



4N90-FC

Power MOSFET

4.0A, 900V N-CHANNEL POWER MOSFET

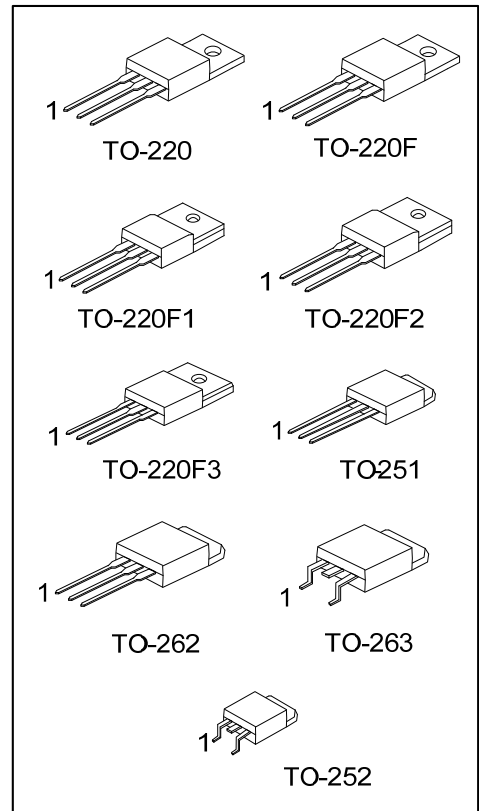
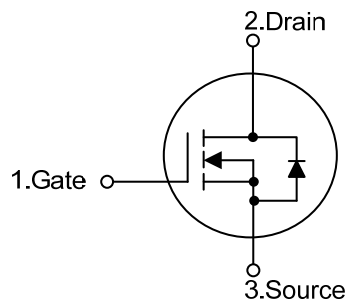
■ DESCRIPTION

The UTC **4N90-FC** 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

- * $R_{DS(ON)} \leq 4.6 \Omega$ @ $V_{GS}=10V$, $I_D=2.0A$
- * Low Reverse Transfer Capacitance
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

■ SYMBOL



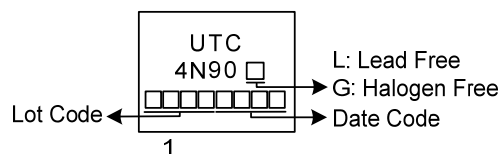
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N90L-TA3-T	4N90G-TA3-T	TO-220	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-TF3-T	4N90G-TF3-T	TO-220F	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-T2Q-T	4N90G-T2Q-T	TO-262	G	D	S	Tube
4N90L-T2Q-R	4N90G-T2Q-R	TO-262	G	D	S	Tape Reel
4N90L-TQ2-T	4N90G-TQ2-T	TO-263	G	D	S	Tube
4N90L-TQ2-R	4N90G-TQ2-R	TO-263	G	D	S	Tape Reel

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

4N90G-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2 TF3: TO-220F, TF3T: TO-220F3, TM3: TO-251, TN3: TO-252, T2Q: TO-262, TQ2: TO-263 (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-Source Voltage		V_{DS}	900	V
Gate-Source Voltage		V_{GS}	± 30	V
Drain Current	Continuous	I_D	4	A
	Pulsed (Note 2)	I_{DM}	8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	138	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.9	V/ns
Power Dissipation	TO-220/TO-262 TO-263	P_D	105	W
	TO-220F/TO-220F1 TO-220F2/TO-220F3		27	W
	TO-251/TO-252		47	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. $L=30\text{mH}$, $I_{AS}=3.0\text{A}$, $V_{DD}=100\text{V}$, $R_G=25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD}\leq 4.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3/TO-262 TO-263	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-252		110	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220/TO-262 TO-263	θ_{JC}	1.19	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2/TO-220F3		4.5	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-252		2.65 (Note)	$^{\circ}\text{C}/\text{W}$

