



1NM60-FD

Power MOSFET

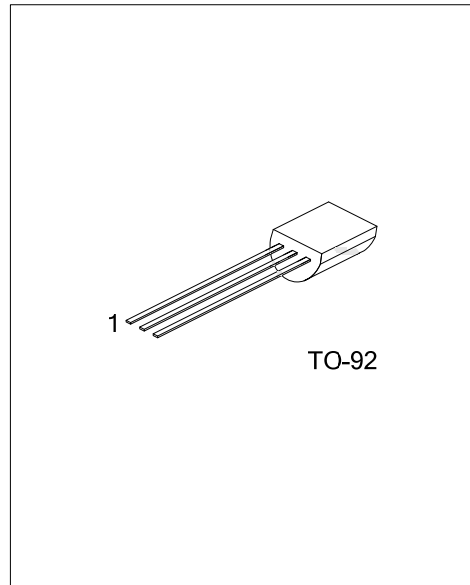
1A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

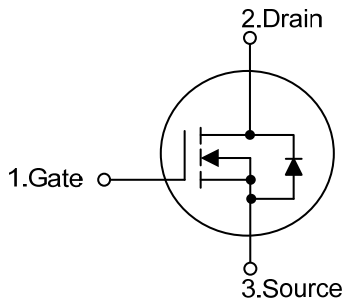
The UTC **1NM60-FD** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} < 3.8\Omega @ V_{GS}=10V, I_D=0.5A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness



SYMBOL



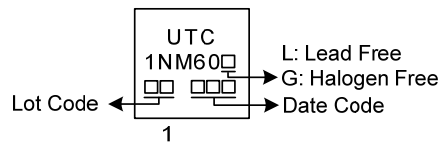
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1NM60L-T92-B	1NM60G-T92-B	TO-92	G	D	S	Tape Box
1NM60L-T92-K	1NM60G-T92-K	TO-92	G	D	S	Bulk

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

<p>1NM60G-T92-B</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) B: Tape Box, K: Bulk (2) T92: TO-92 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
---	--

■ MARKING



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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	600	V
Gate-Source Voltage	V_{GSS}	± 30	V
Continuous Drain Current	I_D	1	A
Pulsed Drain Current (Note 2)	I_{DM}	3	A
Avalanche Energy (Note 3)	E_{AS}	12.8	mJ
Single Pulsed			
Peak Diode Recovery dv/dt (Note 4)	dv/dt	7.8	V/ns
Power Dissipation ($T_A=25^\circ\text{C}$)	P_D	1.4	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. $L=10\text{mH}$, $I_{AS}=2.3\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
 4. $I_{SD} \leq 1.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

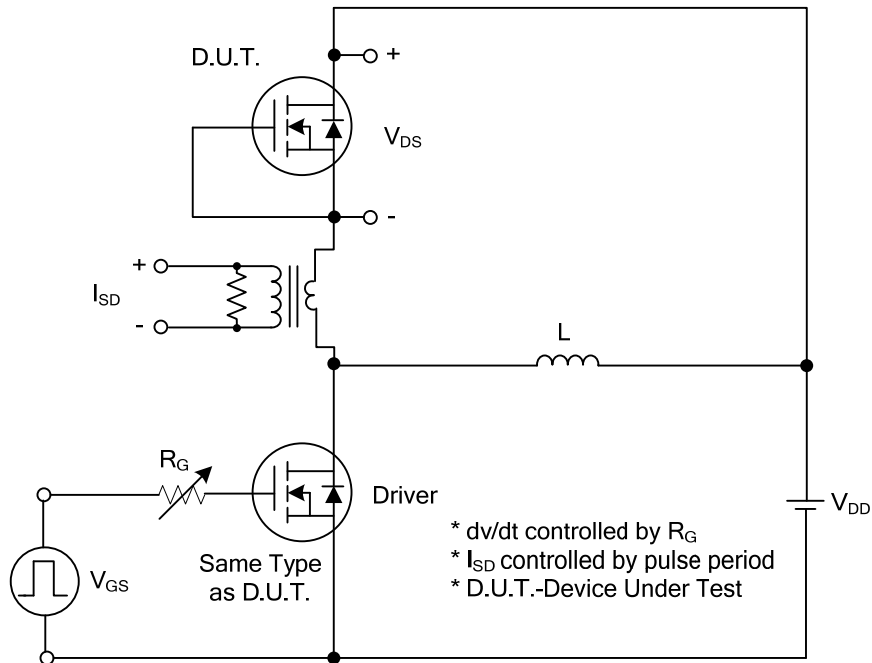
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	140	$^\circ\text{C}/\text{W}$
Junction to Case	θ_{JC}	80	$^\circ\text{C}/\text{W}$

