



30NM60-U2

Power MOSFET

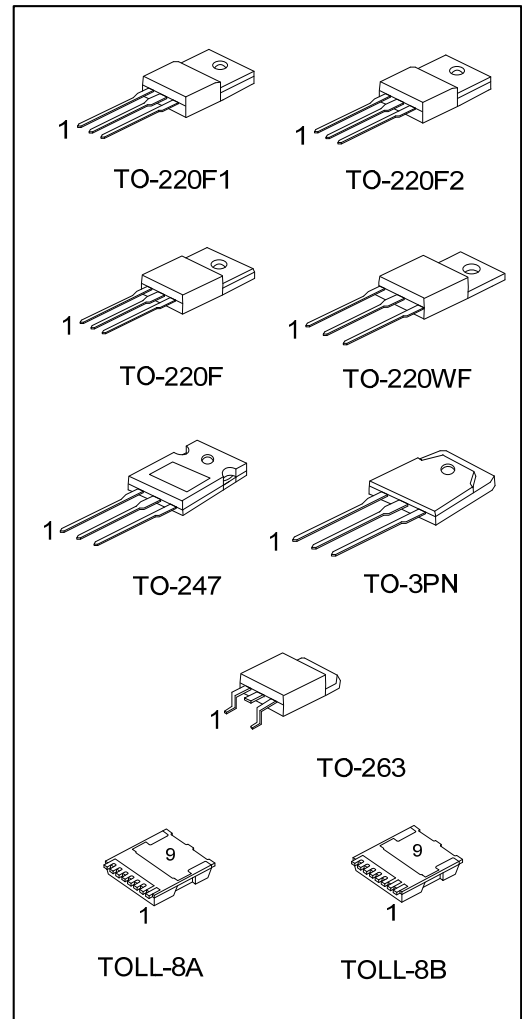
30A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

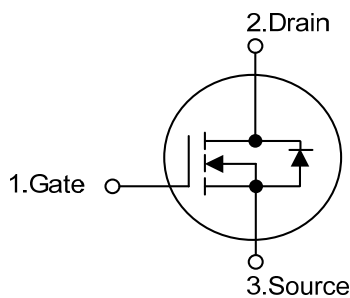
The **UTC 30NM60-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

FEATURES

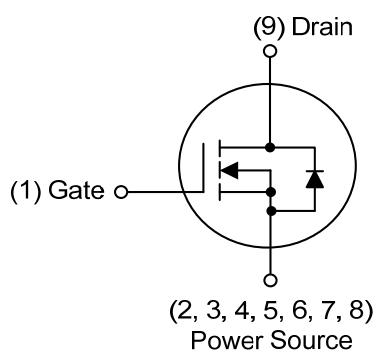
- * $R_{DS(ON)} \leq 0.13 \Omega$ @ $V_{GS} = 10V$, $I_D = 7.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness



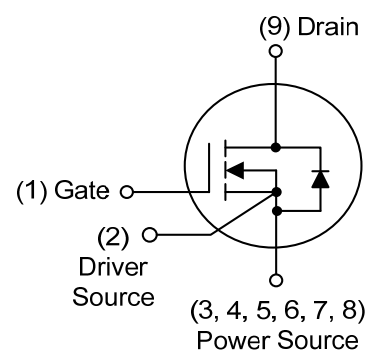
SYMBOL



TO-220F / TO-220F1 / TO-220F2
TO-220WF / TO-247 / TO-263 / TO-3PN



TOLL-8A



TOLL-8B

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
30NM60L-U2-TF1-T	30NM60G-U2-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-TF2-T	30NM60G-U2-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-TF3-T	30NM60G-U2-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-TW1-T	30NM60G-U2-TW1-T	TO-220WF	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-TQ2-T	30NM60G-U2-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-TQ2-R	30NM60G-U2-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
30NM60L-U2-T3N-T	30NM60G-U2-T3N-T	TO-3PN	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-T47-T	30NM60G-U2-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
30NM60L-U2-T8A-T	30NM60G-U2-T8A-T	TOLL-8A	G	S	S	S	S	S	S	S	S	Tape Reel
30NM60L-U2-T8B-T	30NM60G-U2-T8B-T	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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

