



5NM70

Power MOSFET

5A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

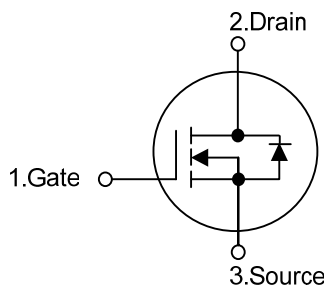
■ **DESCRIPTION**

The UTC **5NM70** 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 high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications at power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

■ **FEATURES**

- * $R_{DS(ON)} \leq 1.3\Omega$ @ $V_{GS}=10V, I_D=2.5A$
- * Fast Switching Capability
- * Improved dv/dt Capability, High Ruggedness

■ **SYMBOL**

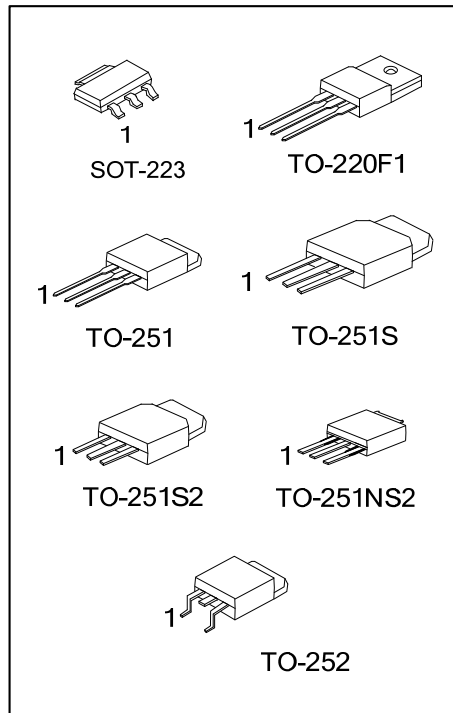


■ **ORDERING INFORMATION**

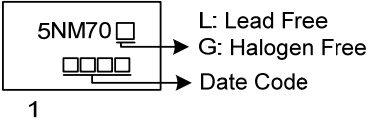
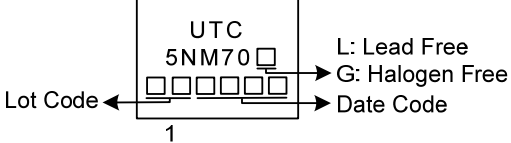
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5NM70L-AA3-R	5NM70G-AA3-R	SOT-223	G	D	S	Tape Reel
5NM70L-TF1-T	5NM70G-TF1-T	TO-220F1	G	D	S	Tube
5NM70L-TM3-T	5NM70G-TM3-T	TO-251	G	D	S	Tube
5NM70L-TMS-T	5NM70G-TMS-T	TO-251S	G	D	S	Tube
5NM70L-TMS2-T	5NM70G-TMS2-T	TO-251S2	G	D	S	Tube
5NM70L-TMN2-T	5NM70G-TMN2-T	TO-251NS2	G	D	S	Tube
5NM70L-TN3-R	5NM70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>5NM70G-AA3-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) AA3: SOT-223, TF1: TO-220F1, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMN2: TO-251NS2, TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
---	---



■ MARKING

SOT-223	TO-220F1 / TO-251 / TO-251S TO-251S2 / TO-251NS2 / TO-252
 <p>5NM70 □ □ □ □ 1</p> <p>L: Lead Free G: Halogen Free Date Code</p>	 <p>UTC 5NM70 □ □ □ □ □ □ 1</p> <p>Lot Code ← L: Lead Free G: Halogen Free Date Code</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	700	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current		I_D	5	A
Pulsed Drain Current (Note 2)		I_{DM}	10	A
Avalanche Current (Note 2)		I_{AR}	1.3	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	123	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns
Power Dissipation	SOT-223	P_D	12	W
	TO-220F1		26	W
	TO-251/TO-251S		54	W
	TO-251S2/TO-251NS2 TO-252			
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. $L=145\text{mH}$, $I_{AS}=1.3\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 5.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-220F1		62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S		110	$^\circ\text{C}/\text{W}$
	TO-251S2/TO-251NS2 TO-252			
Junction to Case	SOT-223	θ_{JC}	10.4	$^\circ\text{C}/\text{W}$
	TO-220F1		4.8	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S		2.3 (Note)	$^\circ\text{C}/\text{W}$
	TO-251S2/TO-251NS2 TO-252			

