



10N50-ML

Power MOSFET

10A, 500V N-CHANNEL POWER MOSFET

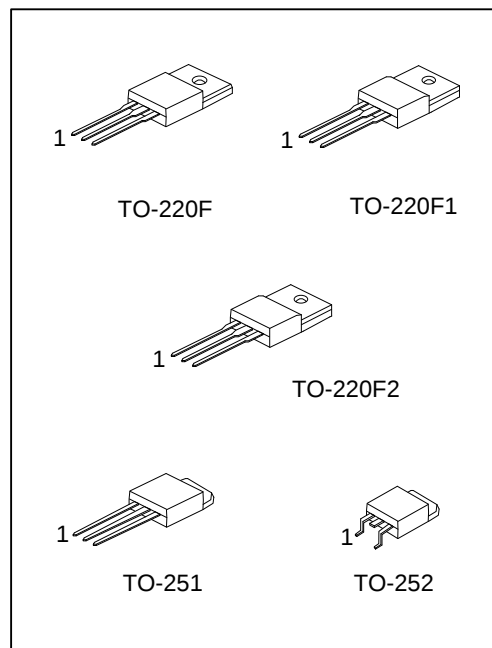
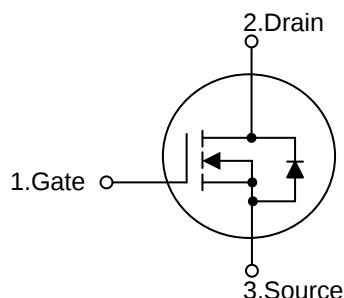
DESCRIPTION

The UTC 10N50-ML 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

- * $R_{DS(ON)} \leq 0.75 \Omega$ @ $V_{GS}=10V$, $I_D=5.0A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



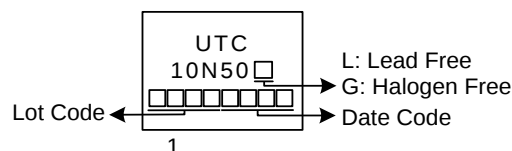
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10N50L-TF1-T	10N50G-TF1-T	TO-220F1	G	D	S	Tube
10N50L-TF2-T	10N50G-TF2-T	TO-220F2	G	D	S	Tube
10N50L-TF3-T	10N50G-TF3-T	TO-220F	G	D	S	Tube
10N50L-TM3-T	10N50G-TM3-T	TO-251	G	D	S	Tube
10N50L-TN3-R	10N50G-TN3-R	TO-252	G	D	S	Tape Reel

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

10N50G-TF1-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2 TM3: TO-251, TN3: TO-252 (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}	500	V
Gate-Source Voltage		V_{GS}	± 30	V
Continuous Drain Current		I_D	10	A
Pulsed Drain Current (Note 2)		I_{DM}	20	A
Avalanche Energy (Note 3)	Single Pulsed	E_{AS}	375	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.7	V/ns
Power Dissipation ($T_A=25^{\circ}\text{C}$)	TO-220F/TO-220F1	P_D	39	W
	TO-220F2			
	TO-251/TO-252		56	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. $L=30\text{mH}$, $I_{AS}=5.0\text{A}$, $V_{DD}=100\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 10\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, Starting $T_J = 25^{\circ}\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220F/TO-220F1	θ_{JA}	62.5	$^{\circ}\text{C/W}$
	TO-220F2			
	TO-251/TO-252		110	$^{\circ}\text{C/W}$
Junction to Case	TO-220F/TO-220F1	θ_{JC}	3.2	$^{\circ}\text{C/W}$
	TO-220F2			
	TO-251/TO-252		2.23 (Note)	$^{\circ}\text{C/W}$