30NM60G-U2-TF1-T (1) Packing Type (2) Package Type (3) Version Code (4) Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TW1: TO-220WF, T47: TO-247, TQ2: TO-263, T3N: TO-3PN, T8A: TOLL-8A, T8B: TOLL-8B (3) Version U2 (4) G: Halogen Free and Lead Free, L: Lead Free
--	---

MARKING

TO-220F / TO-220F1 / TO-220F TO-220WF / TO-263 / TO-247 / TO-3PN	TOLL-8A / TOLL-8A
Version Code ← UTC 30NM60 □ → L: Lead Free G: Halogen Free Lot Code ← U2 □ □ □ □ □ □ → Date Code 1	Version Code ← UTC 30NM60 □ → L: Lead Free G: Halogen Free Lot Code ← U2 □ □ □ □ □ □ → Date Code 1

■ **ABSOLUTE MAXIMUM RATINGS** ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	± 30	V
Drain Current	Continuous	I_D	30	A
	Pulsed (Note 2)	I_{DM}	90	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	450	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.6	V/ns
Power Dissipation	TO-220F/TO-220F1 TO-220F2/TO-220WF	P_D	35	W
	TO-247		150	W
	TO-263		127	W
	TO-3PN		220	W
	TOLL-8A/TOLL-8B		225	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. $L = 100\text{mH}$, $I_{AS} = 3.0\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1 TO-220F2/TO-220WF TO-263	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-3PN		30	$^{\circ}\text{C}/\text{W}$
	TO-247		40	$^{\circ}\text{C}/\text{W}$
	TOLL-8A/TOLL-8B		35	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1 TO-220F2/TO-220WF	θ_{JC}	3.57	$^{\circ}\text{C}/\text{W}$
	TO-247		0.83	$^{\circ}\text{C}/\text{W}$
	TO-263		0.98 (Note)	$^{\circ}\text{C}/\text{W}$
	TO-3PN		0.56	$^{\circ}\text{C}/\text{W}$
	TOLL-8A/TOLL-8B		0.55 (Note)	$^{\circ}\text{C}/\text{W}$

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

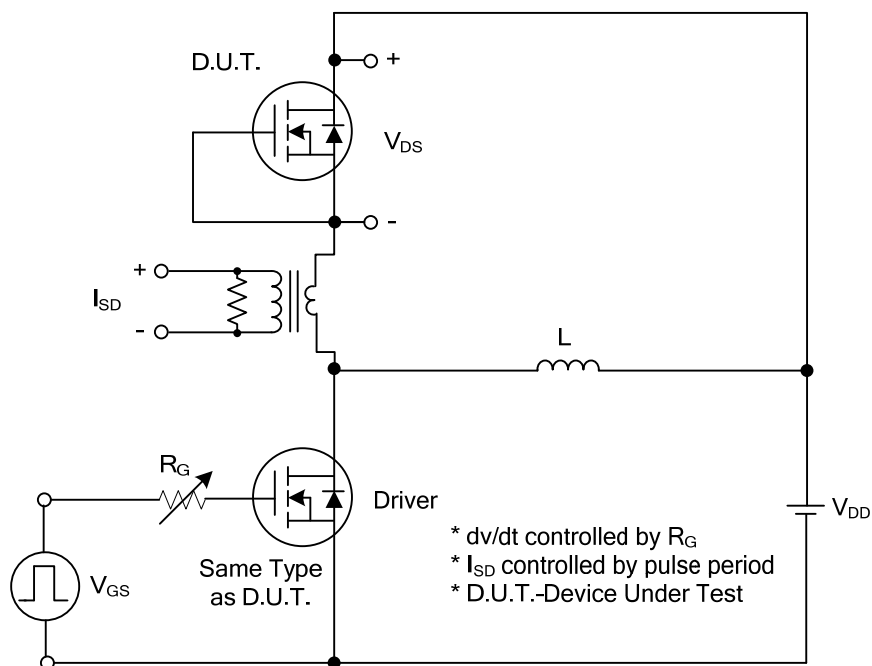
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7.5A$			0.13	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=50V, f=1MHz$		1838		pF
Output Capacitance	C_{OSS}			764		pF
Reverse Transfer Capacitance	C_{RSS}			63		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	$V_{DS}=480V, V_{GS}=10V, I_D=30A$ (Note 1, 2)		87		nC
Gate-Source Charge	Q_{GS}			12		nC
Gate-Drain Charge	Q_{DD}			53		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=30A,$ $R_G=25\Omega$ (Note 1, 2)		33		ns
Turn-On Rise Time	t_R			92		ns
Turn-Off Delay Time	$t_{D(OFF)}$			249		ns
Turn-Off Fall Time	t_F			99		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				30	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				90	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=30A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=30A, V_{GS}=0V,$		538		nS
Body Diode Reverse Recovery Charge	Q_{rr}	$dI_F/dt=100A/\mu s$		10.7		μC

