

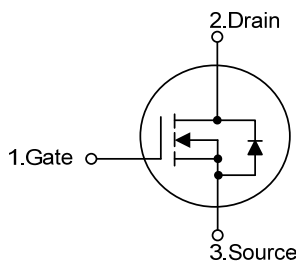
**4N90****Power MOSFET****4A, 900V N-CHANNEL
POWER MOSFET****DESCRIPTION**

The UTC **4N90** is a N-channel enhancement MOSFET adopting UTC's advanced technology to provide customers with DMOS, planar stripe technology. This technology is designed to meet the requirements of the minimum on-state resistance and perfect switching performance. It also can withstand high energy pulse in the avalanche and communication mode.

The UTC **4N90** is particularly applied in high efficiency switch mode power supplies.

FEATURES

- * $R_{DS(ON)} < 4.2\Omega$ @ $V_{GS}=10V$, $I_D=2.0A$
- * High switching speed
- * 100% avalanche tested
- * Improved dv/dt capability

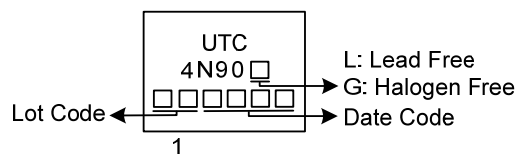
SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N90L-TA3-T	4N90G-TA3-T	TO-220	G	D	S	Tube
4N90L-TF3-T	4N90G-TF3-T	TO-220F	G	D	S	Tube
4N90L-TF1-T	4N90G-TF1-T	TO-220F1	G	D	S	Tube
4N90L-TF2-T	4N90G-TF2-T	TO-220F2	G	D	S	Tube
4N90L-TF3T-T	4N90G-TF3T-T	TO-220F3	G	D	S	Tube
4N90L-TM3-T	4N90G-TM3-T	TO-251	G	D	S	Tube
4N90L-TN3-R	4N90G-TN3-R	TO-252	G	D	S	Tape Reel
4N90L-T3N-T	4N90G-T3N-T	TO-3PN	G	D	S	Tube

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

		(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1 TF2: TO-220F2, TF3T: TO-220F3, TM3: TO-251 TN3: TO-252, T3N: TO-3PN (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 to Source Voltage		V_{DSS}	900	V
Gate to Source Voltage		V_{GSS}	± 30	V
Avalanche Current (Note 2)		I_{AR}	4	A
Continuous Drain Current	Continuous	I_D	4	A
	Pulsed (Note 2)	I_{DM}	16	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	570	mJ
	Repetitive (Note 2)	E_{AR}	14	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation ($T_C=25^\circ\text{C}$)	TO-220	P_D	140	W
	TO-220F/TO-220F1		38	
	TO-220F3		40	
	TO-220F2		54	
	TO-251/TO-252		208	
	TO-3PN		1.12	
Derate above 25°C	TO-220		0.304	$\text{W}/^\circ\text{C}$
	TO-220F/TO-220F1		0.322	
	TO-220F3		0.43	
	TO-220F2		1.66	
	TO-251/TO-252			
	TO-3PN			
Operating 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. $L=67\text{mH}$, $I_{AS}=4\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

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

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-220F3		110	
	TO-251/TO-252		40	
	TO-3PN			
Junction to Case	TO-220	θ_{JC}	0.89	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.25	
	TO-220F3		3.1	
	TO-220F2		2.3	
	TO-251/TO-252		0.6	
	TO-3PN			