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

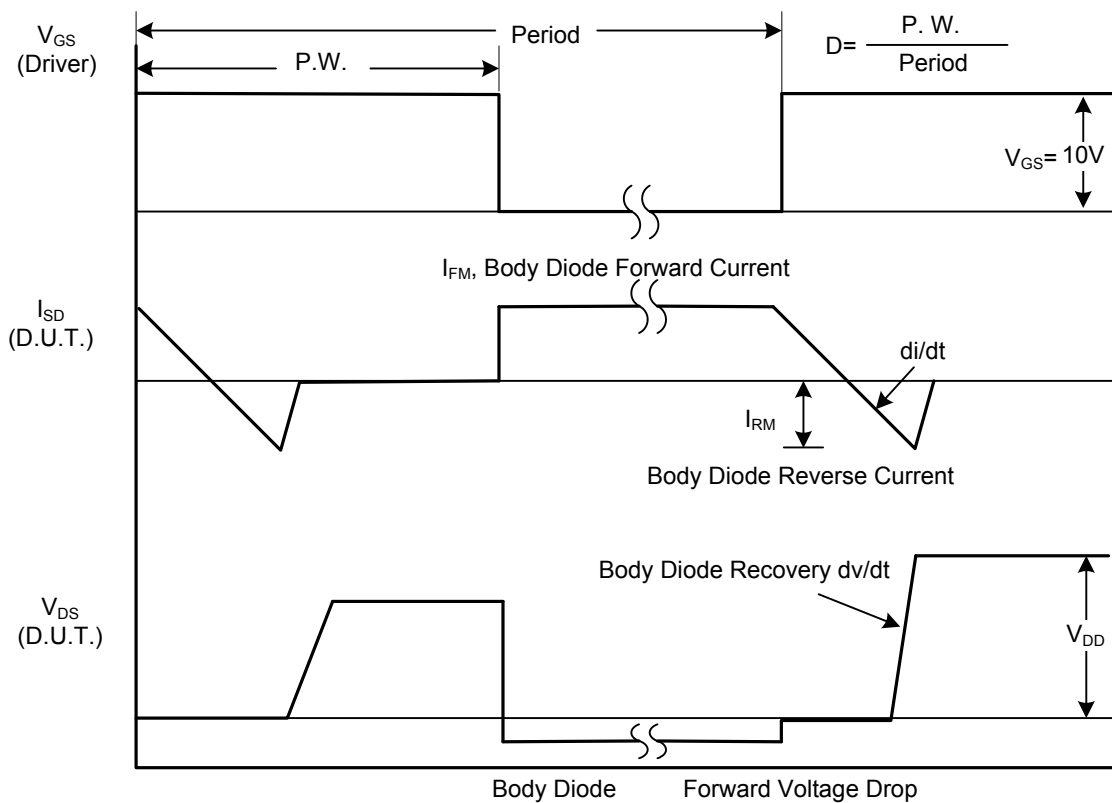
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$			10	μA
Gate-Source Leakage Current	I_{GSS}	Forward			100	nA
		Reverse			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$, $I_D = 0.5\text{A}$			3.8	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		112		pF
Output Capacitance	C_{OSS}			88.5		pF
Reverse Transfer Capacitance	C_{RSS}			10.7		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	$V_{DS} = 100\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 1\text{A}$, $I_G = 3\text{mA}$ (Note 1, 2)		11.4		nC
Gate-Source Charge	Q_{GS}			3.5		nC
Gate-Drain Charge	Q_{GD}			1.7		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 50\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 1\text{A}$, $R_G = 25\Omega$ (Note 1, 2)		2		ns
Turn-On Rise Time	t_R			16		ns
Turn-Off Delay Time	$t_{D(OFF)}$			22		ns
Turn-Off Fall Time	t_F			10		ns
DRAIN-SOURCE DIODE CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				1.0	A
Continuous Drain-Source Current	I_{SD}				3.0	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S = 1.0\text{A}$, $V_{GS} = 0\text{V}$			1.4	V
Reverse Recovery Time	t_{rr}	$I_F = 1.0\text{A}$, $V_{DD} = 100\text{V}$		148		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{A}/\mu\text{s}$		0.7		μC

- Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.
 2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

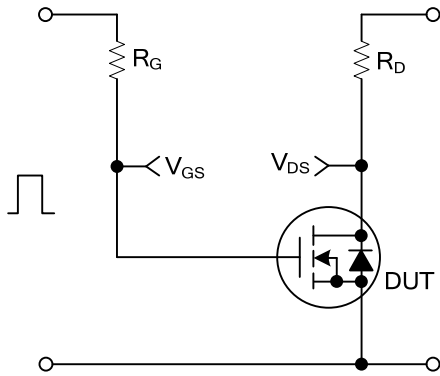


Peak Diode Recovery dv/dt Test Circuit

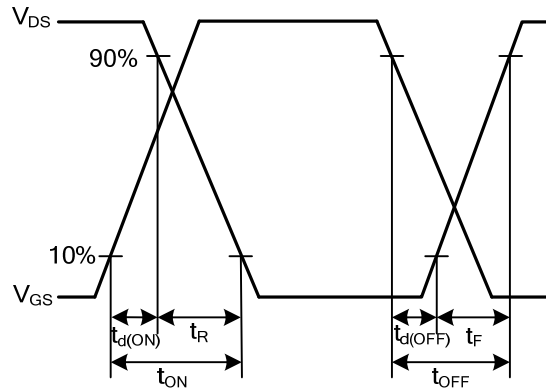


Peak Diode Recovery dv/dt Waveforms

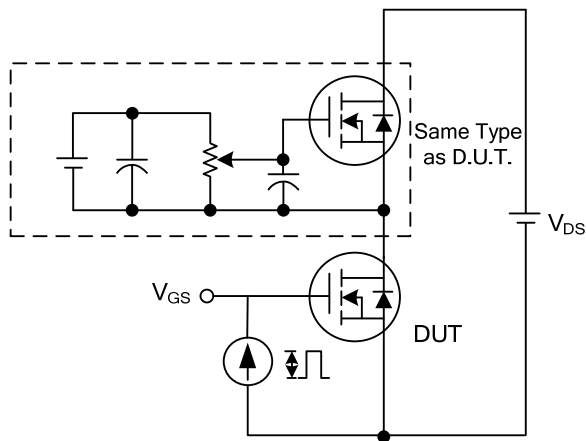
TEST CIRCUITS AND WAVEFORMS (Cont.)