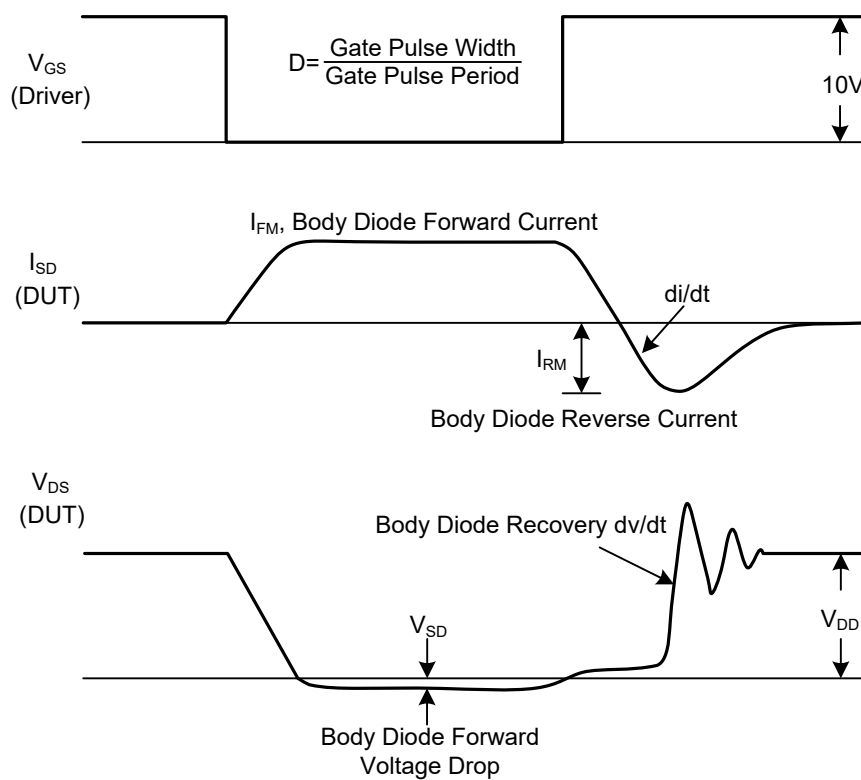
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

