



9N90-C

Power MOSFET

9.0A, 900V N-CHANNEL POWER MOSFET

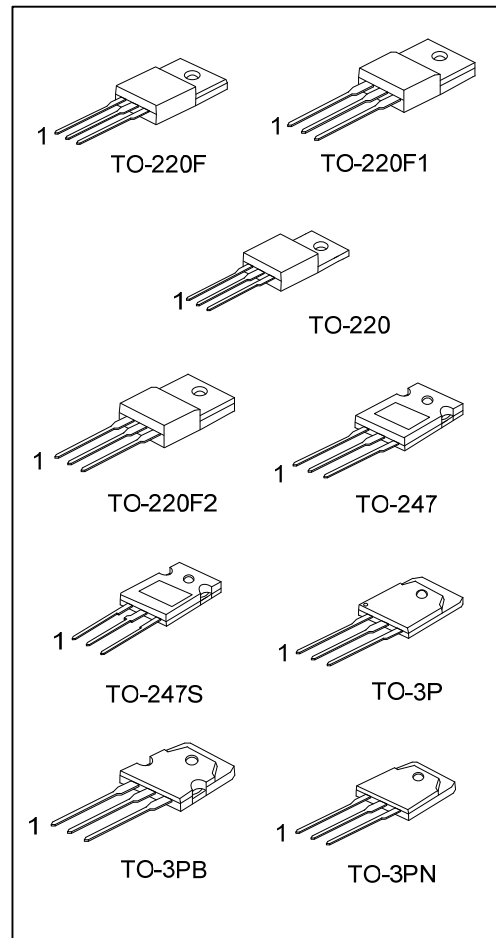
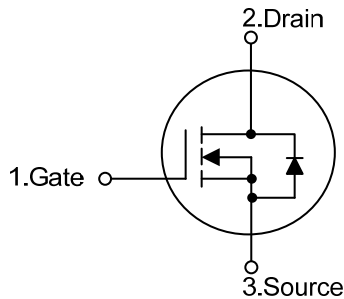
■ DESCRIPTION

The UTC **9N90-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

- * $R_{DS(ON)} \leq 1.4 \Omega @ V_{GS}=10V, I_D=4.5A$
- * Low Reverse Transfer Capacitance
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

■ SYMBOL



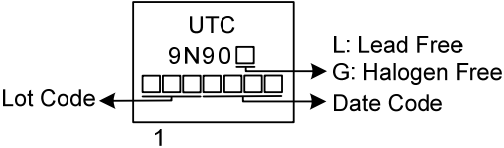
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N90L-TA3-T	9N90G-TA3-T	TO-220	G	D	S	Tube
9N90L-TF1-T	9N90G-TF1-T	TO-220F1	G	D	S	Tube
9N90L-TF2-T	9N90G-TF2-T	TO-220F2	G	D	S	Tube
9N90L-TF3-T	9N90G-TF3-T	TO-220F	G	D	S	Tube
9N90L-T3B-T	9N90G-T3B-T	TO-3PB	G	D	S	Tube
9N90L-T3P-T	9N90G-T3P-T	TO-3P	G	D	S	Tube
9N90L-T3N-T	9N90G-T3N-T	TO-3PN	G	D	S	Tube
9N90L-T47-T	9N90G-T47-T	TO-247	G	D	S	Tube
9N90L-T47S-T	9N90G-T47S-T	TO-247S	G	D	S	Tube

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

<p>9N90G-TA3-T</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, T3B: TO-3PB, T3P: TO-3P, T3N: TO-3PN, T47: TO-247, T47S: TO-247S (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}	± 30	V
Drain Current	Continuous	I_D	9	A
	Pulsed (Note 2)	I_{DM}	18	A
Avalanche Energy		E_{AS}	210	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.2	V/ns
Power Dissipation	TO-220	P_D	160	W
	TO-220F/TO-220F1 TO-220F2		40	W
	TO-247/TO-247S		240	W
	TO-3P/TO-3PB TO-3PN		280	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. $L=10\text{mH}$, $I_{AS}=6.5\text{A}$, $V_{DD}=100\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 9.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-247/TO-247S		50	$^{\circ}\text{C}/\text{W}$
	TO-3P/TO-3PB TO-3PN		40	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	0.78	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2		3.125	$^{\circ}\text{C}/\text{W}$
	TO-247/TO-247S		0.52	$^{\circ}\text{C}/\text{W}$
	TO-3P/TO-3PB TO-3PN		0.45	$^{\circ}\text{C}/\text{W}$

