



11N40-ML

Power MOSFET

11A, 400V N-CHANNEL POWER MOSFET

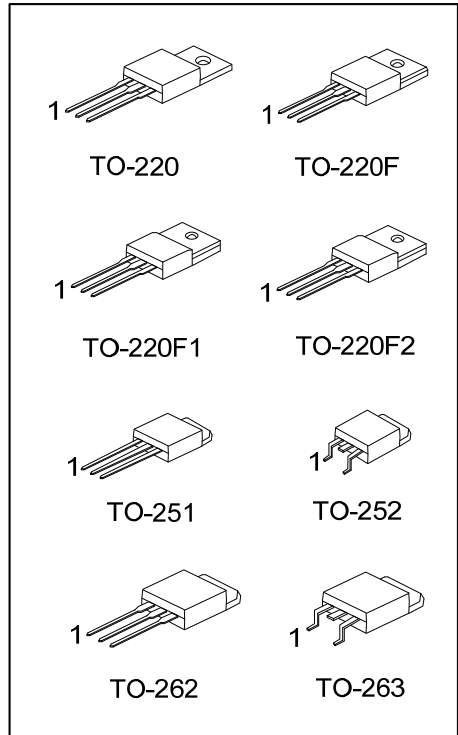
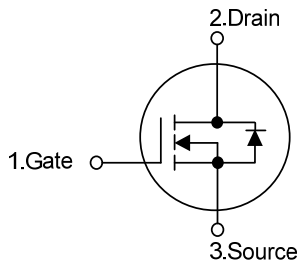
DESCRIPTION

The UTC **11N40-ML** is a high voltage power MOSFET combines advanced planar MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

FEATURES

- * $R_{DS(ON)} \leq 0.55 \Omega$ @ $V_{GS}=10V$, $I_D=5.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL



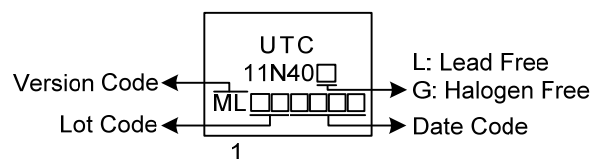
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11N40L-TA3-T	11N40G-TA3-T	TO-220	G	D	S	Tube
11N40L-TF1-T	11N40G-TF1-T	TO-220F1	G	D	S	Tube
11N40L-TF2-T	11N40G-TF2-T	TO-220F2	G	D	S	Tube
11N40L-TF3-T	11N40G-TF3-T	TO-220F	G	D	S	Tube
11N40L-TM3-T	11N40G-TM3-T	TO-251	G	D	S	Tube
11N40L-TN3-R	11N40G-TN3-R	TO-252	G	D	S	Tape Reel
11N40L-TQ2-T	11N40G-TQ2-T	TO-263	G	D	S	Tube
11N40L-TQ2-R	11N40G-TQ2-R	TO-263	G	D	S	Tape Reel

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

11N40G-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, 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°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	400	V
Gate-Source Voltage		V _{GSS}	±30	V
Continuous Drain Current	T _C =25°C	I _D	11	A
	T _C =100°C		6.5	A
Pulsed Drain Current (Note 2)		I _{DM}	44	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	437	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.8	V/ns
Power Dissipation	TO-220/TO-262 TO-263	P _D	147	W
	TO-220F/TO-220F1 TO-220F2		35	W
	TO-251/TO-252		56	W
Junction Temperature		T _J	+150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°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 = 30mH, I_{AS} = 5.4A, V_{DD} = 50V, R_G = 25Ω Starting T_J = 25°C

4. I_{SD} ≤ 11A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-262/TO-263	θ _{JA}	62.5	°C/W
	TO-251/TO-252		110	°C/W
Junction to Case	TO-220/TO-262 TO-263	θ _{JC}	0.85	°C/W
	TO-220F/TO-220F1 TO-220F2		3.57	°C/W
	TO-251/TO-252		2.23 (Note)	°C/W