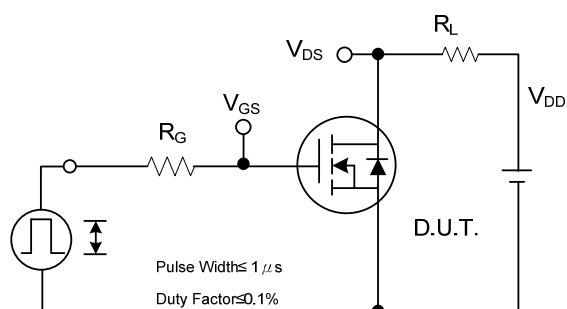


Peak Diode Recovery dv/dt Test Circuit

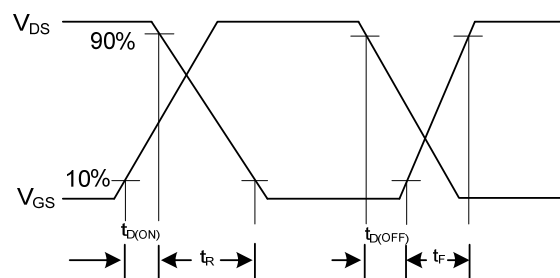


Peak Diode Recovery dv/dt Waveforms

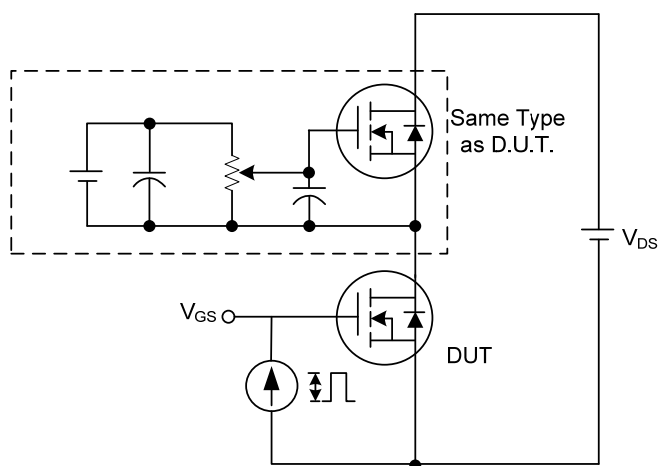
■ TEST CIRCUITS AND WAVEFORMS



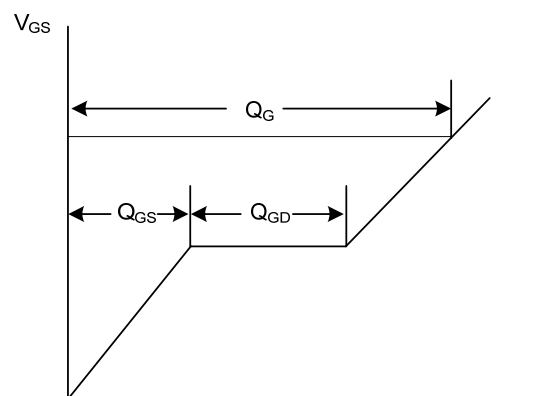
Switching Test Circuit



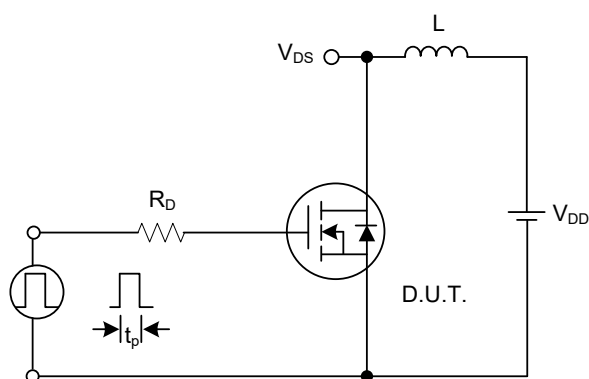
Switching Waveforms