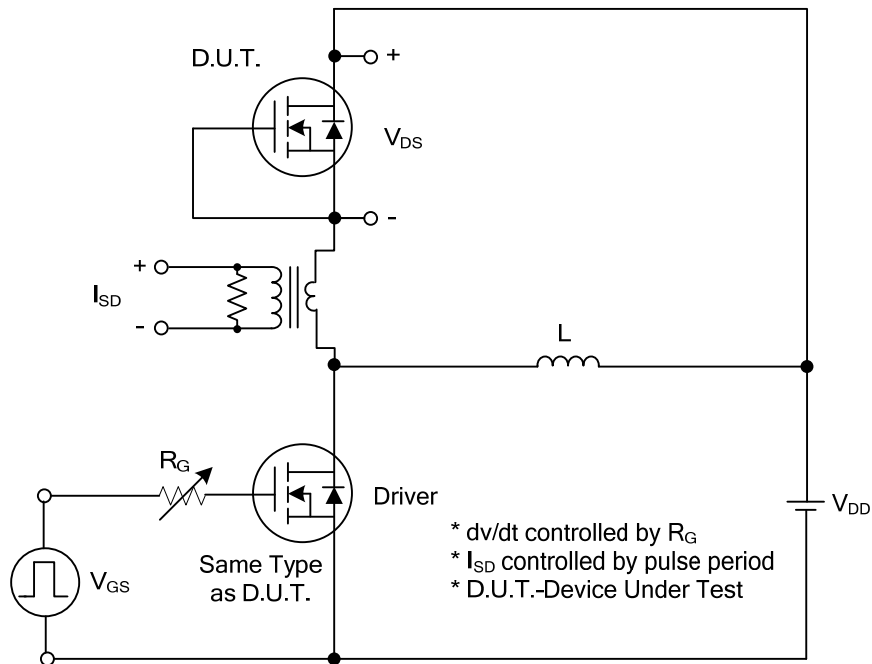
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	900			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =900V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	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
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4.5A			1.4	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		1900		pF
Output Capacitance	C _{OSS}			216		pF
Reverse Transfer Capacitance	C _{RSS}			23		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =200V, V _{GS} =10V, I _D =9A I _G =1mA (Note 1, 2)		46		nC
Gate-Source Charge	Q _{GS}			18		nC
Gate-Drain Charge	Q _{GD}			15		nC
Turn-On Delay Time (Note 1)	t _{D(ON)}	V _{DD} =30V, V _{GS} =10V, I _D =10A, R _G =25Ω (Note 1, 2)		72		ns
Turn-On Rise Time	t _R			92		ns
Turn-Off Delay Time	t _{D(OFF)}			290		ns
Turn-Off Fall Time	t _F			55		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				9	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				18	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =9A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =9A, V _{GS} =0V, dI _F /dt=100A/μs		636		ns
Body Diode Reverse Recovery Charge	Q _{rr}				10.4	