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

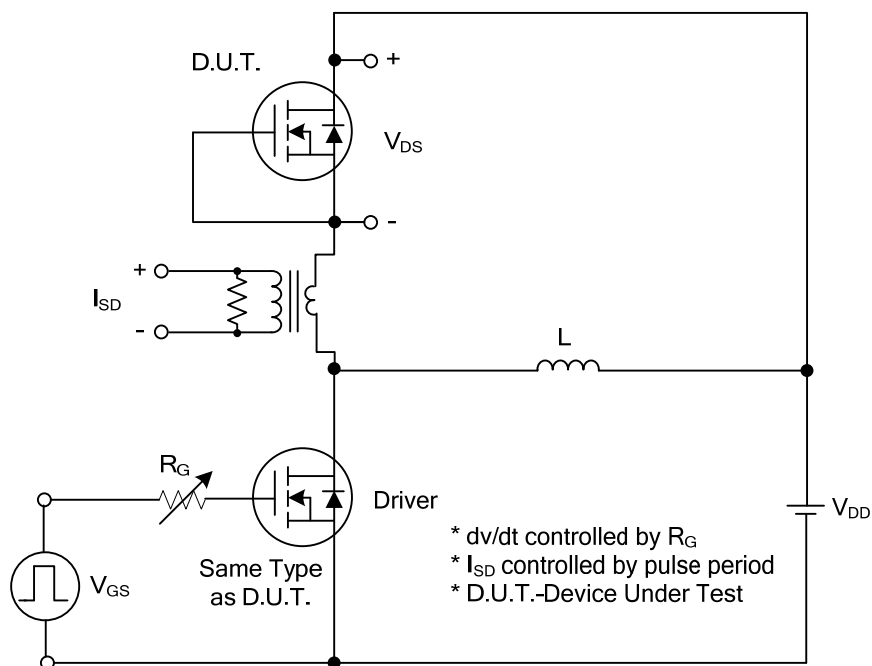
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	900			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=900V, V_{GS}=0V$			10	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$			± 100	nA
ON CHARACTERISTICS						
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.0A$			4.6	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		600		pF
Output Capacitance	C_{OSS}			58		pF
Reverse Transfer Capacitance	C_{RSS}			2		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=720V, V_{GS}=10V, I_D=4.0A$ $I_G=1mA$ (Note 1, 2)		14.2		nC
Gate-Source Charge	Q_{GS}			4.6		nC
Gate-Drain Charge	Q_{GD}			1.25		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V,$ $I_D=4.0A, R_G=25\Omega$ (Note 1, 2)		10		ns
Turn-On Rise Time	t_R			15.5		ns
Turn-Off Delay Time	$t_{D(OFF)}$			28		ns
Turn-Off Fall Time	t_F			27		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				4	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				8	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=4.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=4.0A, V_{GS}=0V,$ $di_F/dt=100A/\mu s$		400		nS
Body Diode Reverse Recovery Charge	Q_{rr}			6.3		μC

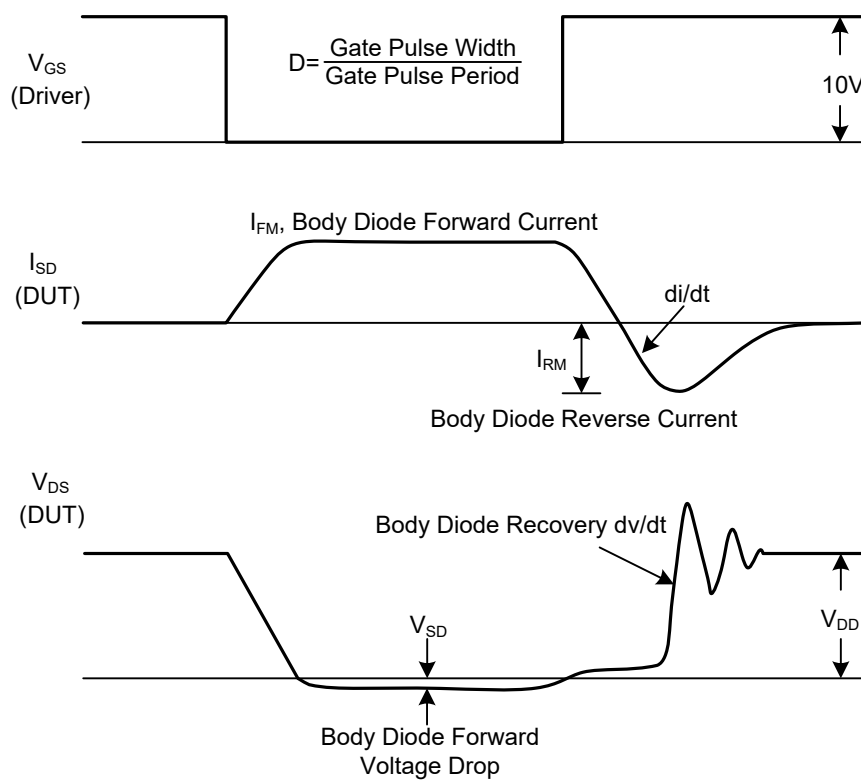
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