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

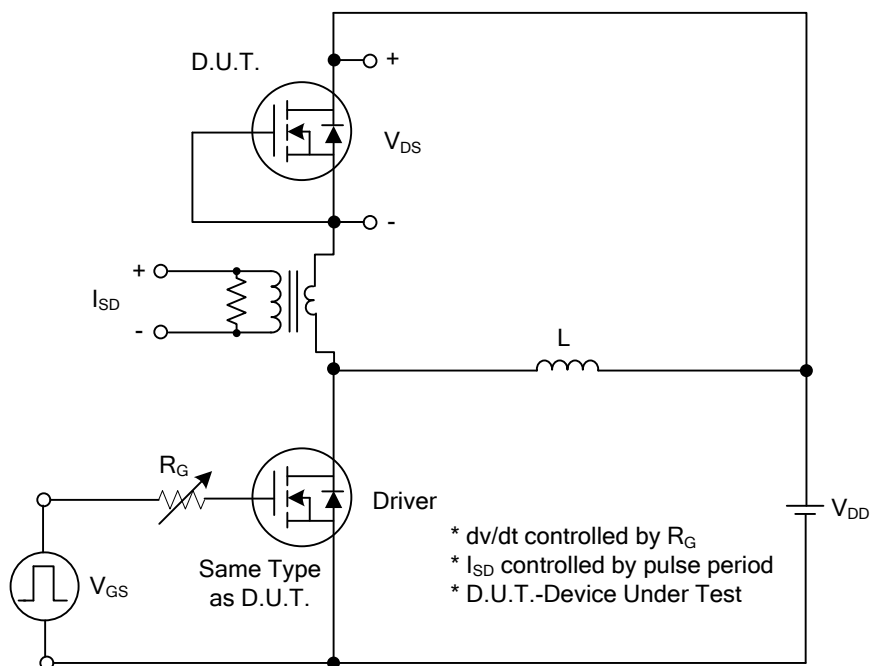
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	400			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=400V, V_{GS}=0V$			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		$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.5A$			0.55	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$		940		pF
Output Capacitance		C_{OSS}			125		pF
Reverse Transfer Capacitance		C_{RSS}			9.5		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	$V_{DS}=320V, V_{GS}=10V, I_D=11A$ $I_G=1mA$ (Note 1, 2)		23		nC
Gate-Source Charge		Q_{GS}			5.4		nC
Gate-Drain Charge		Q_{GD}			5		nC
Turn-On Delay Time (Note 1)		$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=11A,$ $R_G=25\Omega$ (Note 1, 2)		10		ns
Turn-On Rise Time		t_R			19		ns
Turn-Off Delay Time		$t_{D(OFF)}$			70		ns
Turn-Off Fall Time		t_F			27		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I_S				11	A
Maximum Body-Diode Pulsed Current		I_{SM}				22	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	$I_S=11A, V_{GS}=0V$			1.4	V
Reverse Recovery Time (Note 1)		t_{rr}	$I_S=11A, V_{GS}=0V$ $di/dt=100A/\mu s$		410		ns
Reverse Recovery Charge		Q_{rr}			7		μC

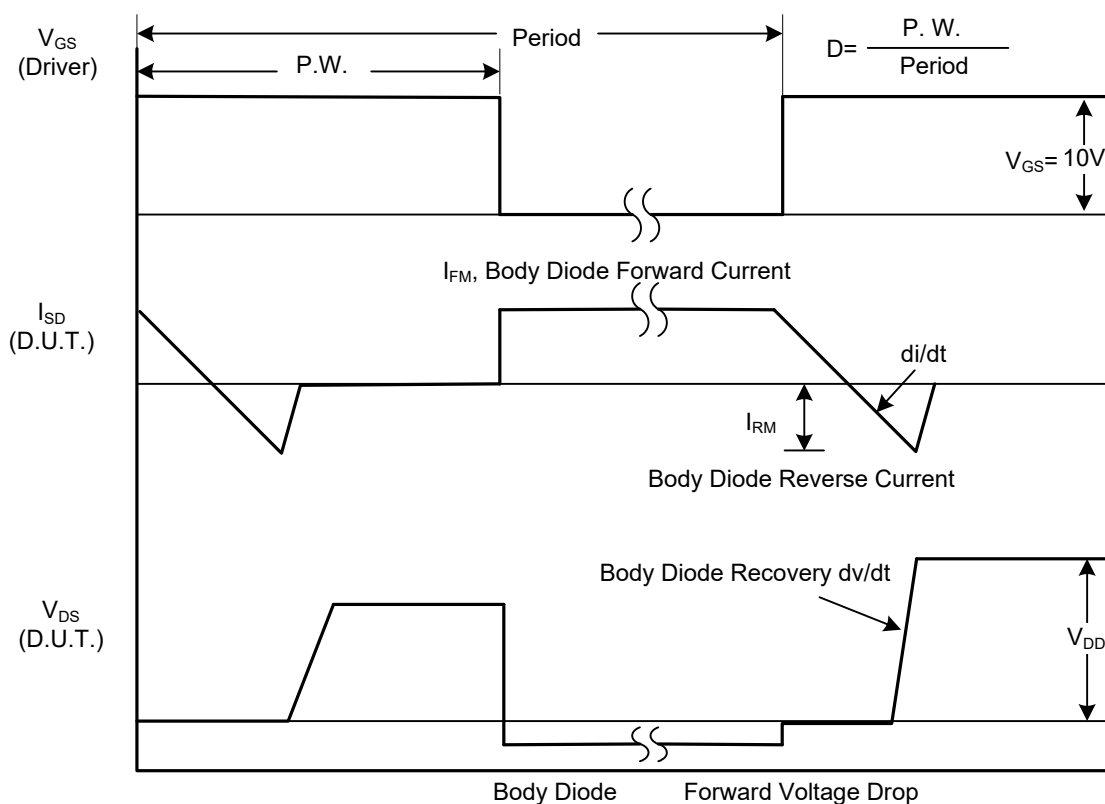
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