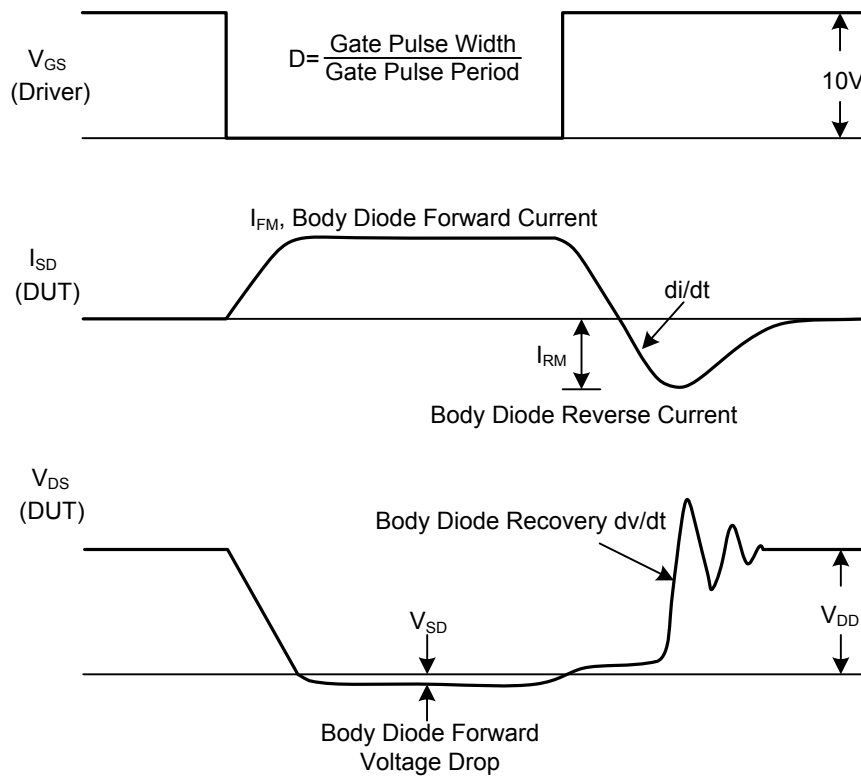
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

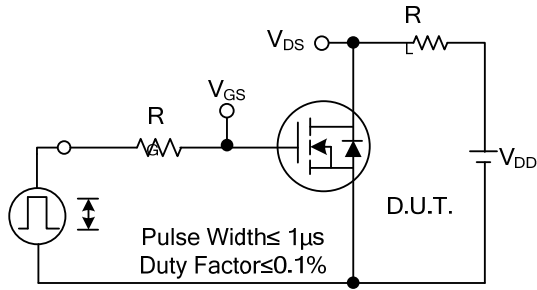


Peak Diode Recovery dv/dt Test Circuit

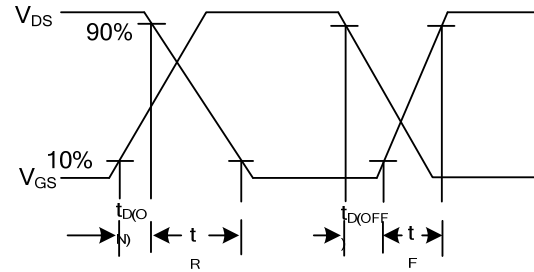


Peak Diode Recovery dv/dt Waveforms

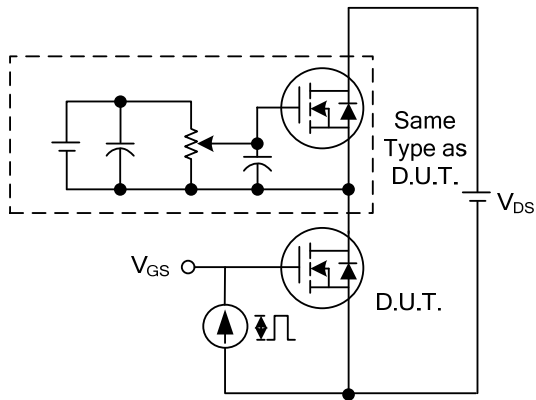
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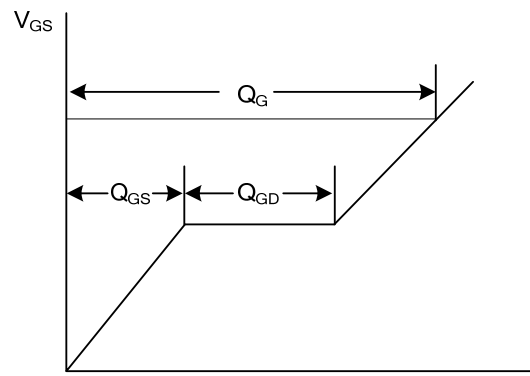
Switching Test Circuit



