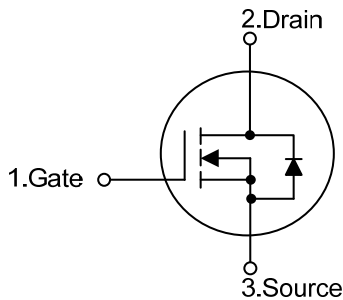
#### DESCRIPTION

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

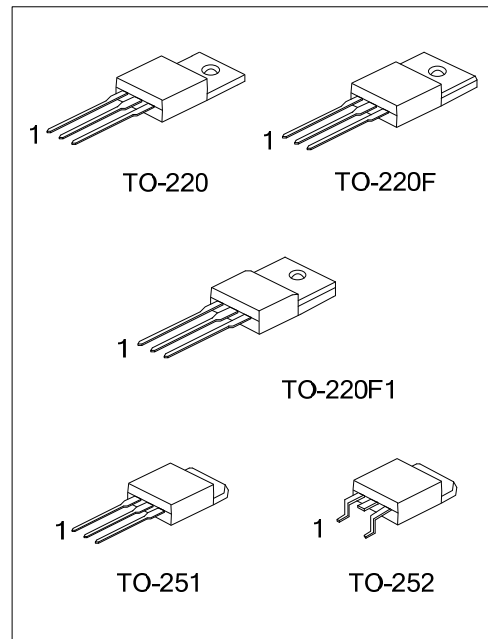


#### ORDERING INFORMATION

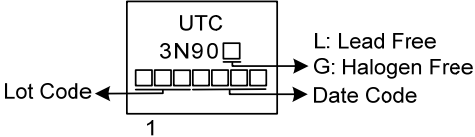
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N90L-TA3-T	3N90G-TA3-T	TO-220	G	D	S	Tube
3N90L-TF3-T	3N90G-TF3-T	TO-220F	G	D	S	Tube
3N90L-TF1-T	3N90G-TF1-T	TO-220F1	G	D	S	Tube
3N90L-TM3-T	3N90G-TM3-T	TO-251	G	D	S	Tube
3N90L-TN3-R	3N90G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>3N90G-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, 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



■ 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	Single Pulsed (Note 3)	$E_{AS}$	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-252		45	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.  $L=10\text{mH}$ ,  $I_{AS}=4.3\text{A}$ ,  $V_{DD}=90\text{V}$ ,  $R_G=25\ \Omega$ , 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-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-252		2.7	$^\circ\text{C}/\text{W}$