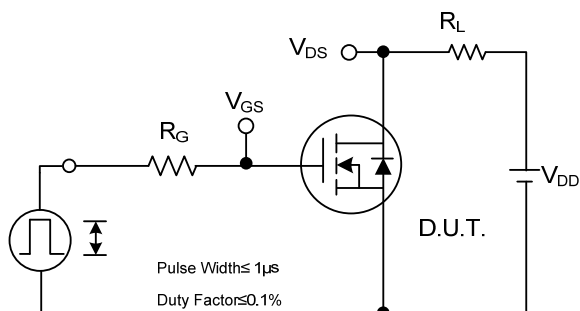


Peak Diode Recovery dv/dt Test Circuit

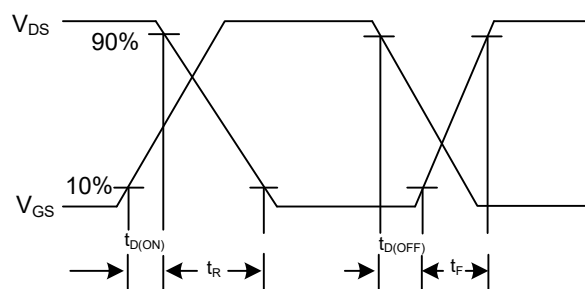


Peak Diode Recovery dv/dt Waveforms

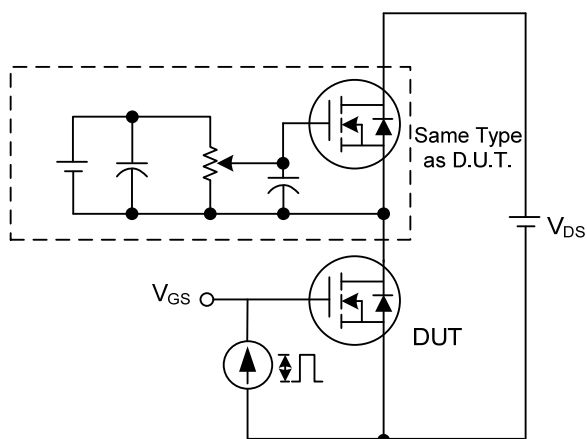
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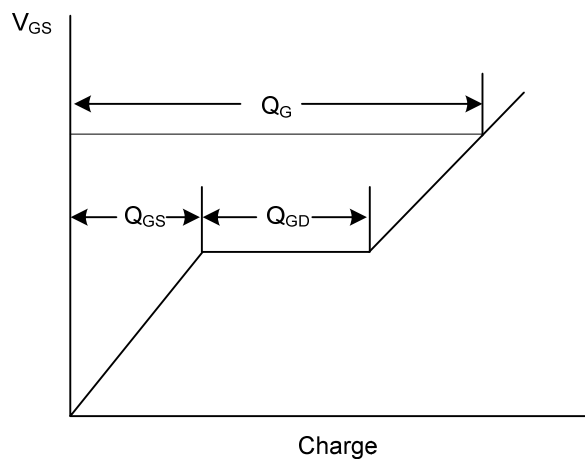
Switching Test Circuit