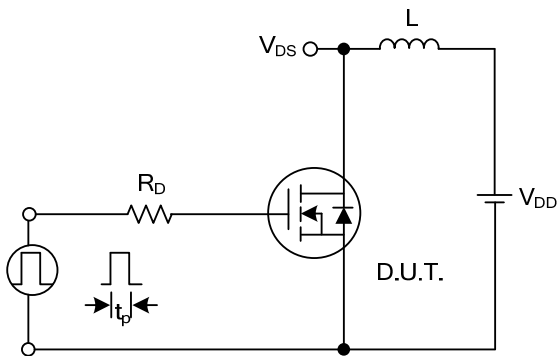
Switching Waveforms



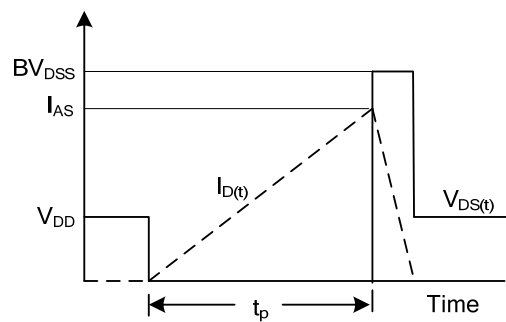
Gate Charge Test Circuit



Gate Charge Waveform

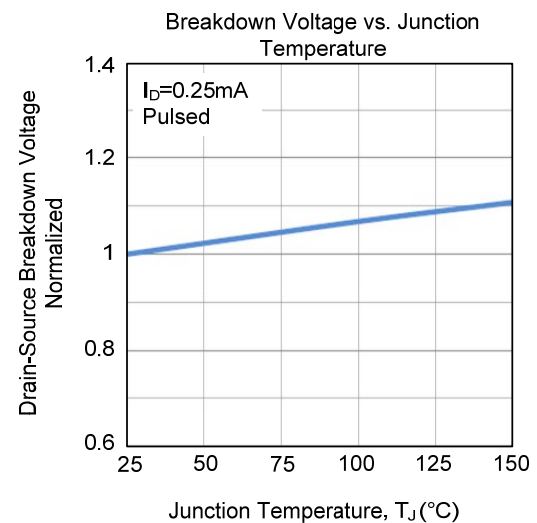