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

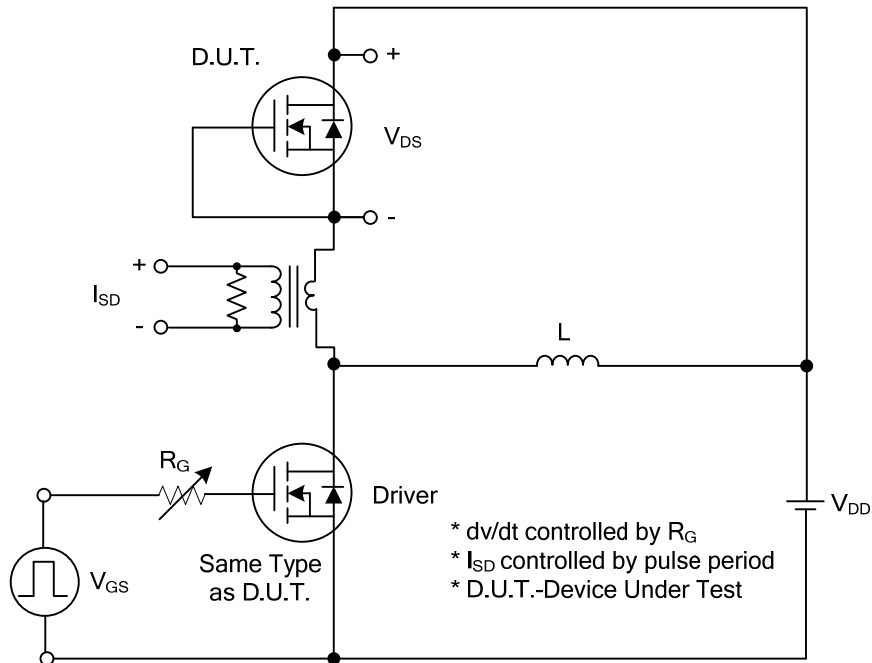
■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	700			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=700V, V_{GS}=0V$			10	μA
Gate-Source Leakage Current	Forward	$V_{GS}=30V, V_{DS}=0V$ $V_{GS}=-30V, V_{DS}=0V$			100	nA
	Reverse				-100	
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.5A$			1.3	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$		360		pF
Output Capacitance	C_{OSS}			270		pF
Reverse Transfer Capacitance	C_{RSS}			6		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=560V, V_{GS}=10V, I_D=5A,$ $I_G=1mA$ (Note 1, 2)		13		nC
Gate to Source Charge	Q_{GS}			6		nC
Gate to Drain Charge	Q_{GD}			2		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=5A,$ $R_G=25\Omega$ (Note 1, 2)		6		ns
Rise Time	t_R			17		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			24		ns
Fall-Time	t_F			23		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				5	A
Maximum Body-Diode Pulsed Current	I_{SM}				10	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=5A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=5A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$		290		ns
Body Diode Reverse Recovery Charge	Q_{rr}			2.5		μC

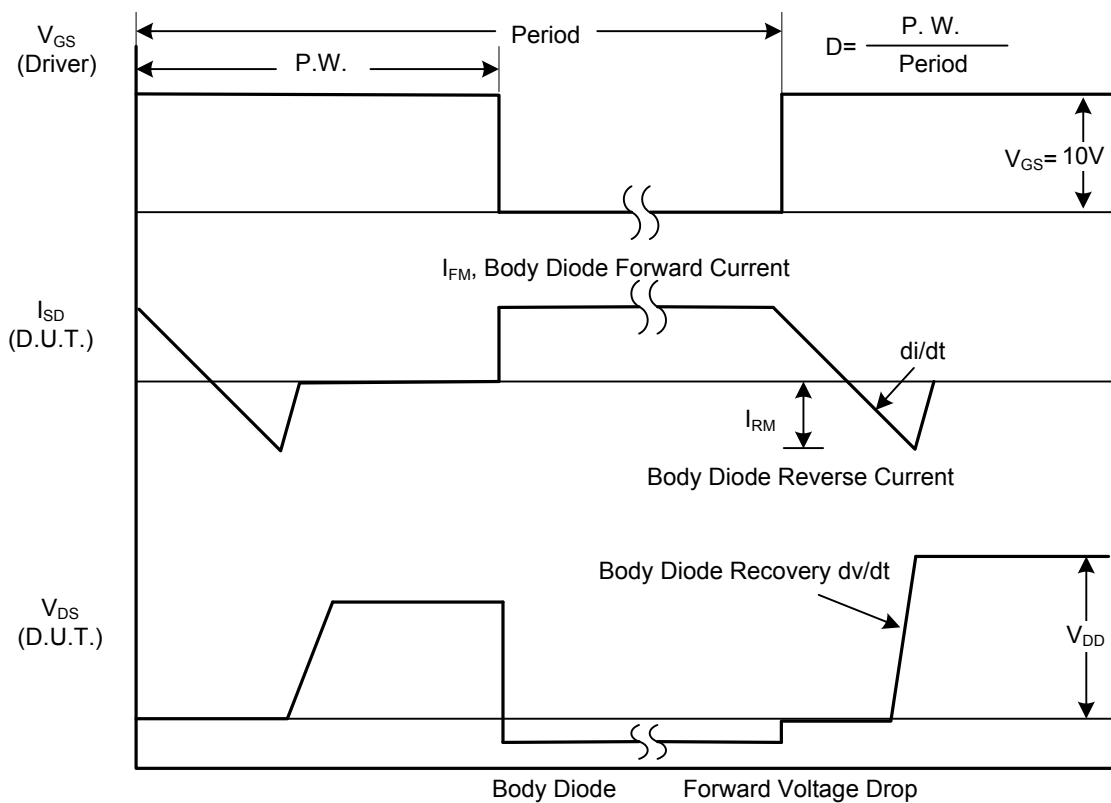
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