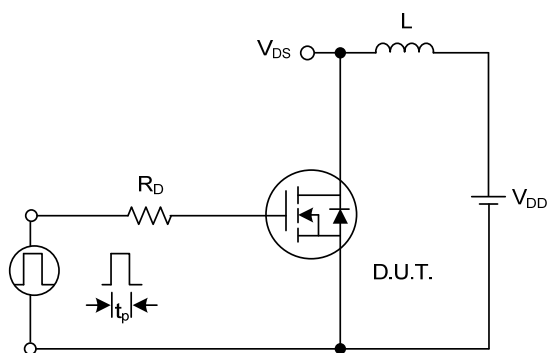
Switching Waveforms



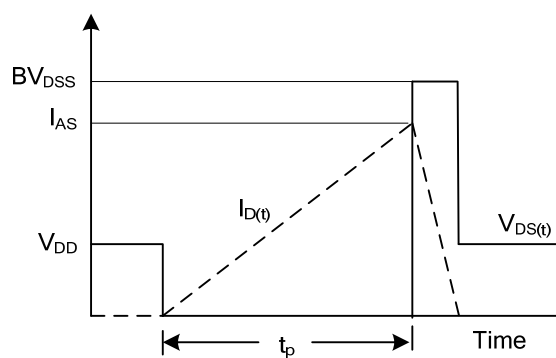
Gate Charge Test Circuit



Gate Charge Waveform

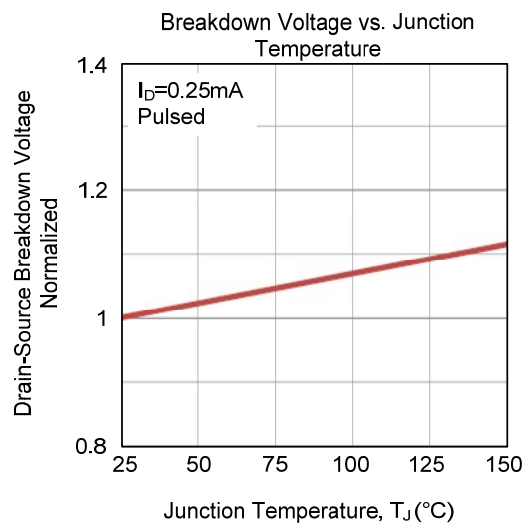