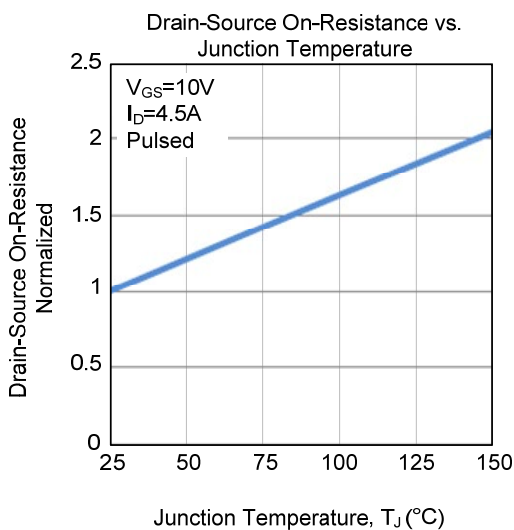
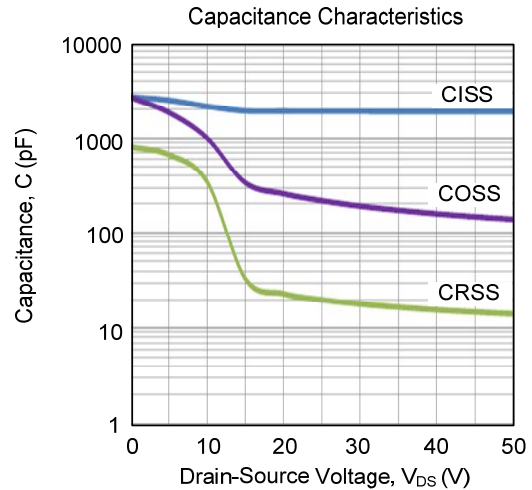
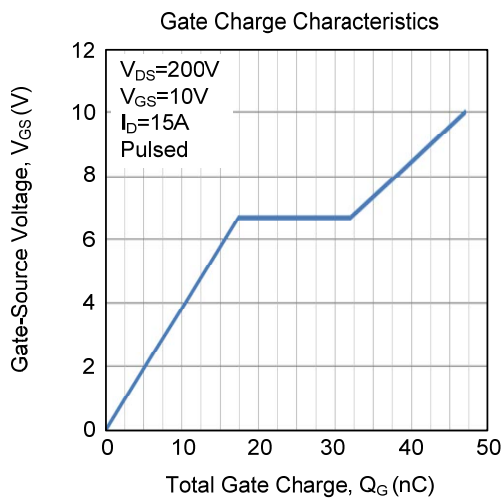
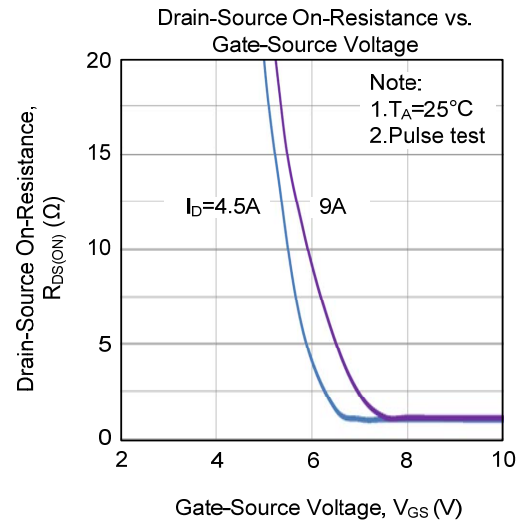
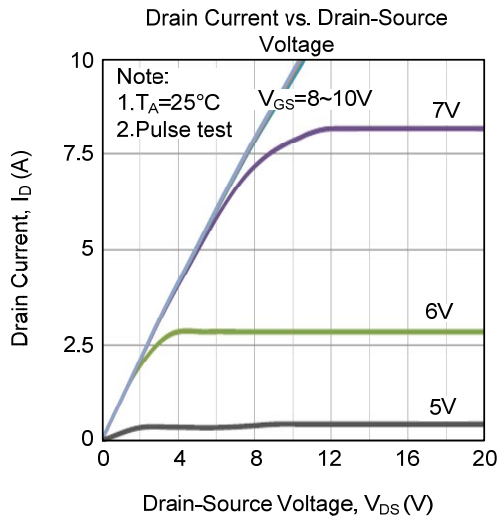