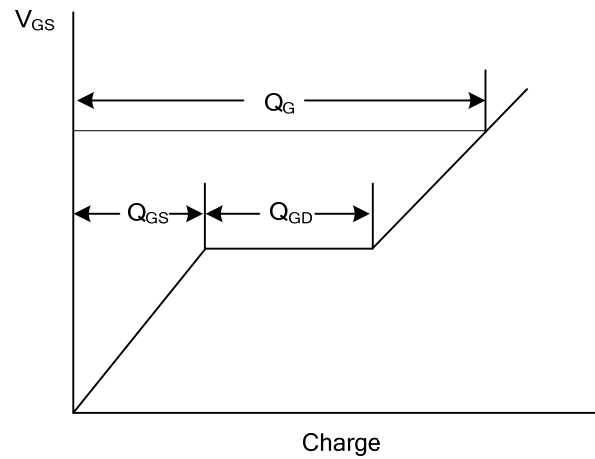
Switching Test Circuit



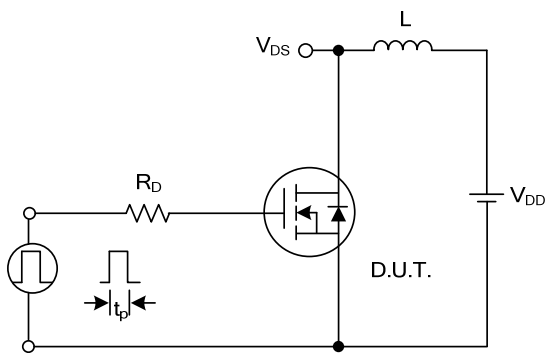
Switching Waveforms



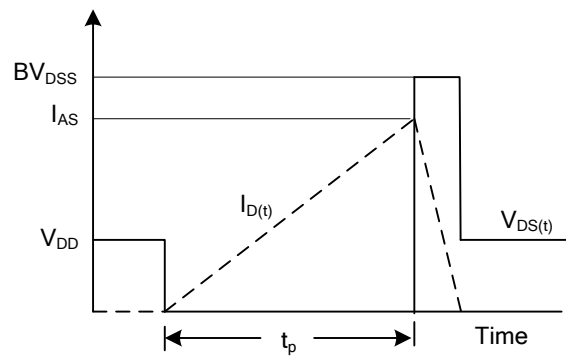
Gate Charge Test Circuit



Gate Charge Waveform