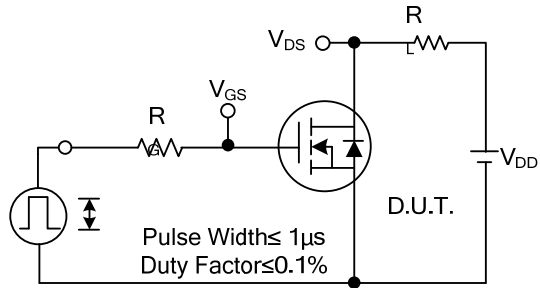


Peak Diode Recovery dv/dt Test Circuit

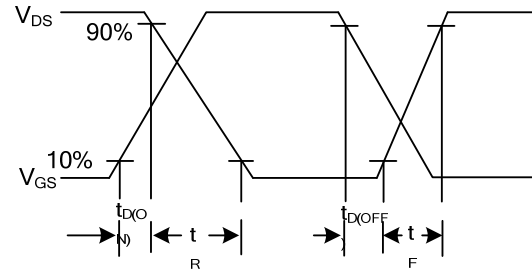


Peak Diode Recovery dv/dt Waveforms

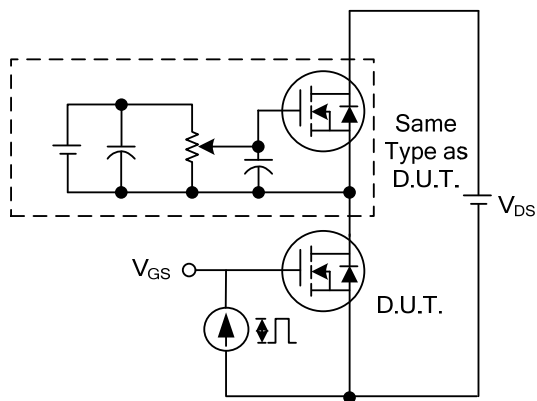
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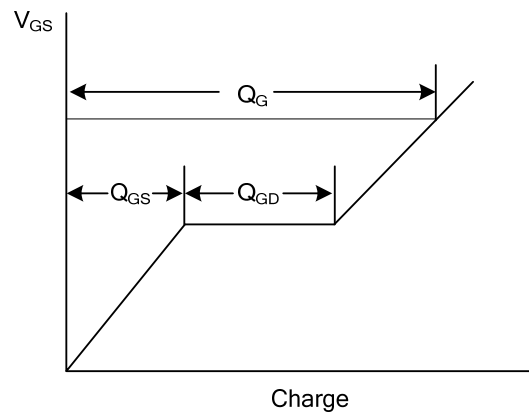
Switching Test Circuit