Unclamped Inductive Switching Test Circuit

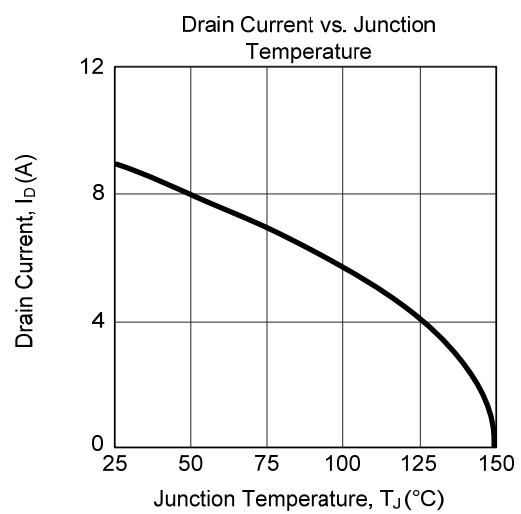
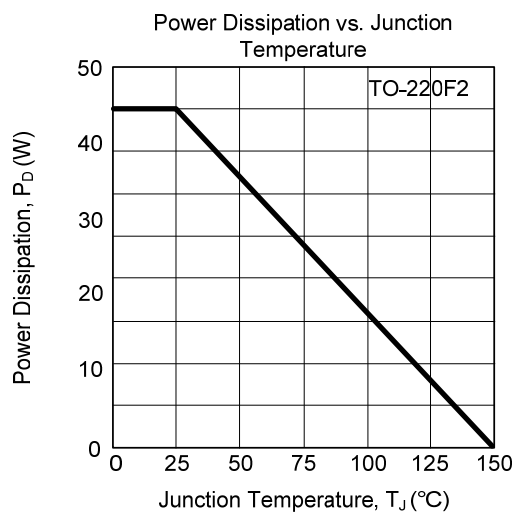
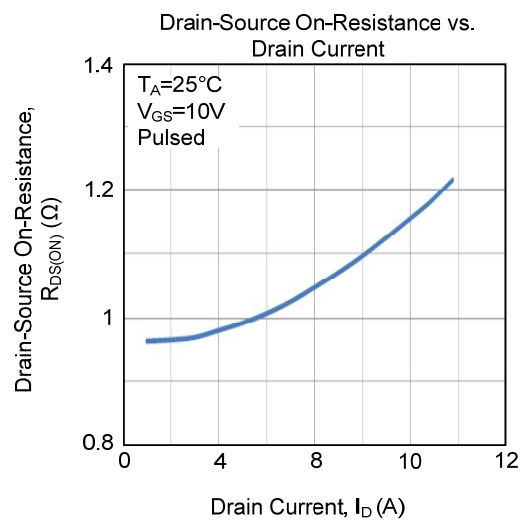
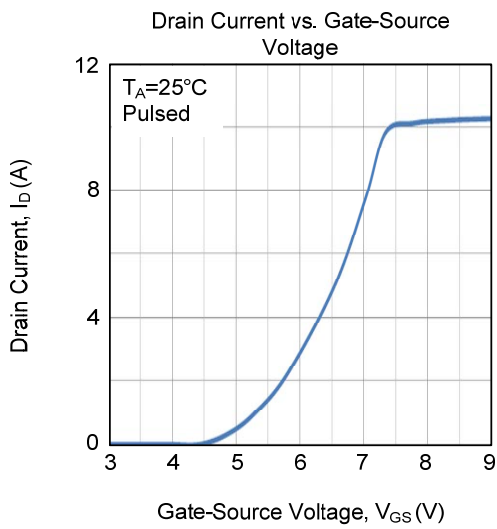
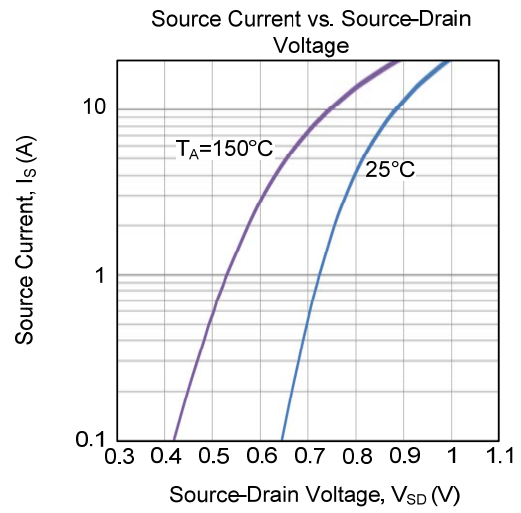
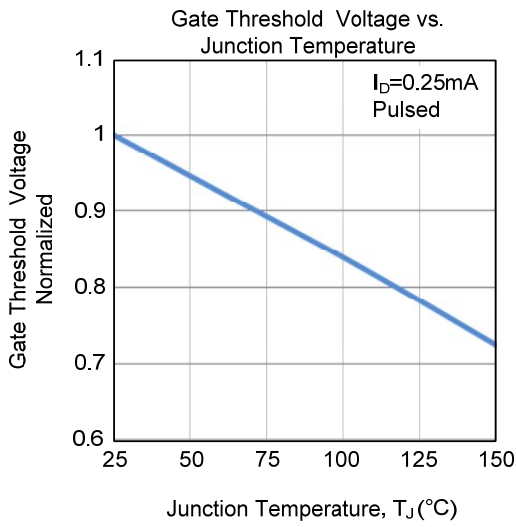


Unclamped Inductive Switching Waveforms

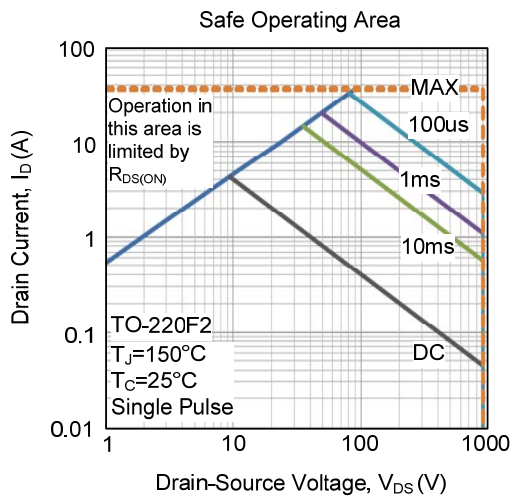
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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