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

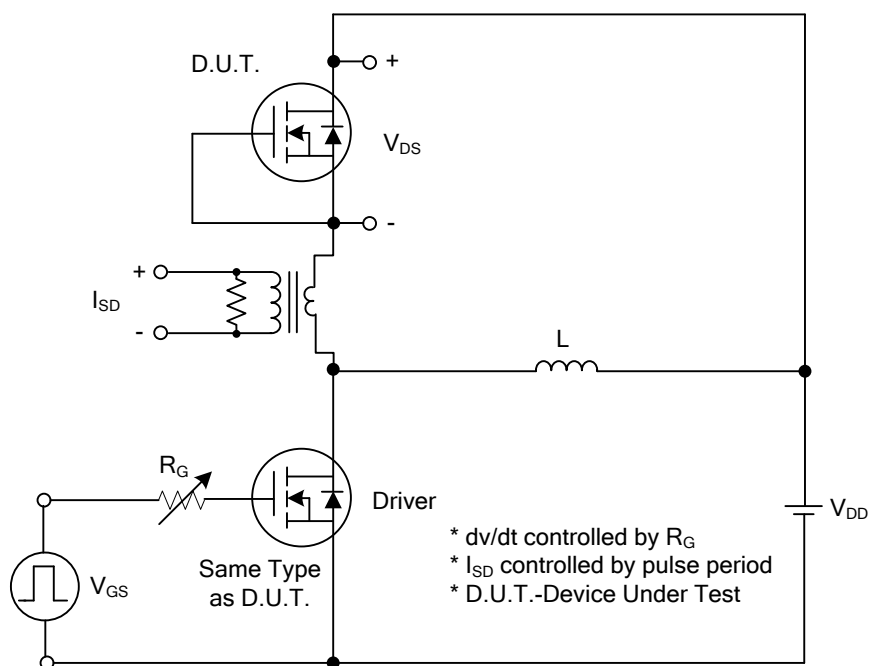
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	500			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=500V, V_{GS}=0V$			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	$V_{GS}=30V, V_{DS}=0V$			100	nA
	Reverse		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.0A$			0.75	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		1180		pF
Output Capacitance		C_{OSS}			123		pF
Reverse Transfer Capacitance		C_{RSS}			6.5		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	$V_{DS}=400V, V_{GS}=10V, I_D=10A, I_G=1mA$ (Note 1, 2)		24.4		nC
Gate-Source Charge		Q_{GS}			6.3		nC
Gate-Drain Charge		Q_{GD}			4.8		nC
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=10A, R_G=25\Omega$ (Note 1, 2)		14		ns
Turn-On Rise Time		t_R			19		ns
Turn-Off Delay Time		$t_{D(OFF)}$			66.4		ns
Turn-Off Fall Time		t_F			27		ns
DRAIN-SOURCE DIODE CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				10	A
Continuous Drain-Source Current		I_{SD}				20	A
Drain-Source Diode Forward Voltage		V_{SD}	$I_S=10A, V_{GS}=0V$			1.4	V
Reverse Recovery Time		t_{rr}	$I_F=10A, di/dt=100A/\mu s$		282		ns
Reverse Recovery Charge		Q_{rr}			6.4		μC

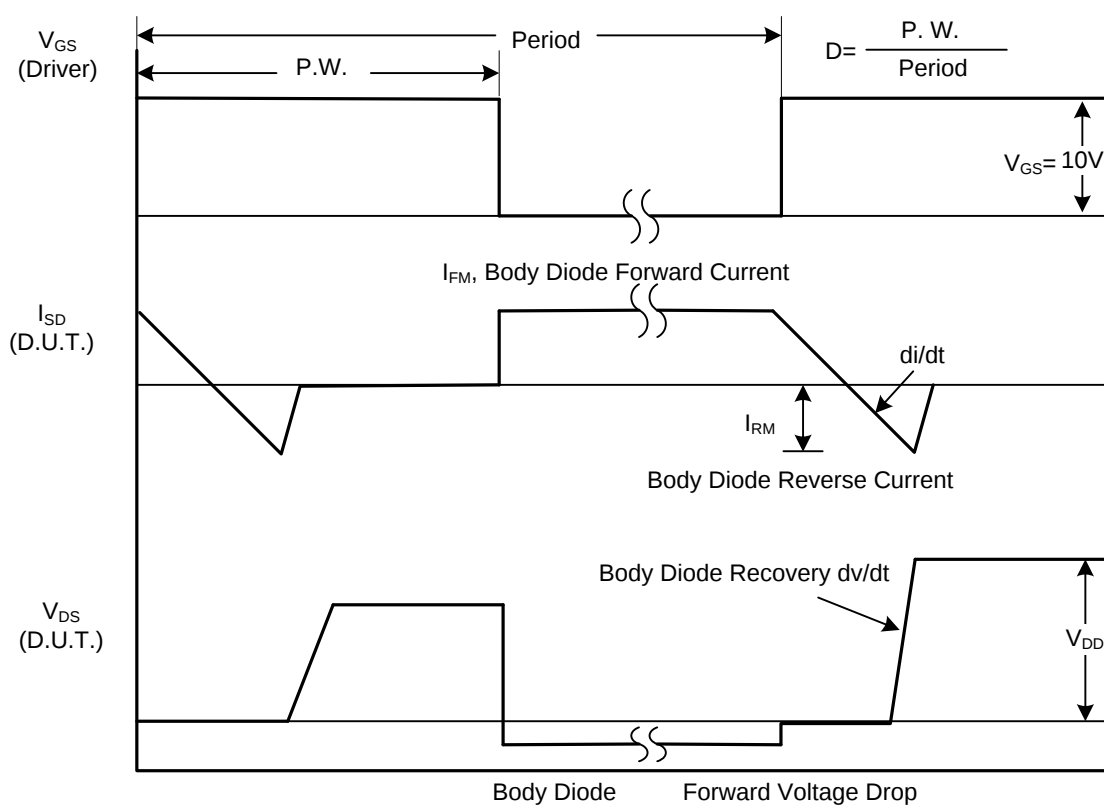
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