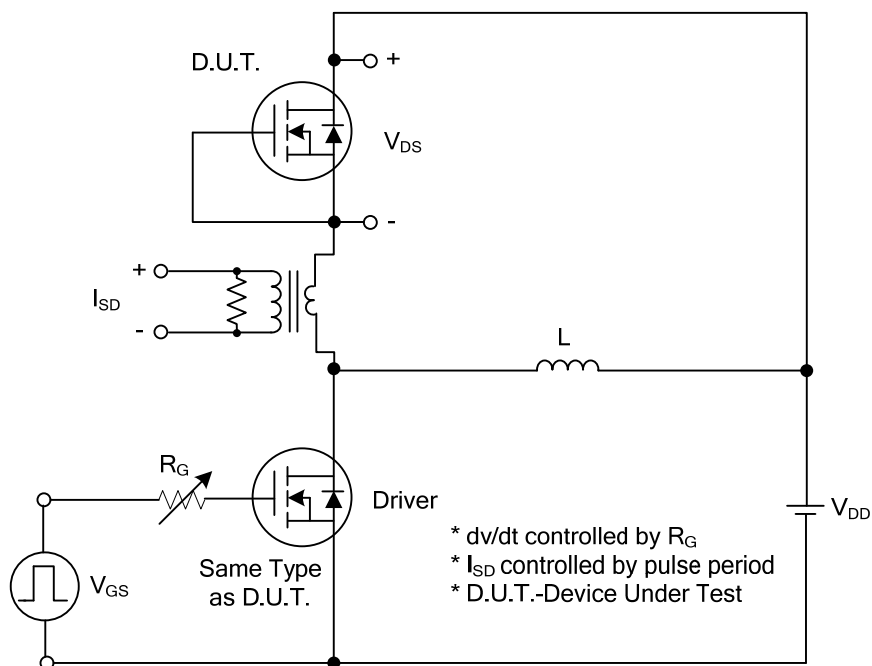
■ **ELECTRICAL CHARACTERISTICS** ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	900			V
Breakdown Voltage Temperature Coefficient		ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		1.05		V/°C
Drain-Source Leakage Current		I _{DSS}	V _{DS} =900V, V _{GS} =0V			10	μA
			V _{DS} =720V, T _C =125°C			100	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse	I _{GSS}	V _{GS} =-30V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	3.0		5.0	V
Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =2.0A			4.2	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		1094		pF
Output Capacitance		C _{OSS}			101		pF
Reverse Transfer Capacitance		C _{RSS}			13.3		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =250V, V _{GS} =10V, I _D =4.0A (Note 1,2)		31		nC
Gate-Source Charge		Q _{GS}			9		nC
Gate-Drain Charge		Q _{GD}			9.7		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =30V, I _D =0.5A, R _G =25Ω (Note 1,2)		70		ns
Turn-ON Rise Time		t _R			188		ns
Turn-OFF Delay Time		t _{D(OFF)}			188		ns
Turn-OFF Fall Time		t _F			88		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				4	A
Maximum Body-Diode Pulsed Current		I _{SM}				16	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =4.0A, V _{GS} =0V			1.4	V

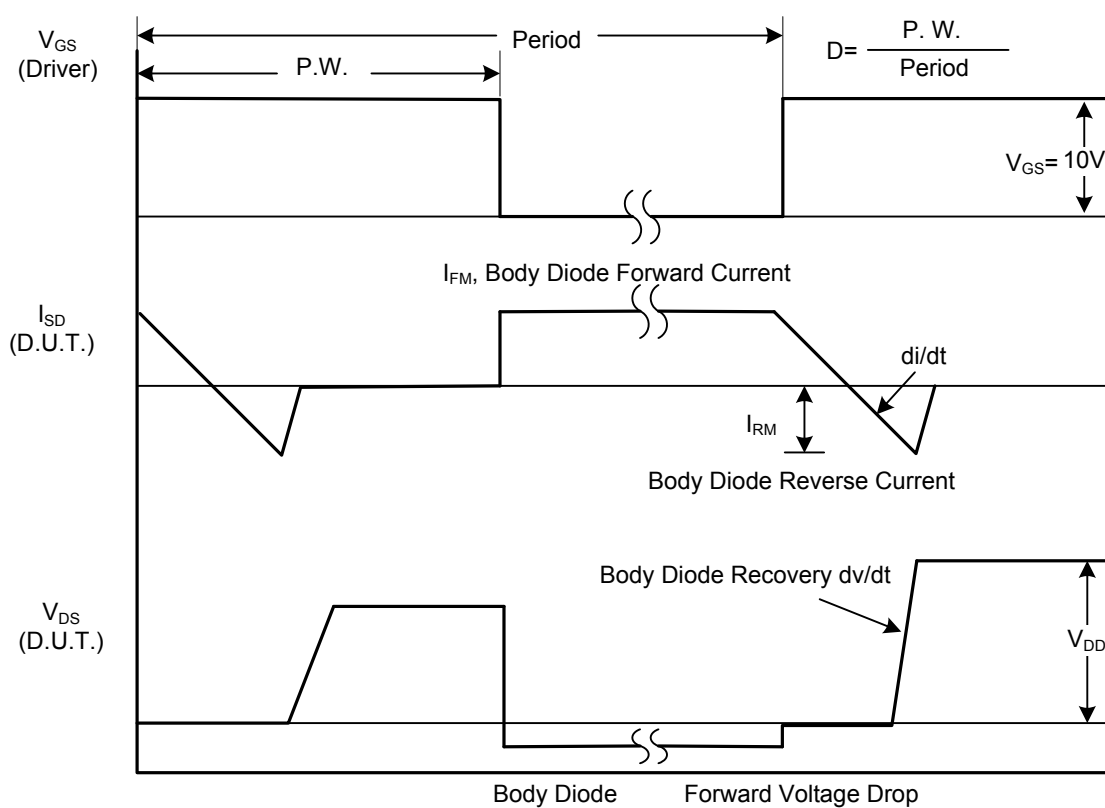
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