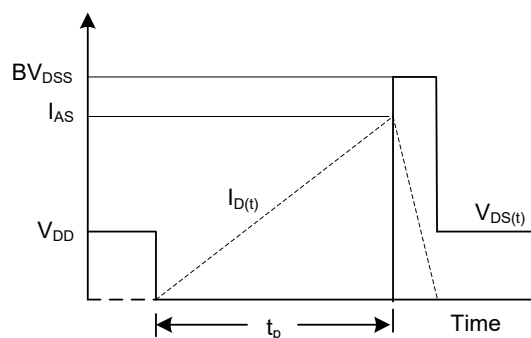
Gate Charge Test Circuit



Charge
Gate Charge Waveform

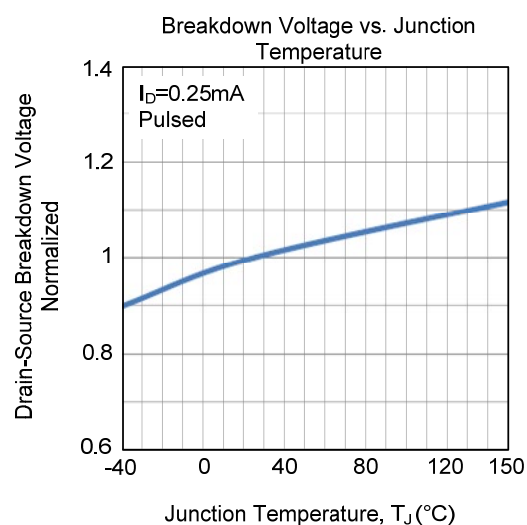
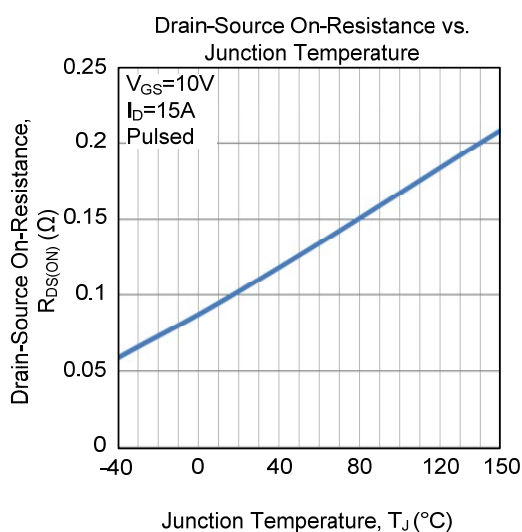
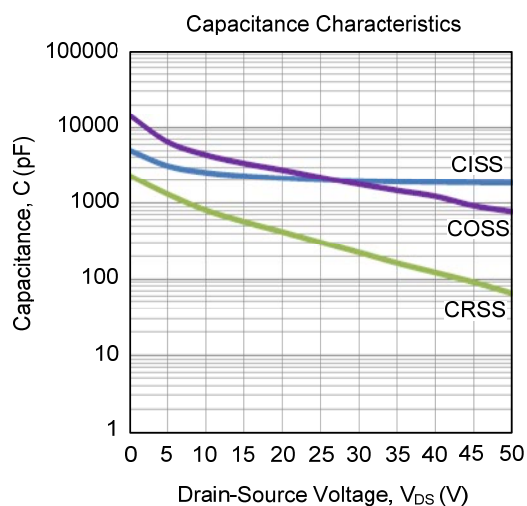
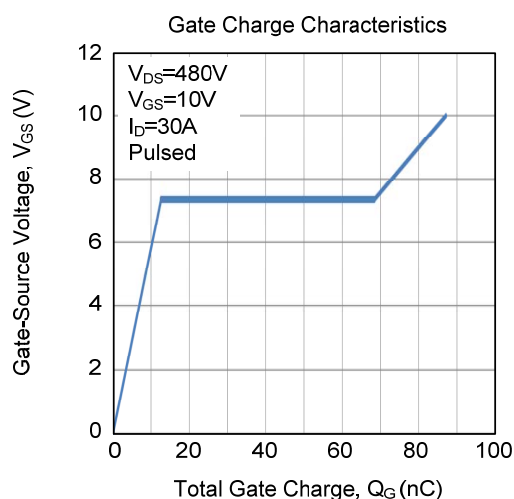
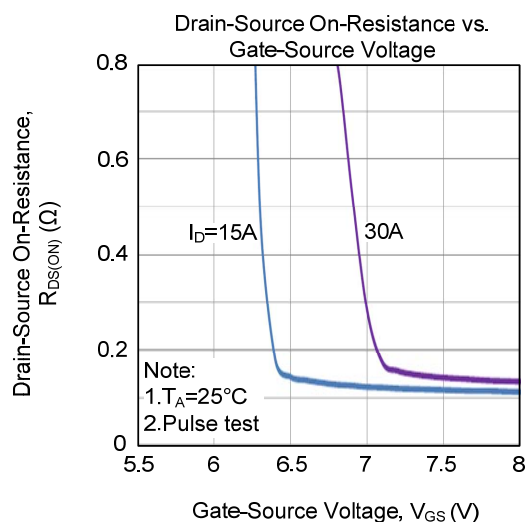
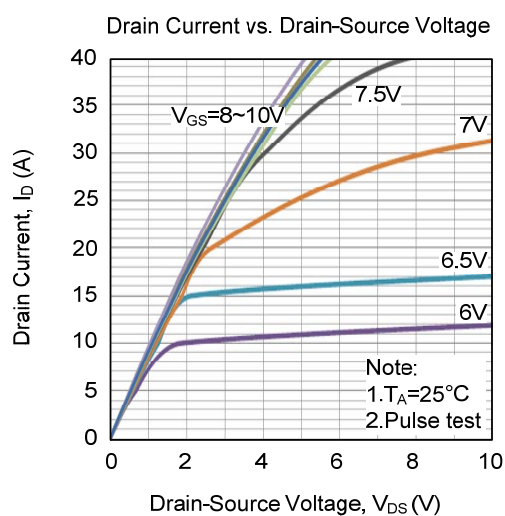