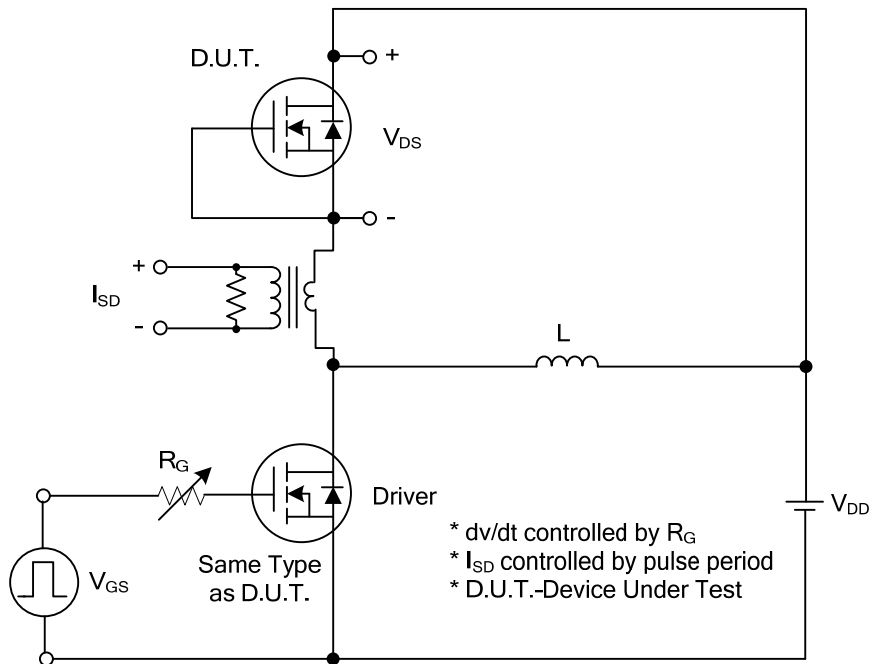
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	900			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =900V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V			±100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	3.0		5.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.5A			4.8	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz		455		pF
Output Capacitance	C <sub>OSS</sub>			65		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			8.6		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =400V, V <sub>GS</sub> =10V, I <sub>D</sub> =3A I <sub>G</sub> =3mA (Note 1, 2)		20		nC
Gate-Source Charge	Q <sub>GS</sub>			9		nC
Gate-Drain Charge	Q <sub>GD</sub>			6		nC
Turn-On Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =400V, V <sub>GS</sub> =10V, I <sub>D</sub> =3A, R <sub>G</sub> =25Ω (Note 1, 2)		43		ns
Turn-On Rise Time	t <sub>R</sub>			48		ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			88		ns
Turn-Off Fall Time	t <sub>F</sub>			41		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				3	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				6	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =3.0A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =3.0A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs		540		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			3.4		μC

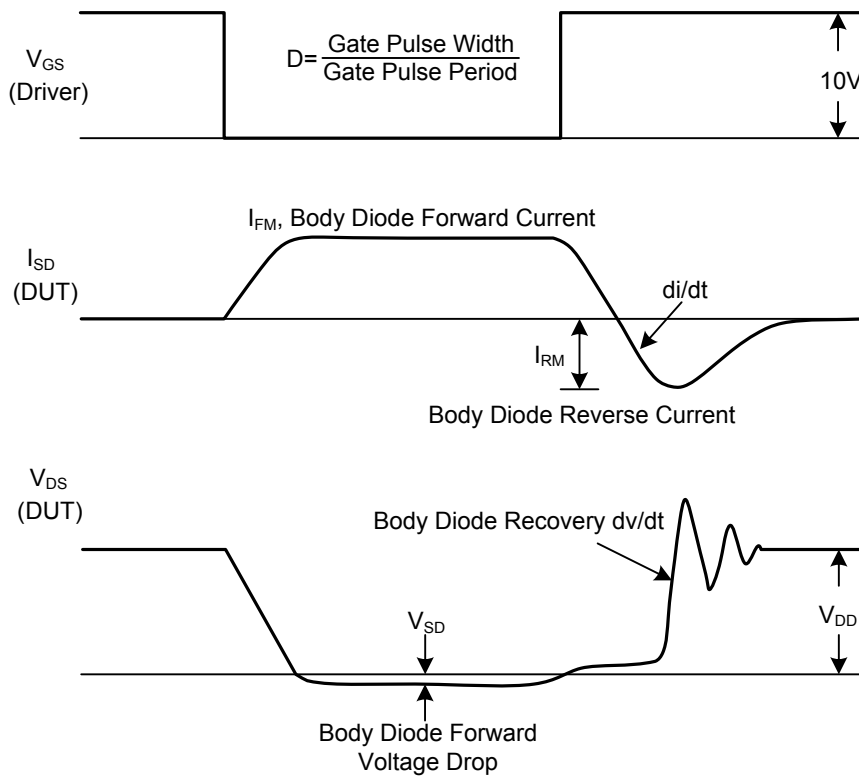
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