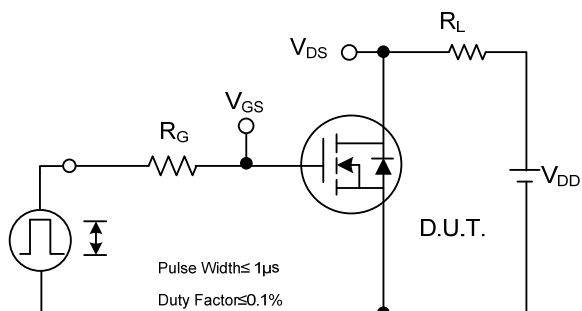


Peak Diode Recovery dv/dt Test Circuit

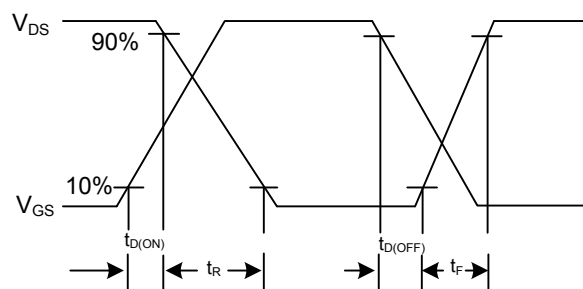


Peak Diode Recovery dv/dt Waveforms

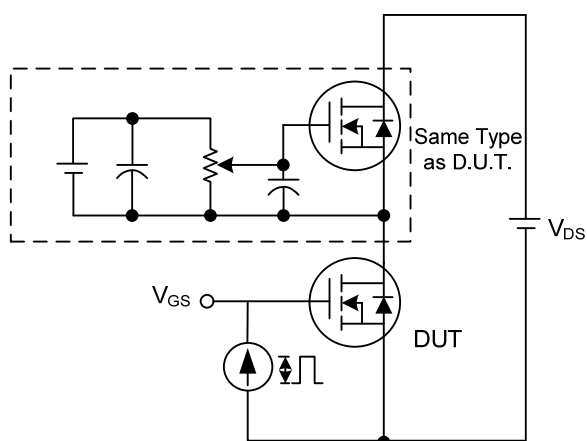
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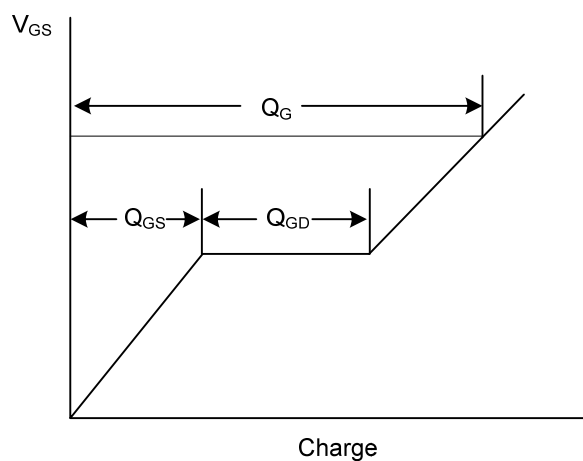
Switching Test Circuit