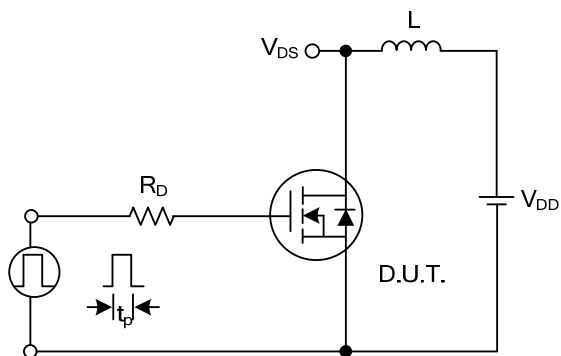
Switching Waveforms



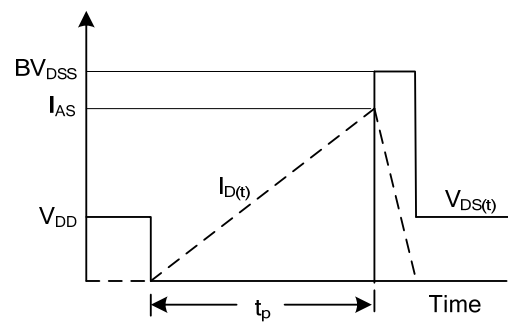
Gate Charge Test Circuit



Gate Charge Waveform

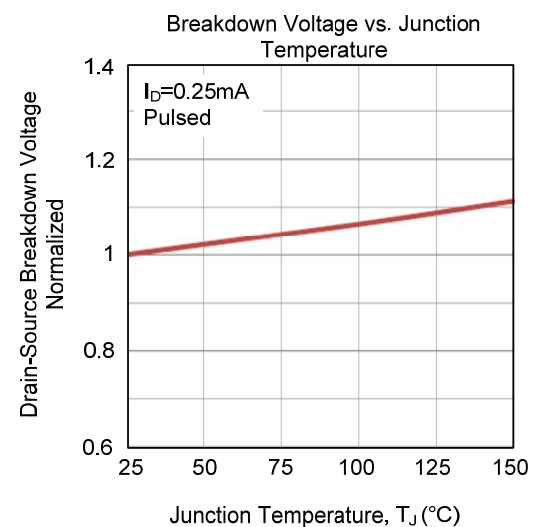