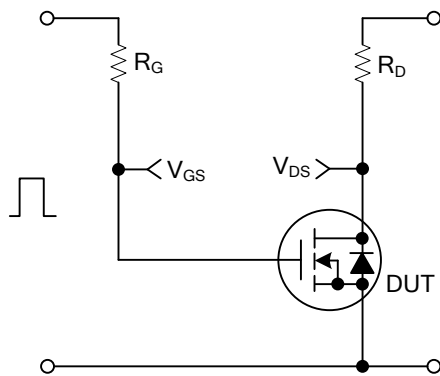


Peak Diode Recovery dv/dt Test Circuit

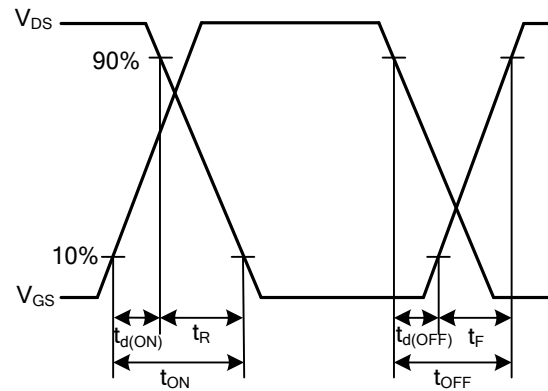


Peak Diode Recovery dv/dt Waveforms

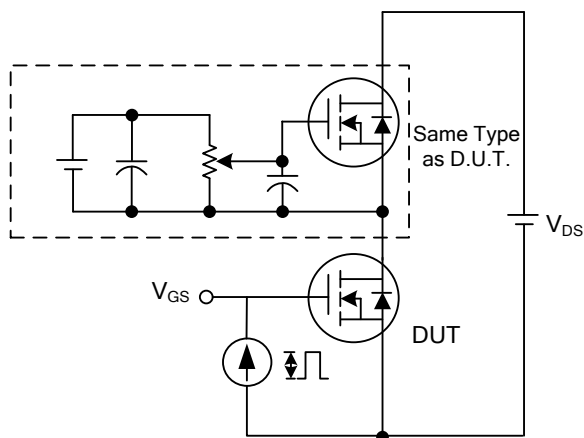
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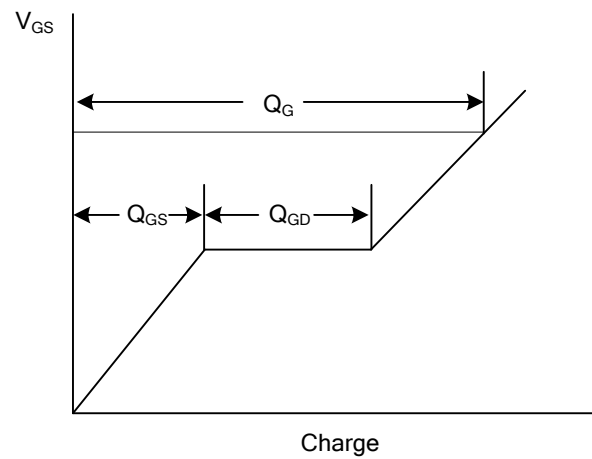
Switching Test Circuit