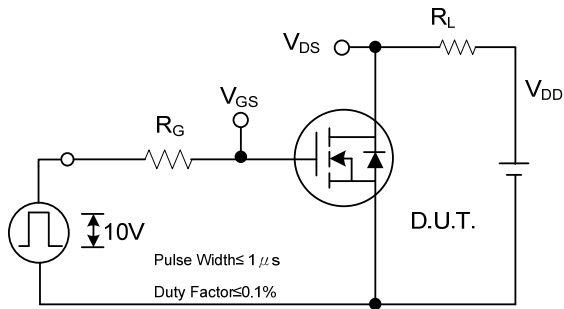
TEST CIRCUITS AND WAVEFORMS



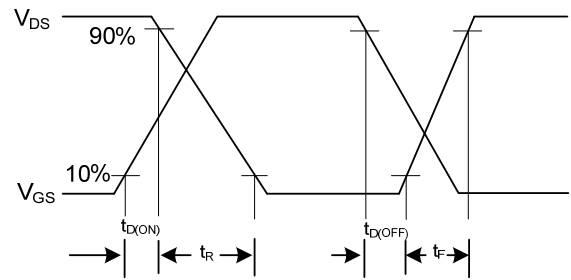
Peak Diode Recovery dv/dt Test Circuit



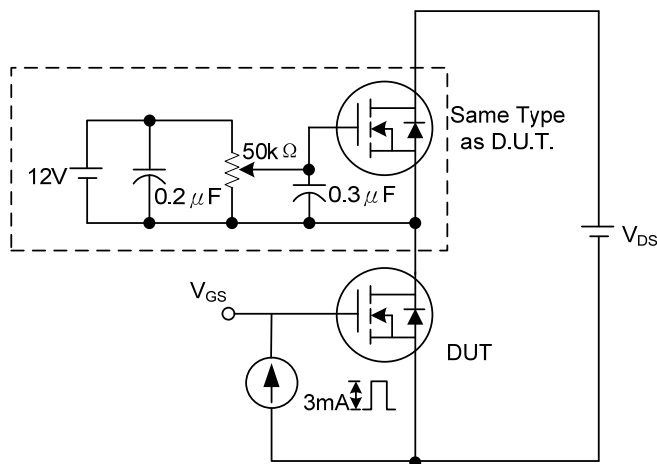
TEST CIRCUITS AND WAVEFORMS



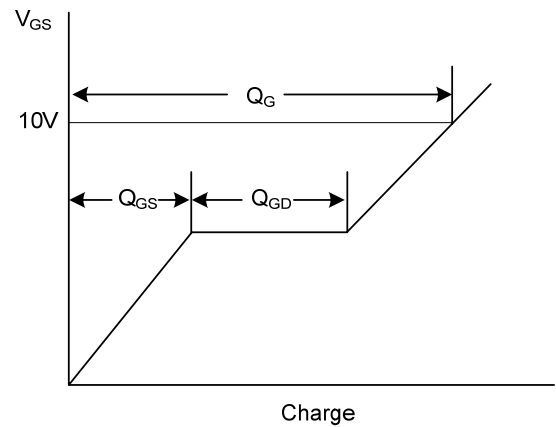
Switching Test Circuit



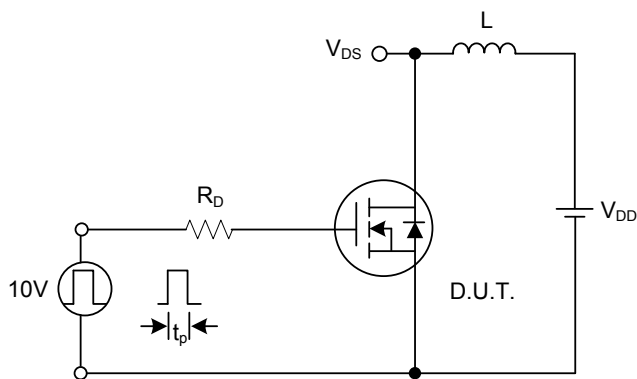
Switching Waveforms