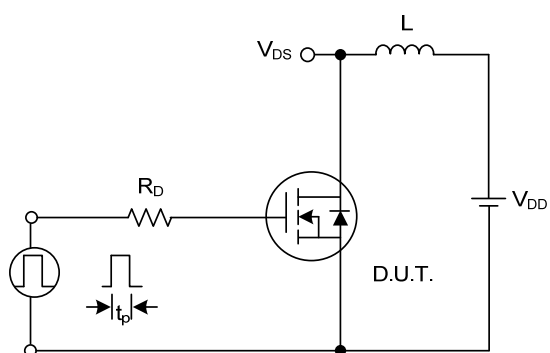
Switching Waveforms



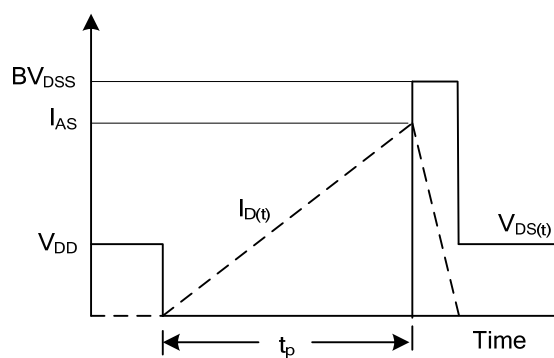
Gate Charge Test Circuit



Gate Charge Waveform

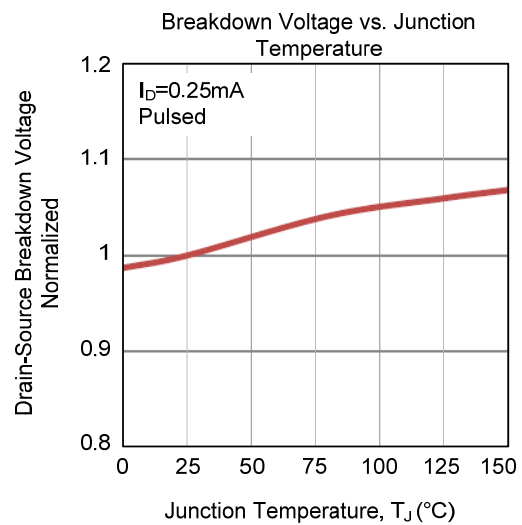