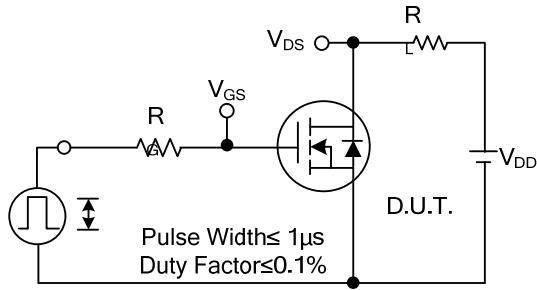


Peak Diode Recovery dv/dt Test Circuit

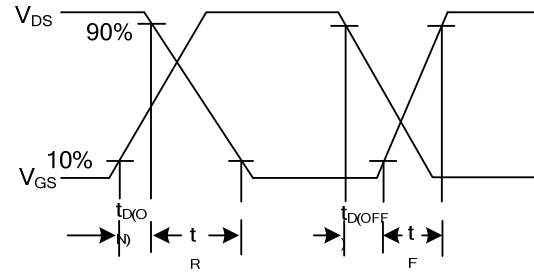


Peak Diode Recovery dv/dt Waveforms

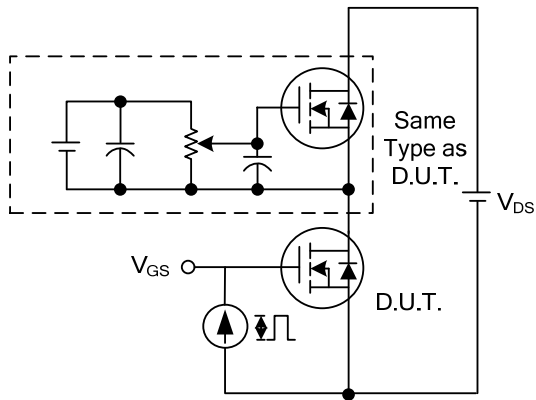
## TEST CIRCUITS AND WAVEFORMS



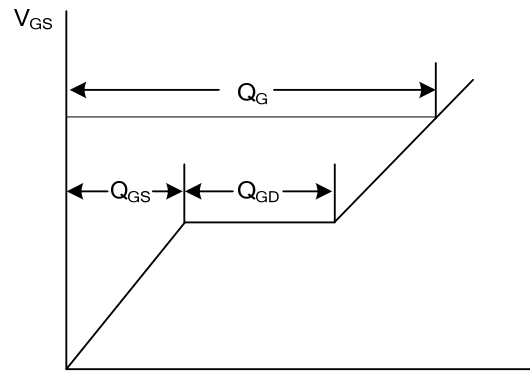
Switching Test Circuit



Switching Waveforms

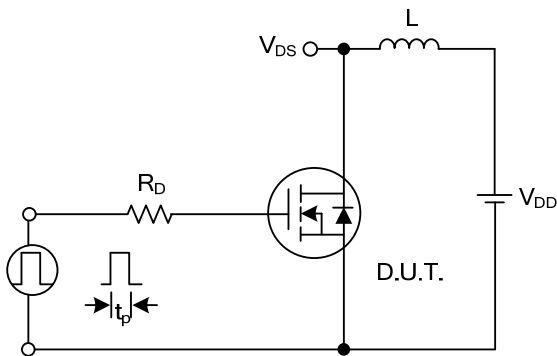