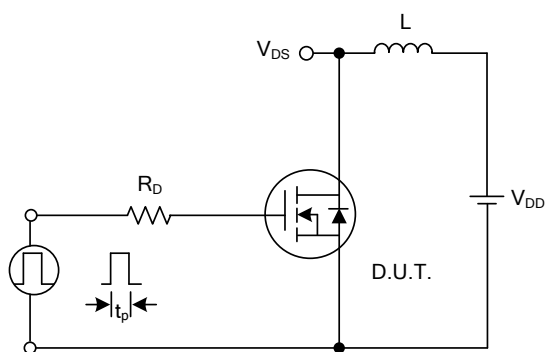
Switching Waveforms



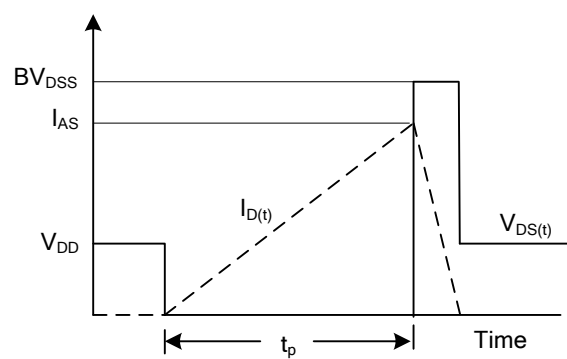
Gate Charge Test Circuit



Gate Charge Waveform

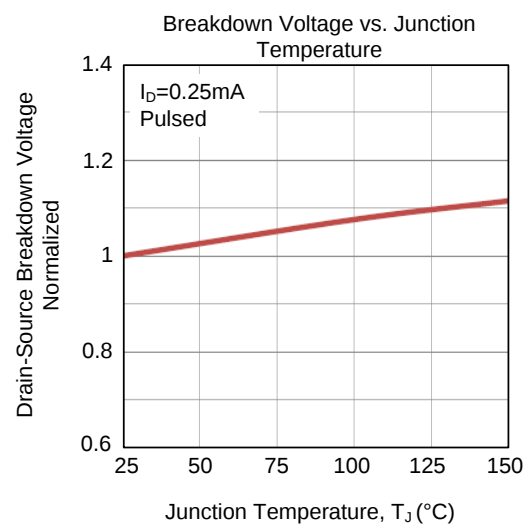