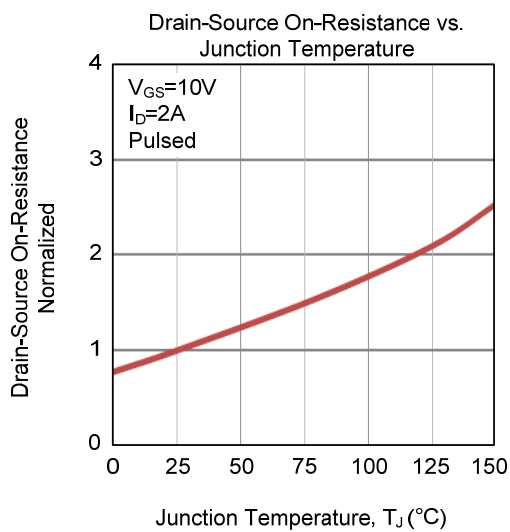
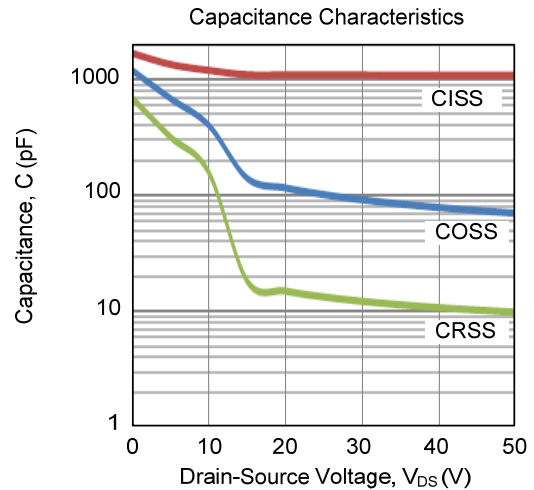
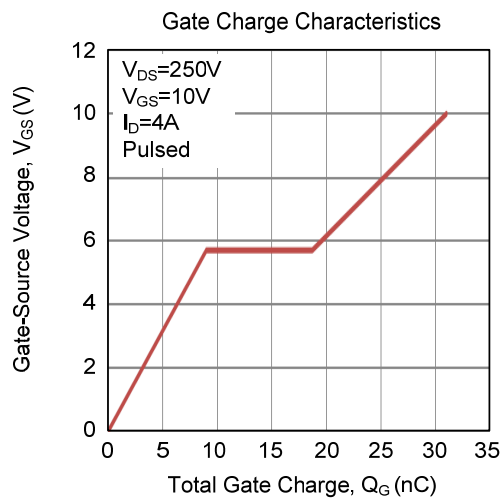
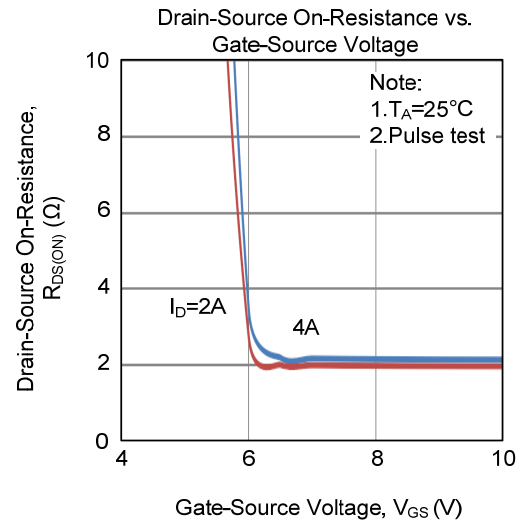
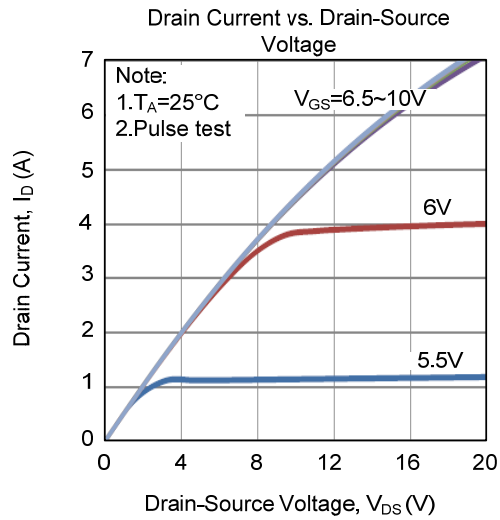