Gate Charge Test Circuit

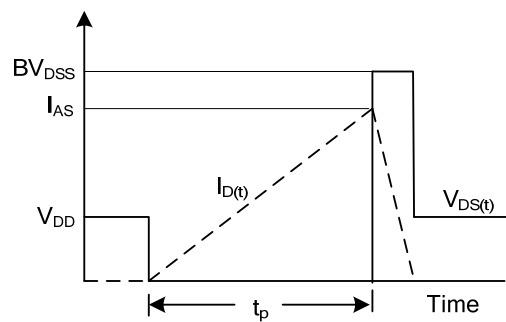


Charge

Gate Charge Waveform

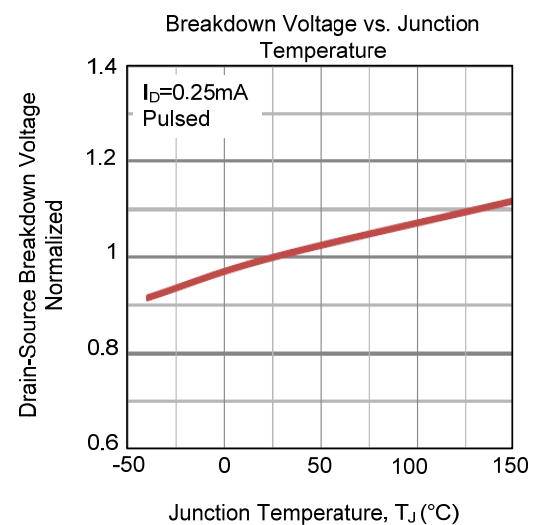
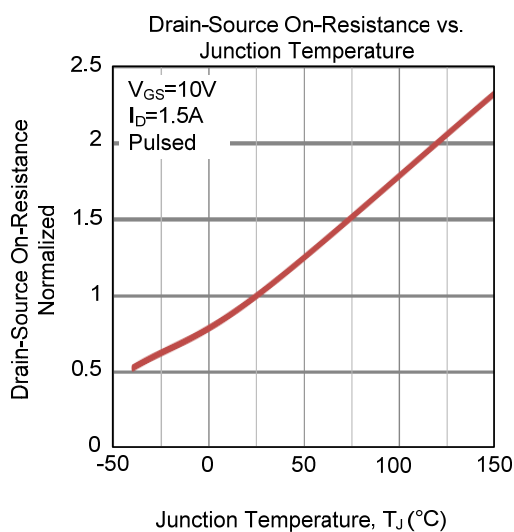
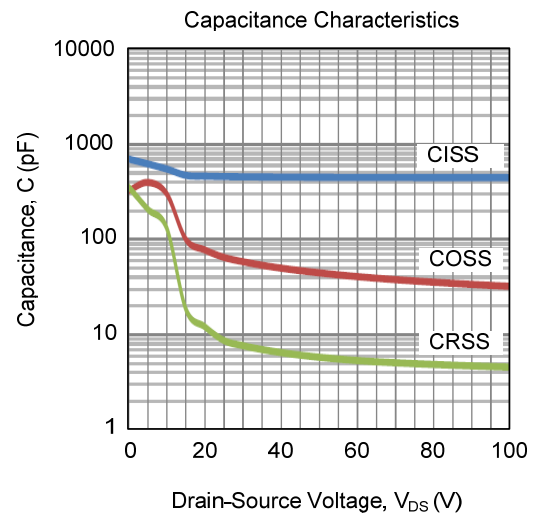
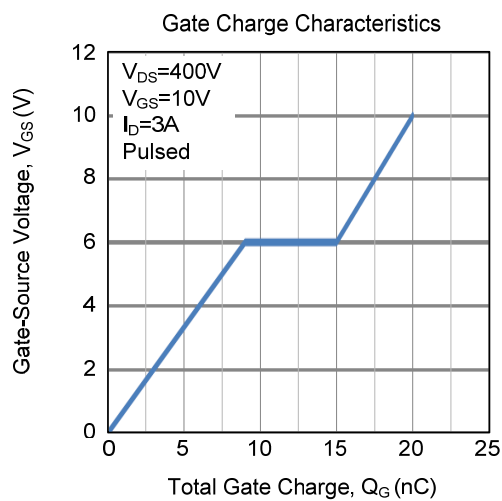
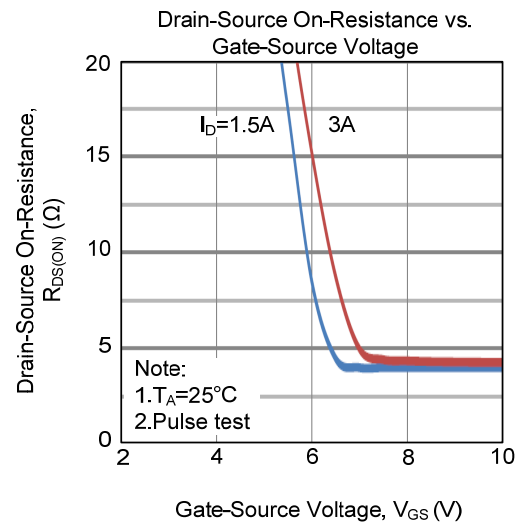
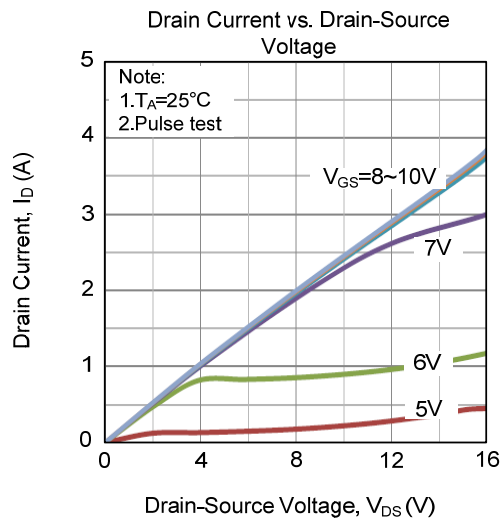