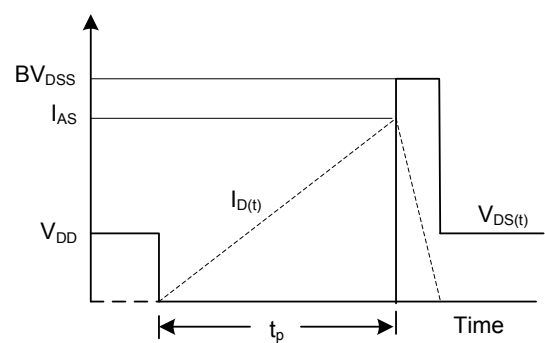
Gate Charge Test Circuit



Gate Charge Waveform

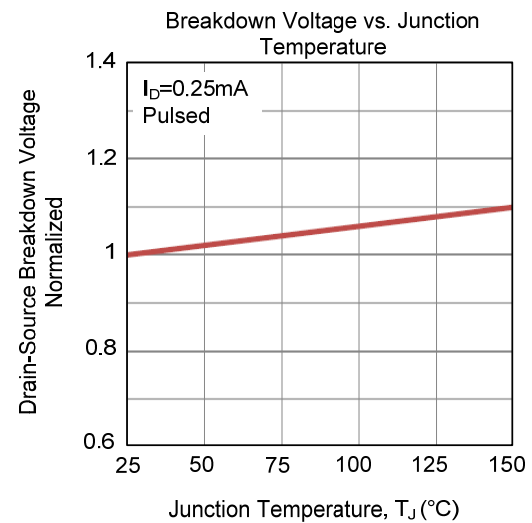
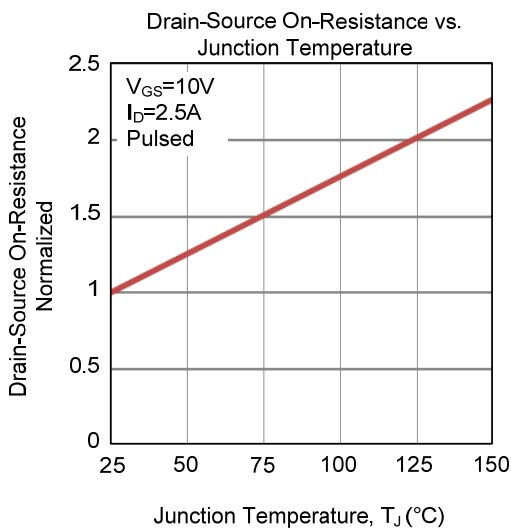
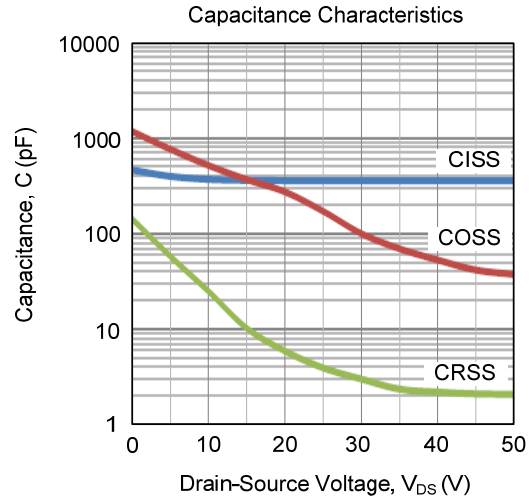
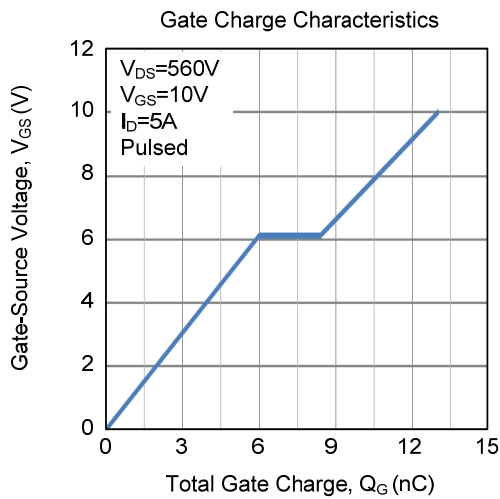
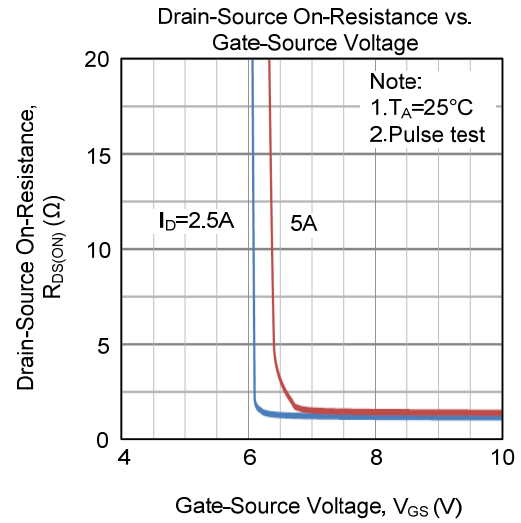
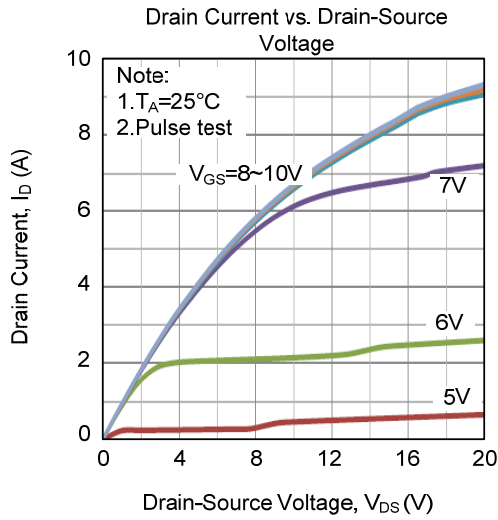