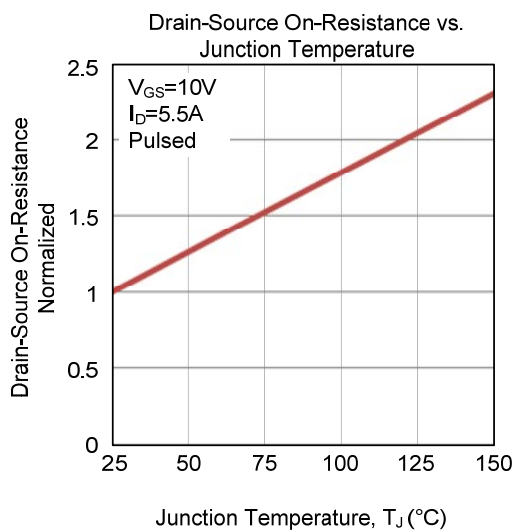
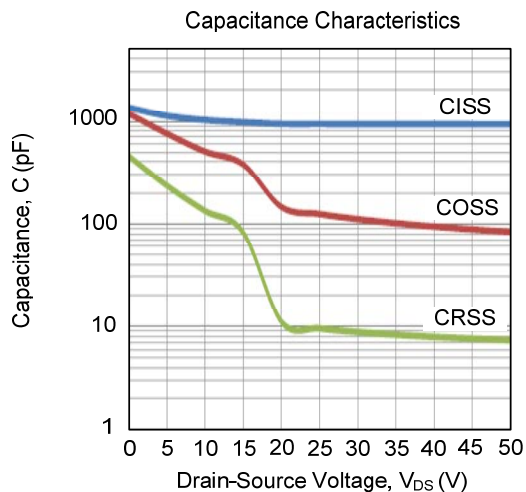
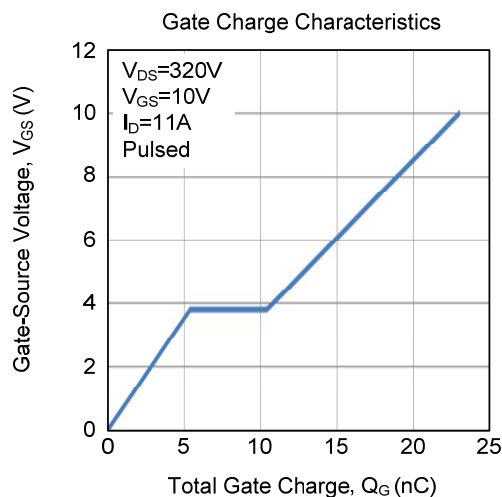
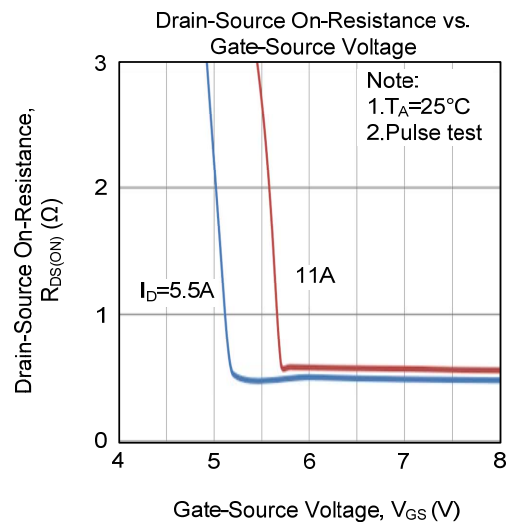
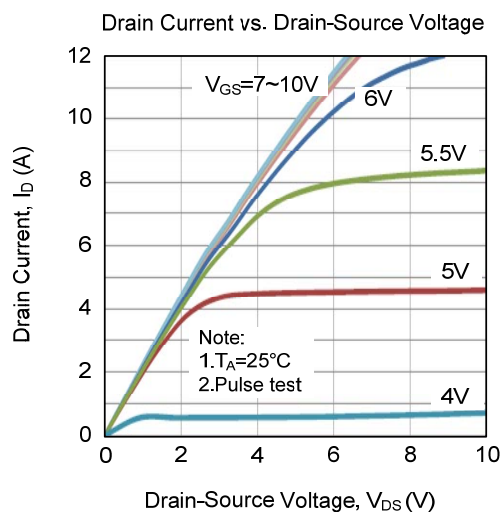