Unclamped Inductive Switching Test Circuit

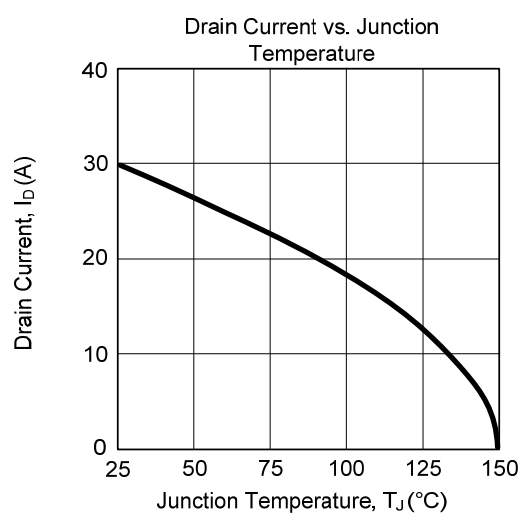
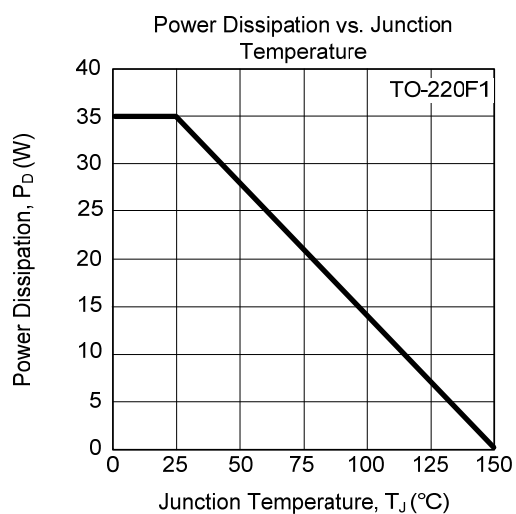
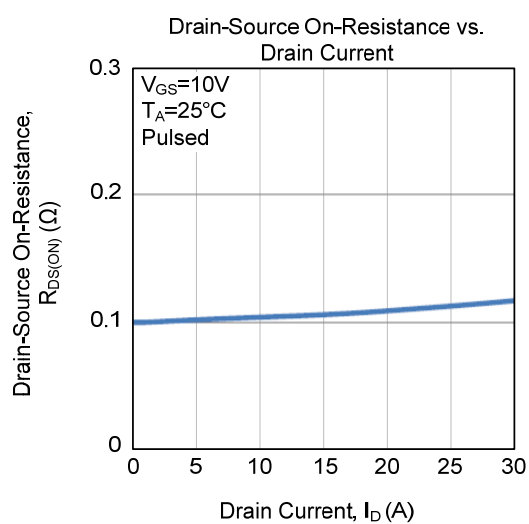
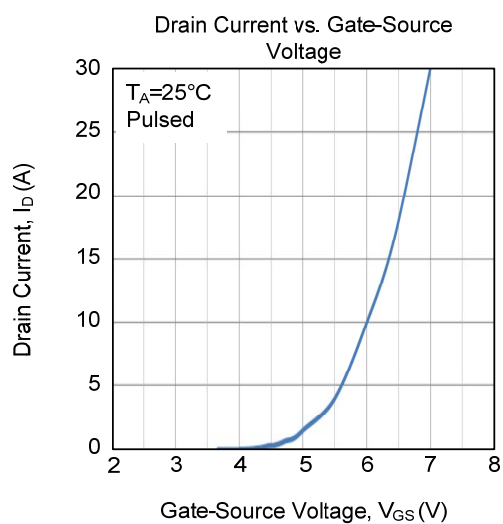