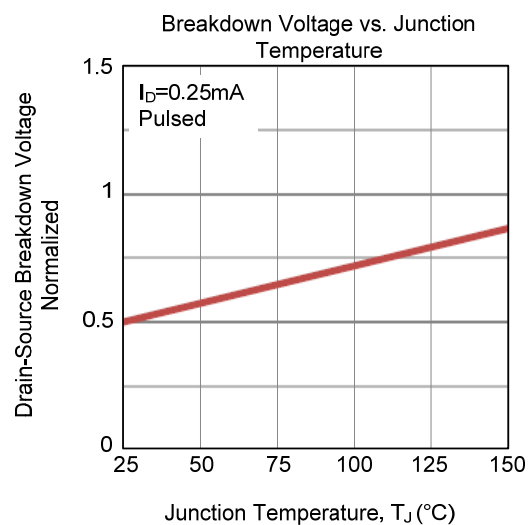
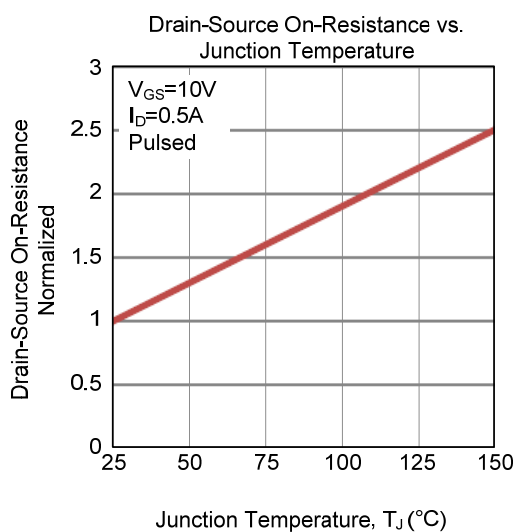
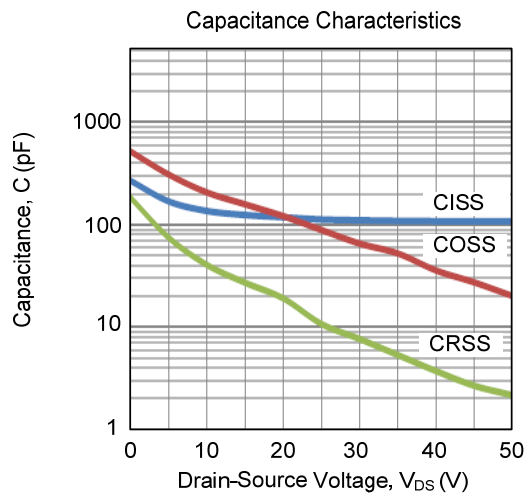
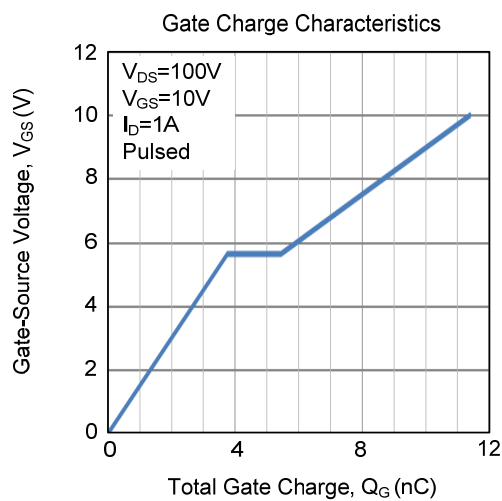
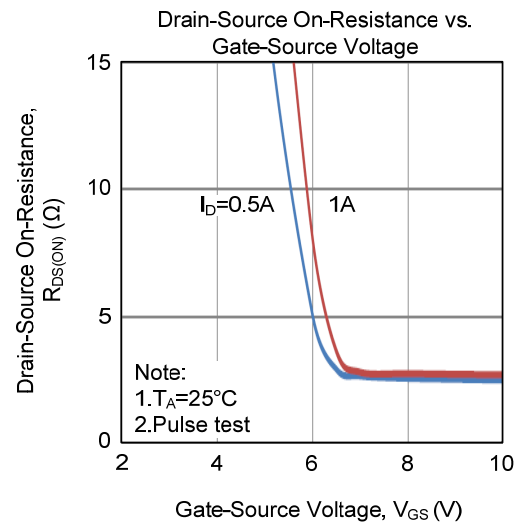
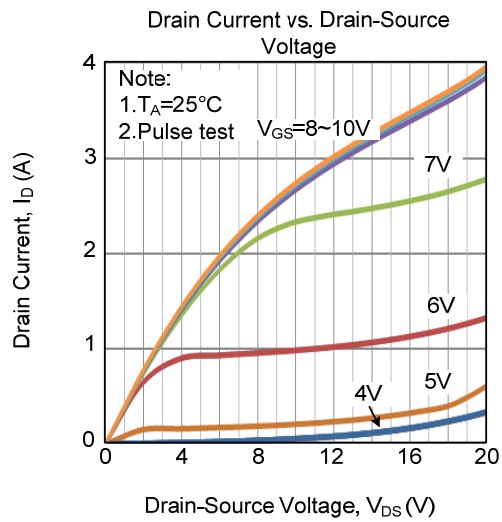