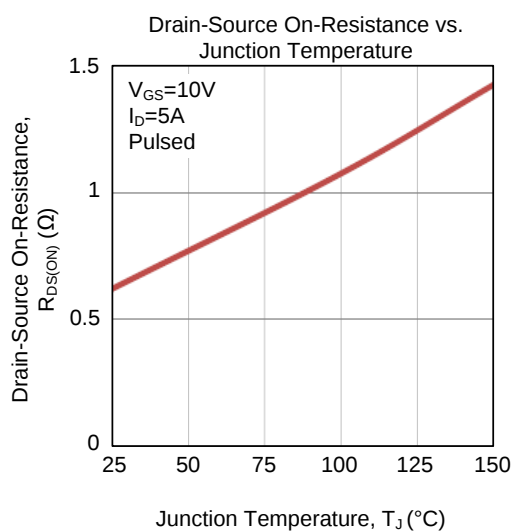
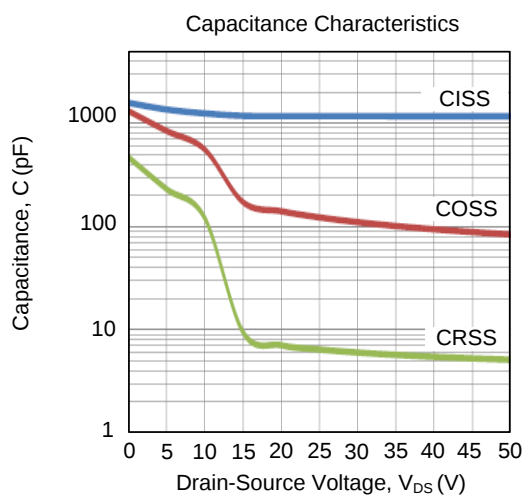
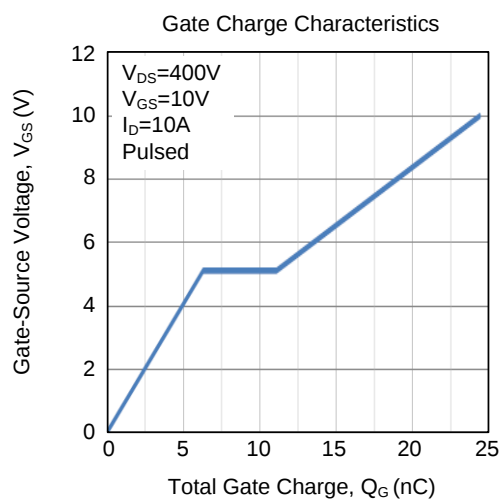
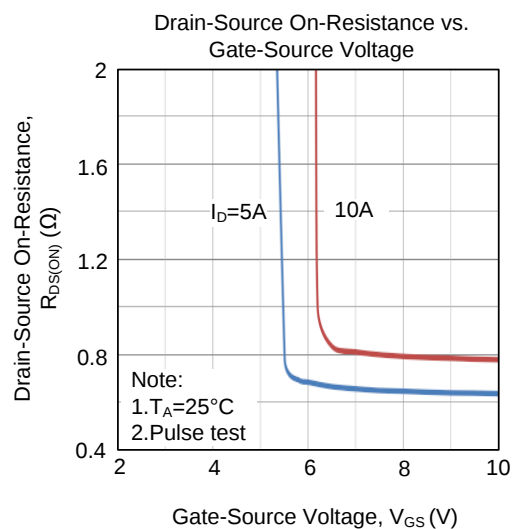
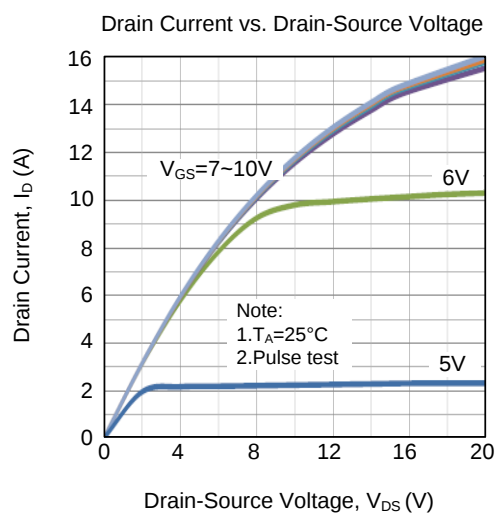