Unclamped Inductive Switching Test Circuit

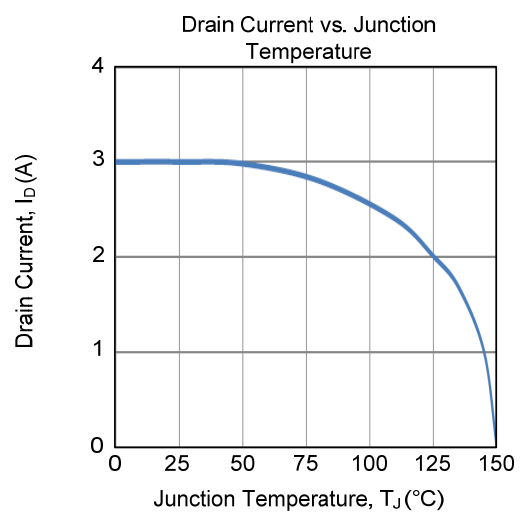
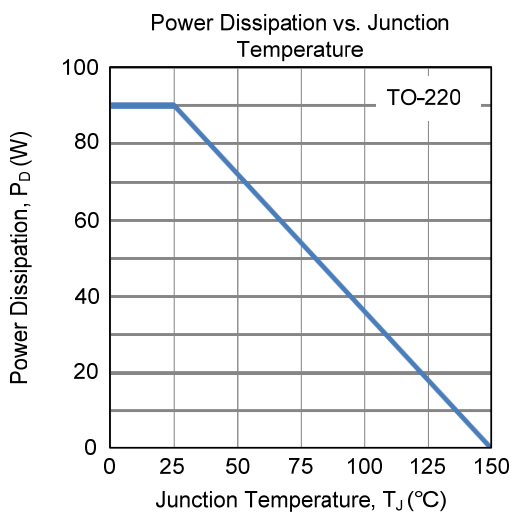
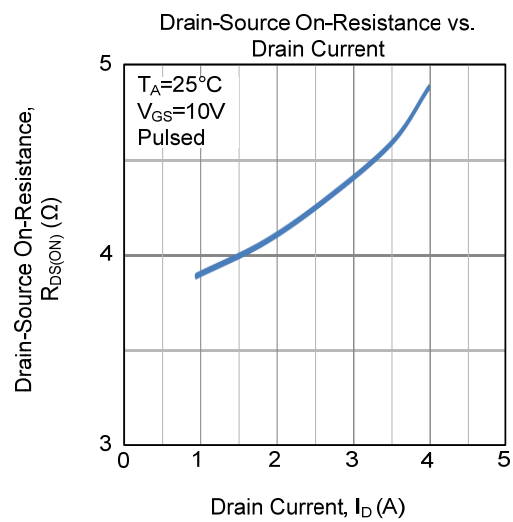
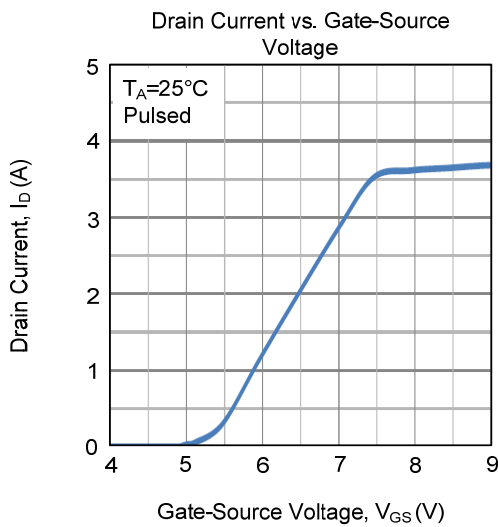
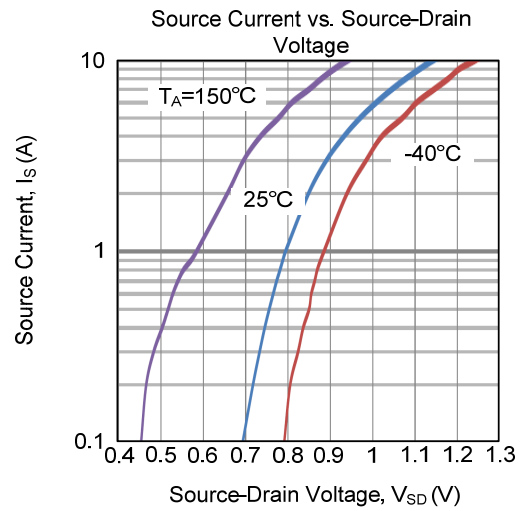