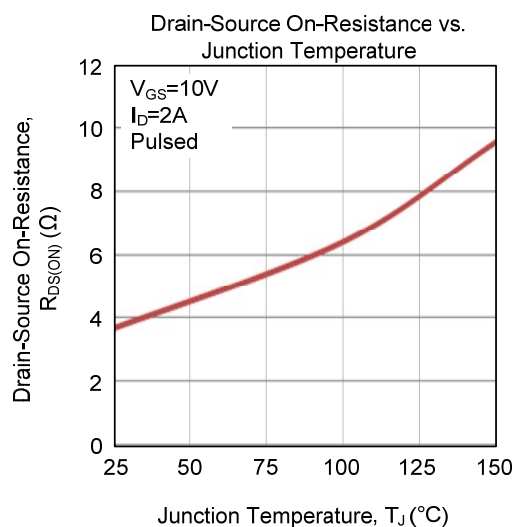
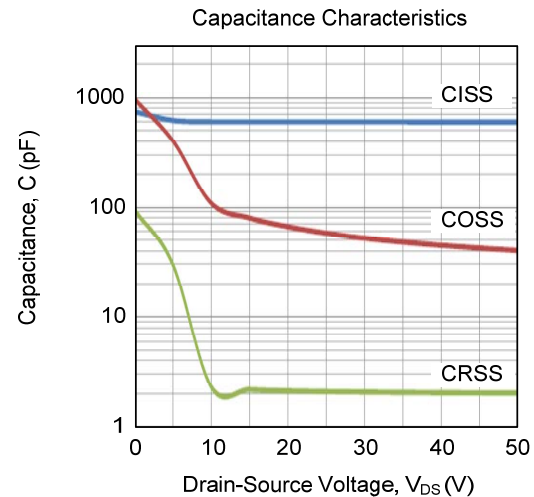
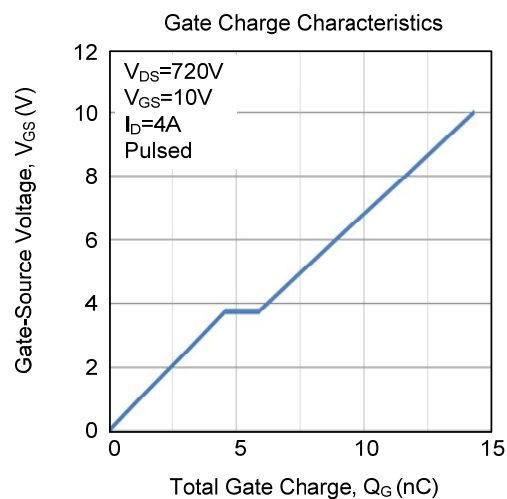
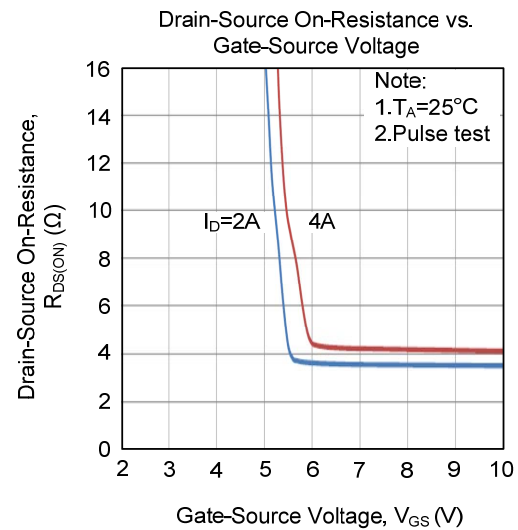
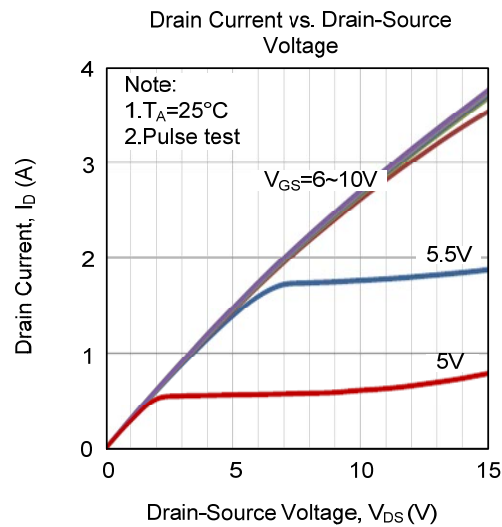