Unclamped Inductive Switching Test Circuit

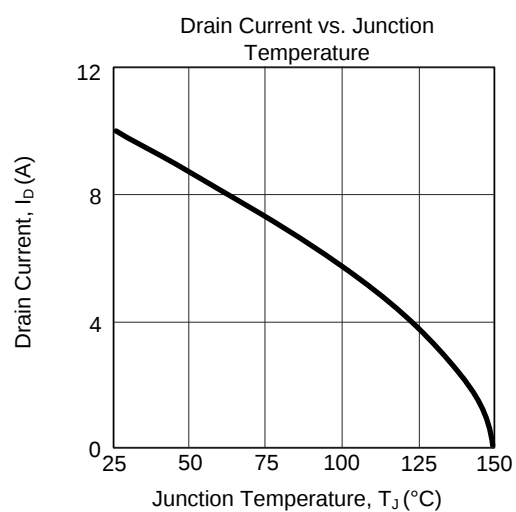
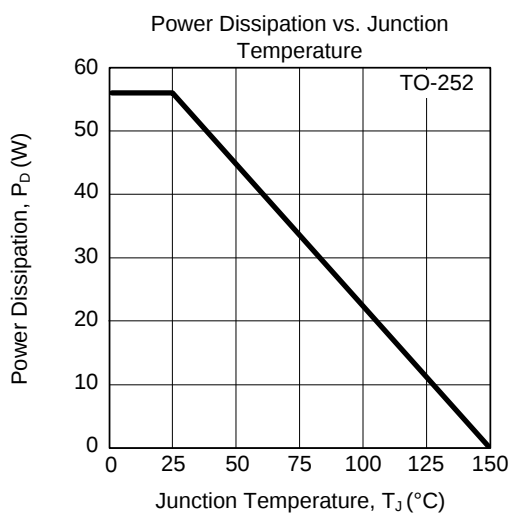
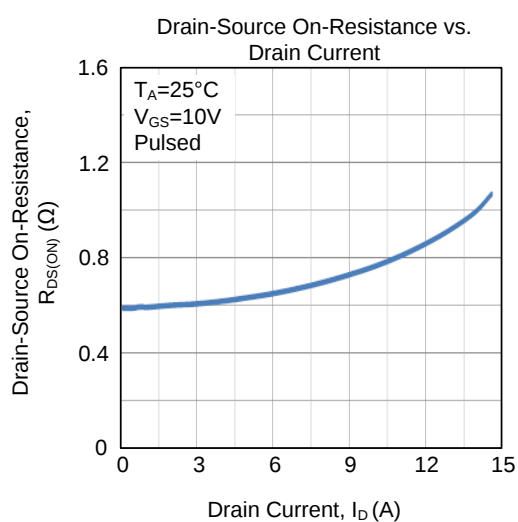
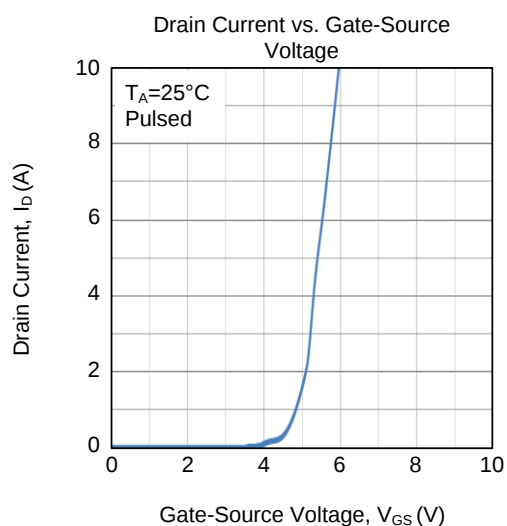
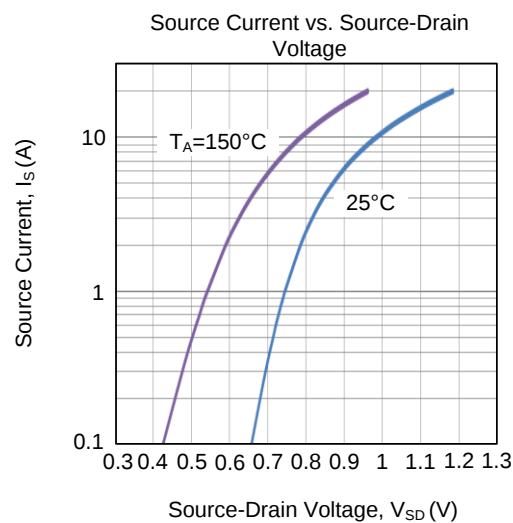
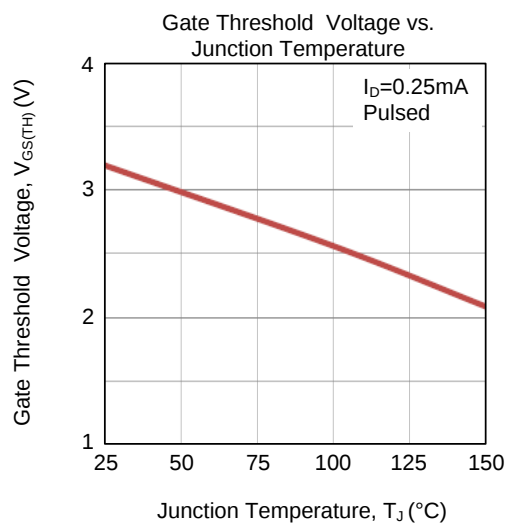


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)





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