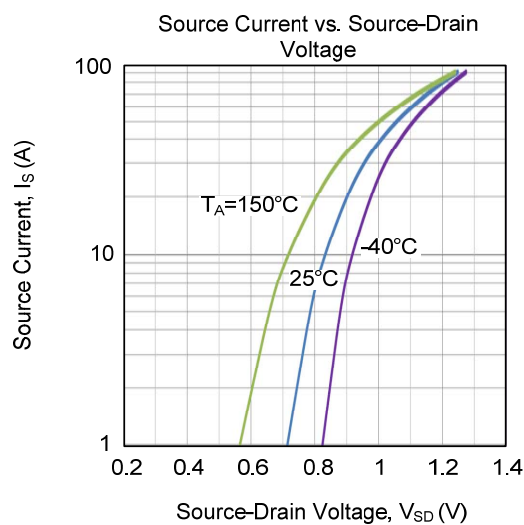
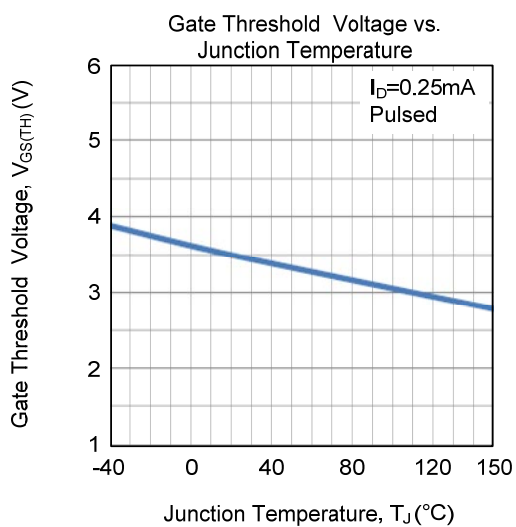


Unclamped Inductive Switching Waveforms

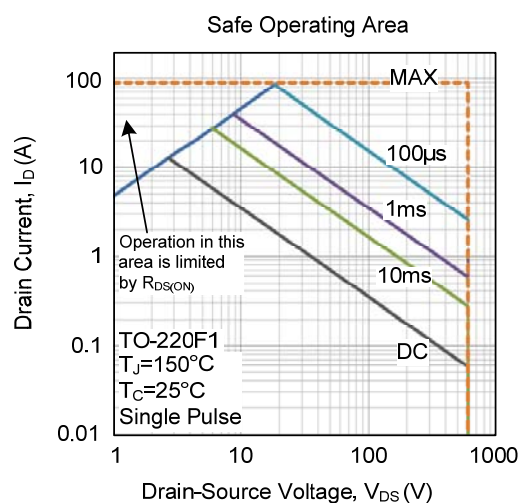
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.