Unclamped Inductive Switching Test Circuit

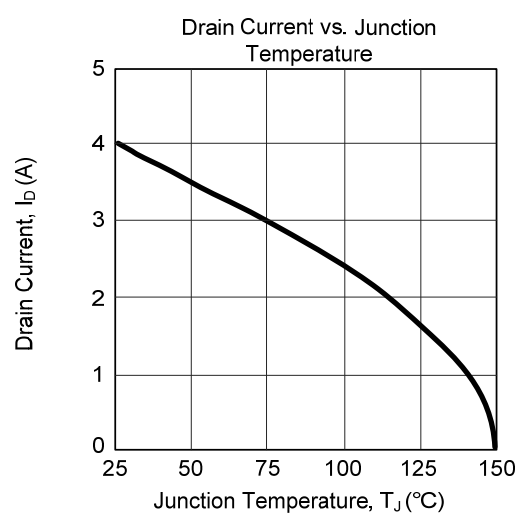
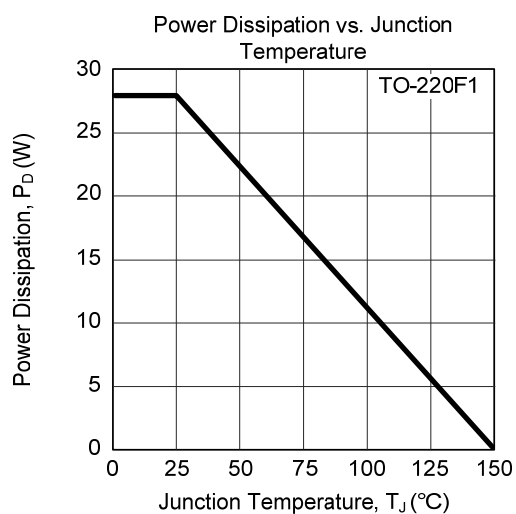
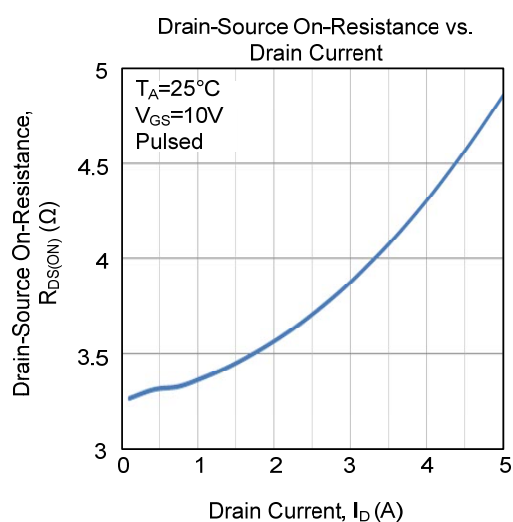
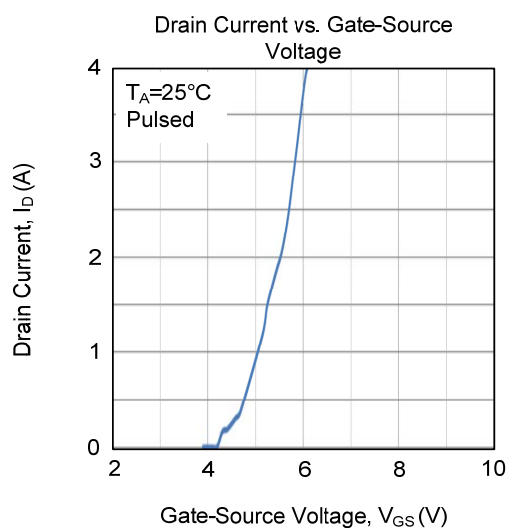
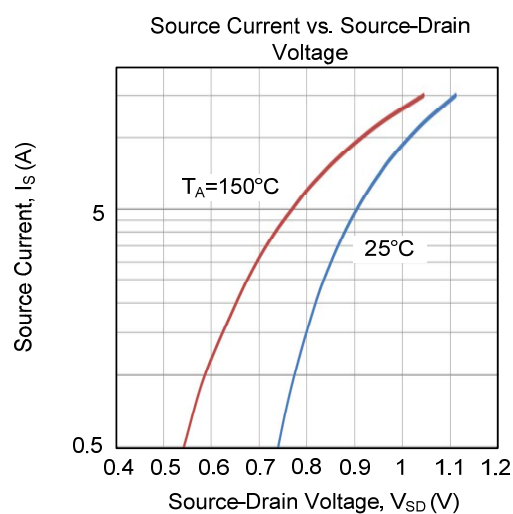
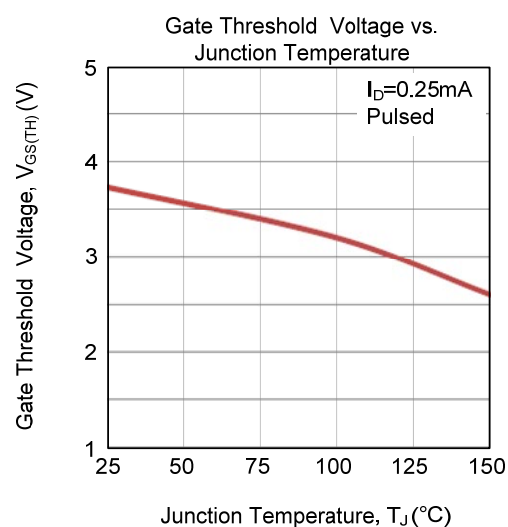


Unclamped Inductive Switching Waveforms

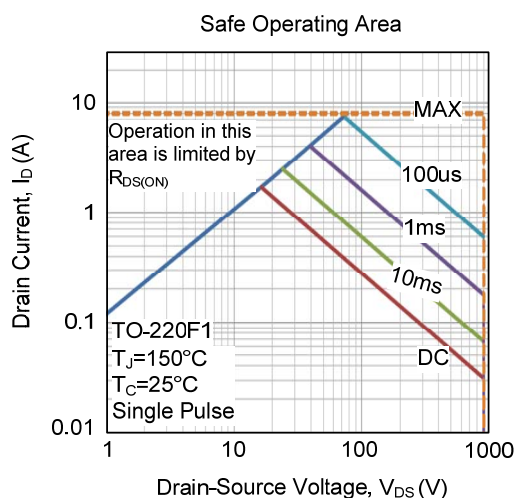
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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