Unclamped Inductive Switching Test Circuit

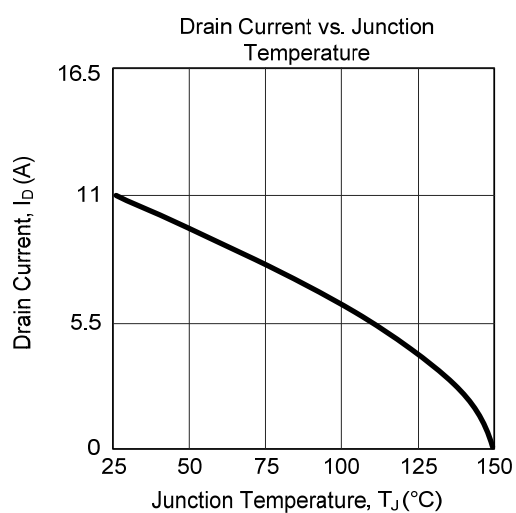
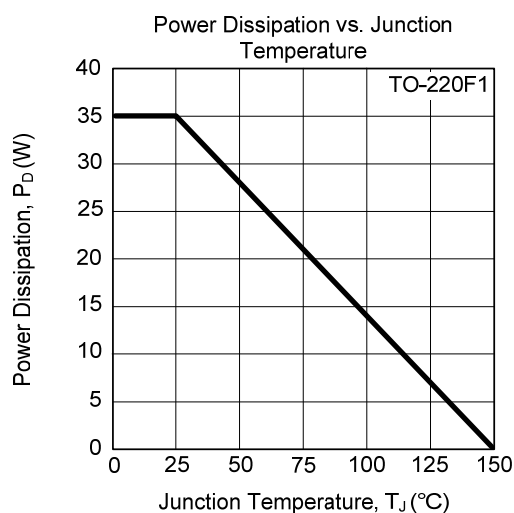
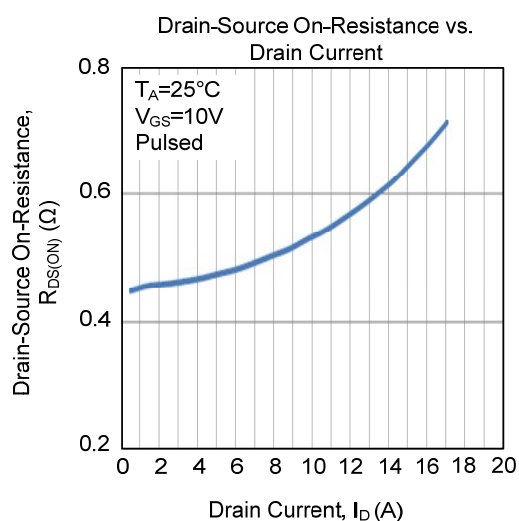
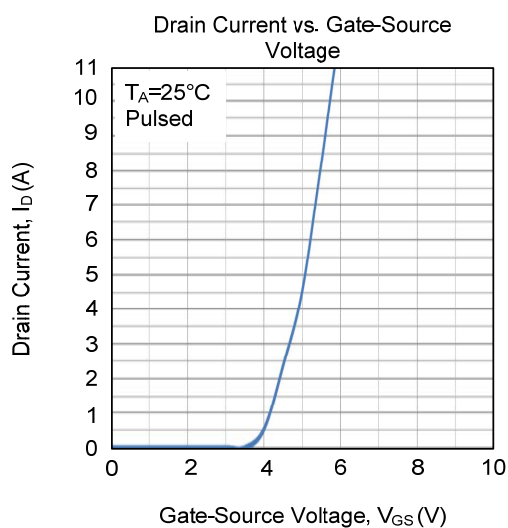
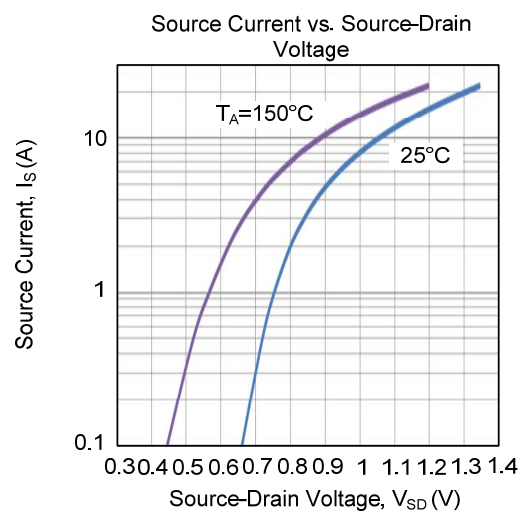
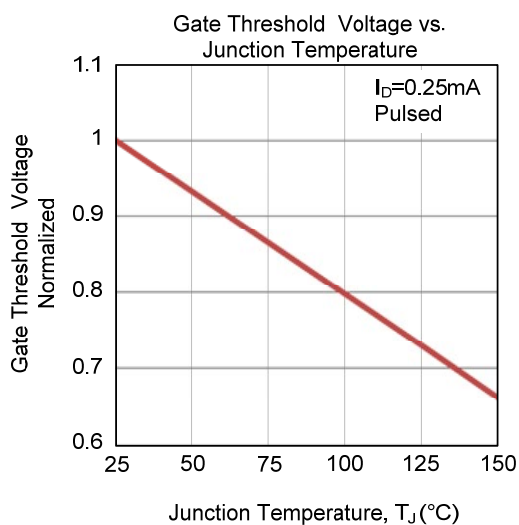


Unclamped Inductive Switching Waveforms

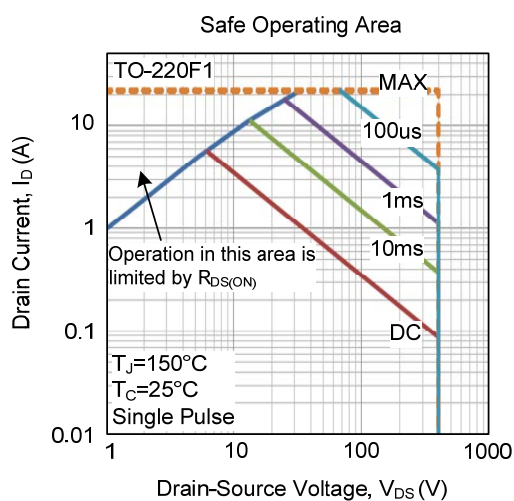
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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