Unclamped Inductive Switching Test Circuit

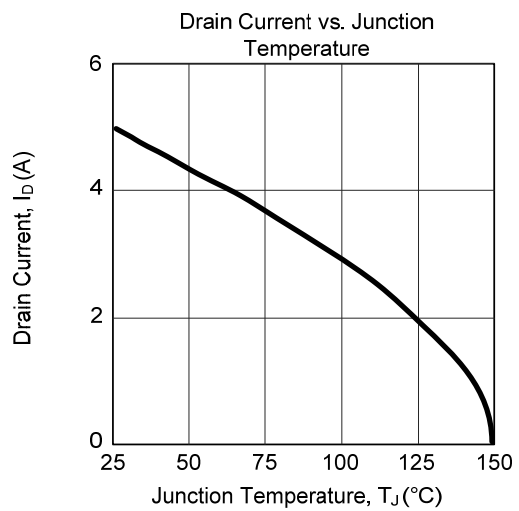
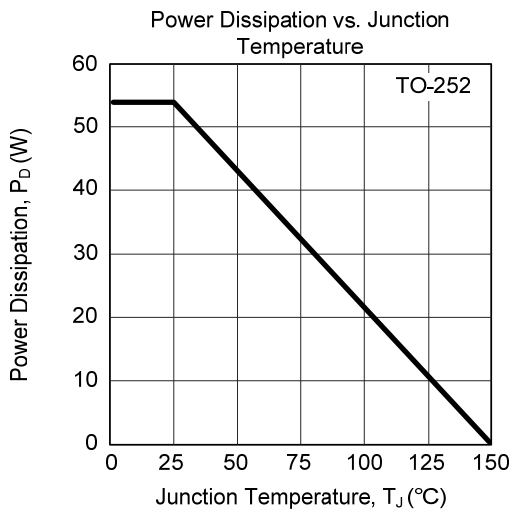
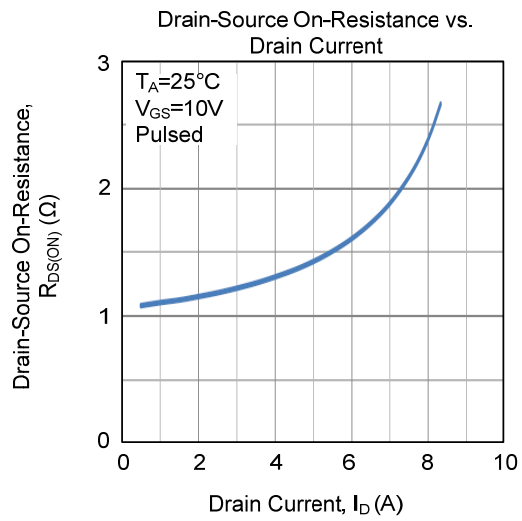
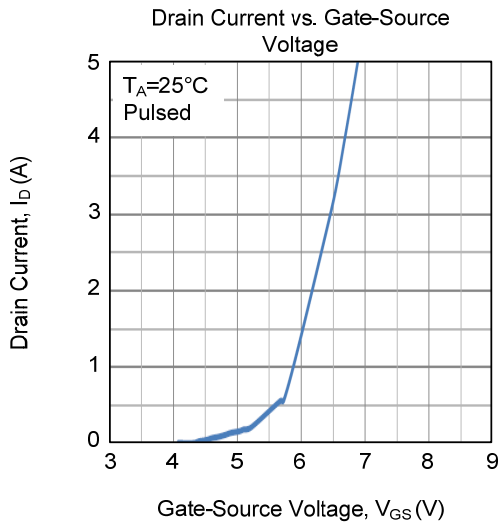