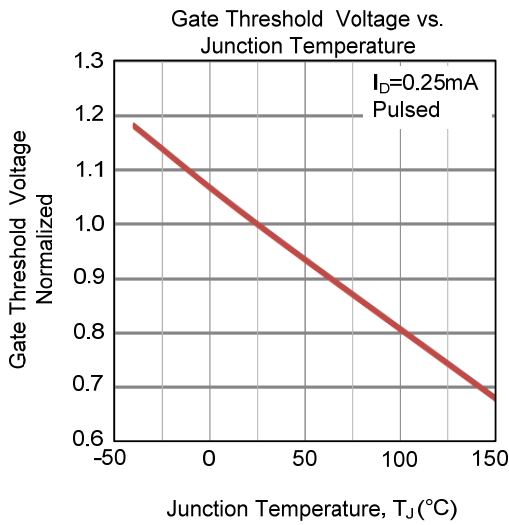


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

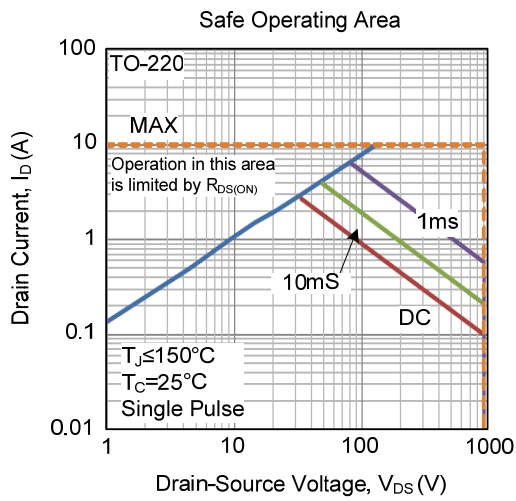


■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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