Unclamped Inductive Switching Test Circuit

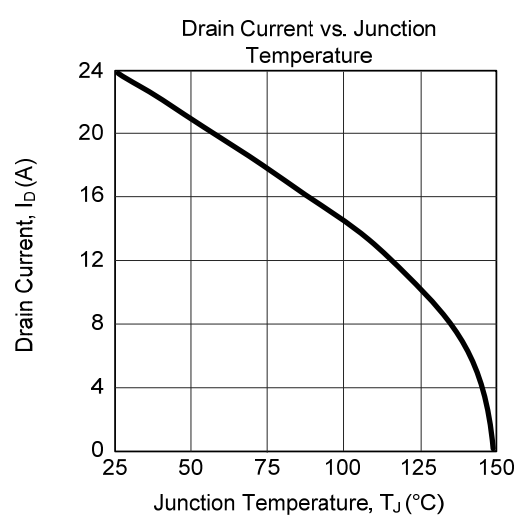
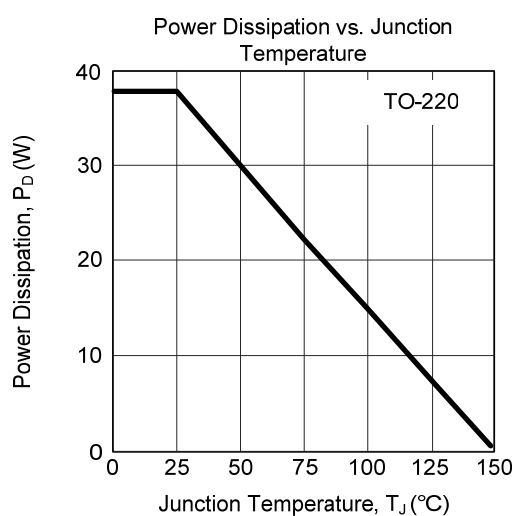
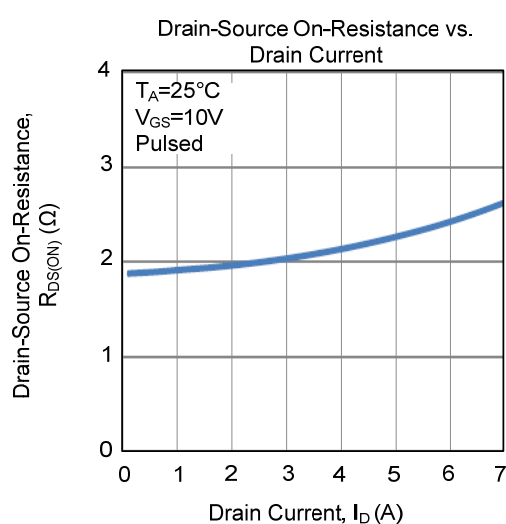
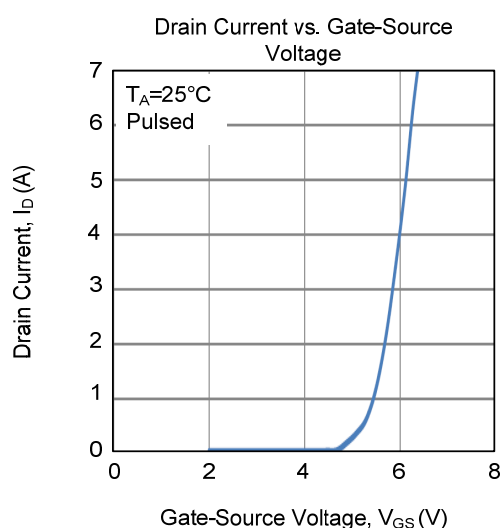
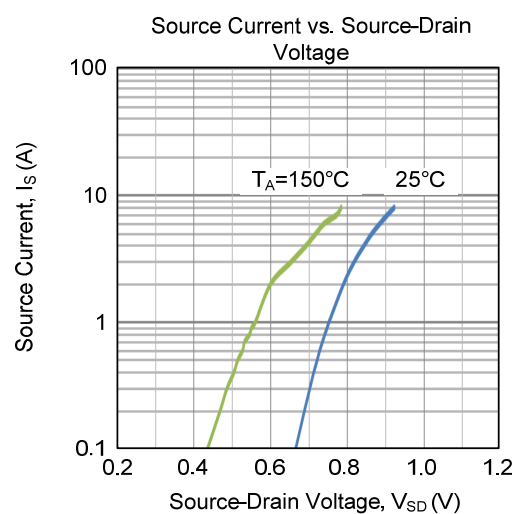
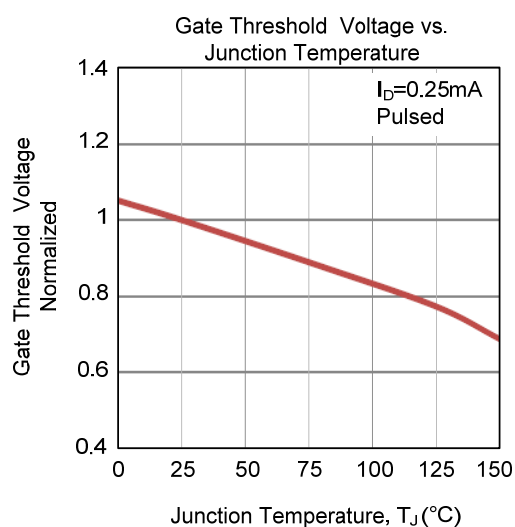


Unclamped Inductive Switching Waveforms

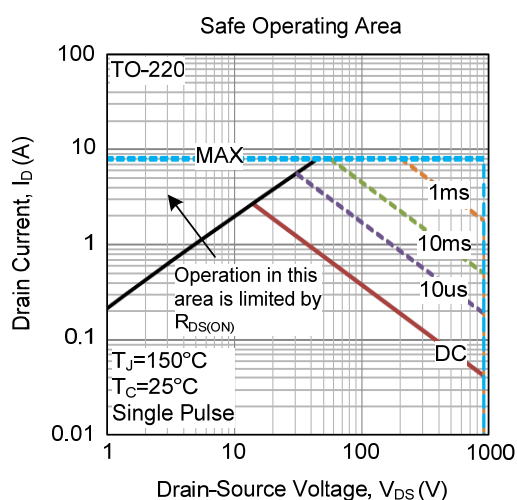
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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