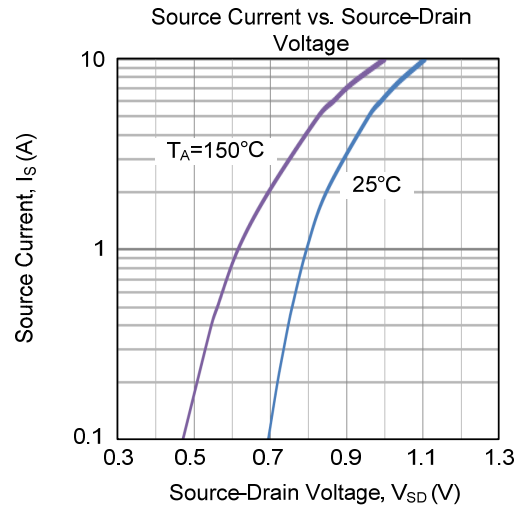
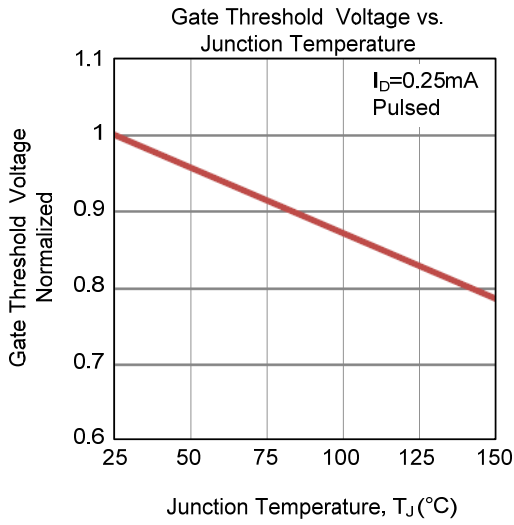


Unclamped Inductive Switching Waveforms

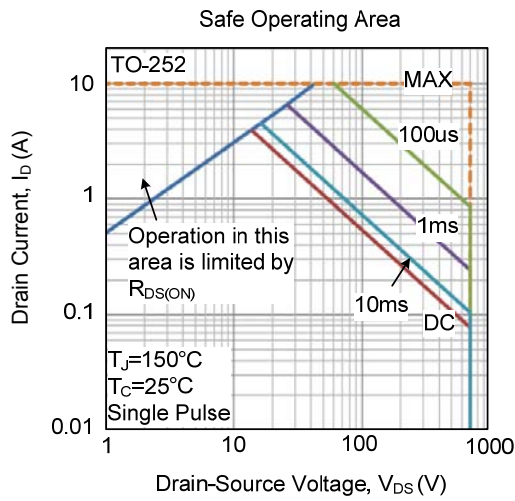
TYPICAL CHARACTERISTICS



■ 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.