Unclamped Inductive Switching Test Circuit

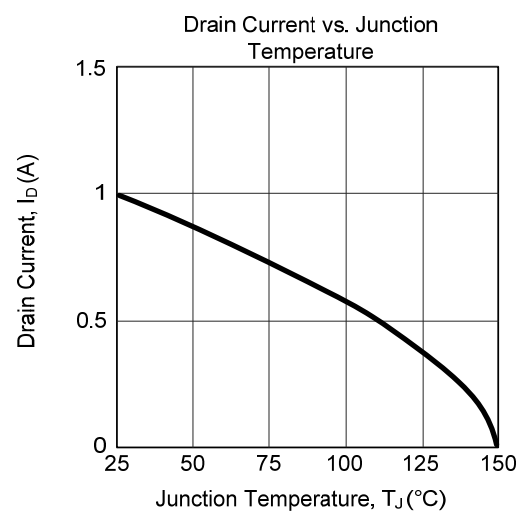
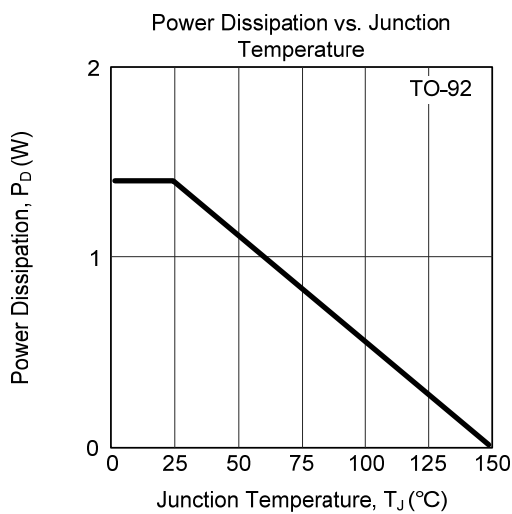
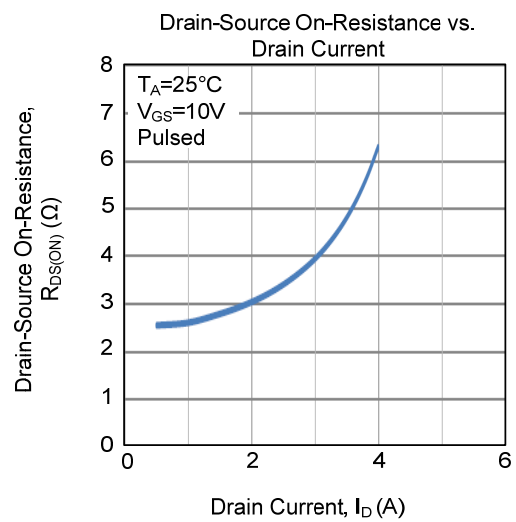
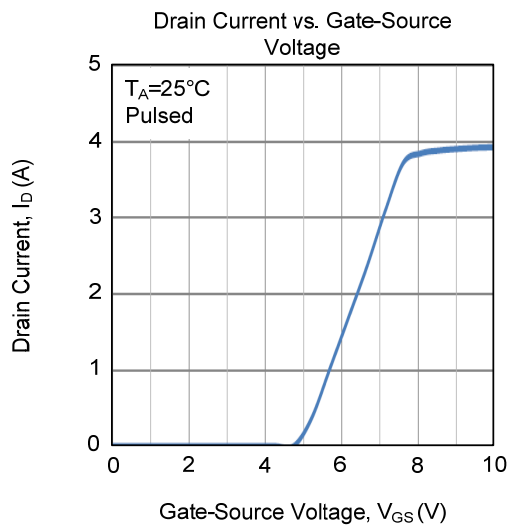
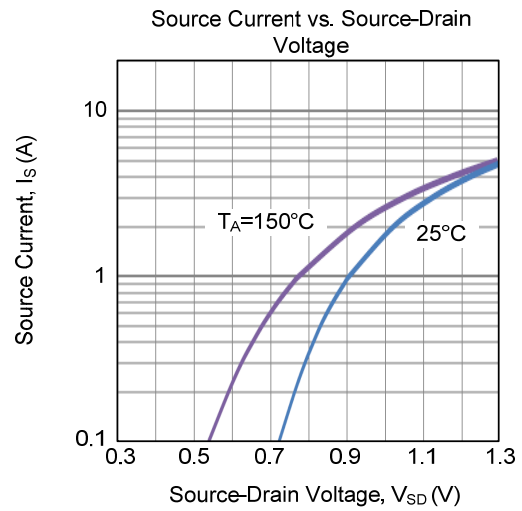
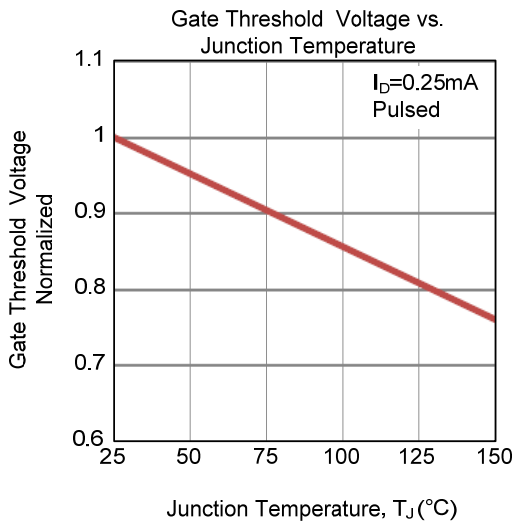


Unclamped Inductive Switching Waveforms

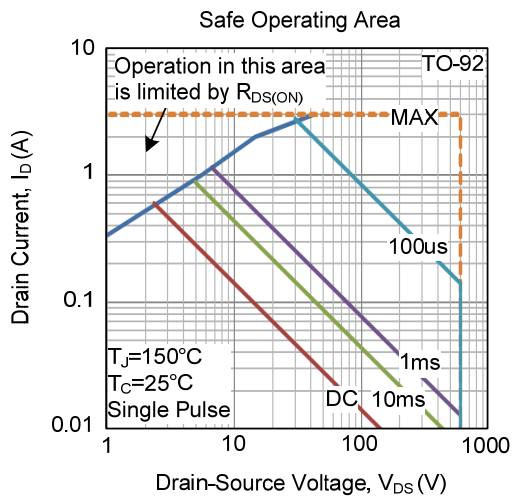
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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.