



# 1P40

## POWER MOSFET

### -1A, -400V P-CHANNEL POWER MOSFET

■ DESCRIPTION

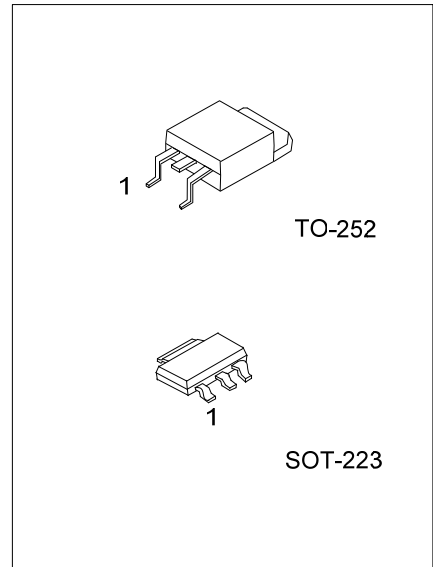
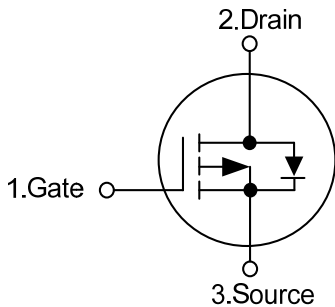
The UTC **1P40** is a P-channel MOS Field Effect Transistor. it uses UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance.

The UTC **1P40** is suitable for high voltage switching applications.

■ FEATURES

- \*  $R_{DS(ON)} \leq 11.6\Omega$  @  $V_{GS} = -10V, I_D = -0.5A$
- \* High switching speed
- \* Low input capacitance

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1P40L-AA3-R	1P40G-AA3-R	SOT-223	G	D	S	Tape Reel
1P40L-TN3-R	1P40G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>1P40G-AA3-R</p>	<p>(1) R: Tape Reel (2) AA3: SOT-223, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
--------------------	---

■ MARKING

SOT-223	TO-252

■ ABSOLUTE MAXIMUM RATING ( $T_A=25^\circ\text{C}$  unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	-400	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	DC	$I_D$	-1	A
	Pulsed (Note 2)	$I_{DM}$	-2	A
Single Avalanche Energy (Note 3)		$E_{AS}$	104	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	12.8	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	SOT-223	$P_D$	6.9	W
	TO-252		38	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-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.  $L=86\text{mH}$ ,  $I_{AS}=-1.56\text{A}$ ,  $V_{DD}=-90\text{V}$ ,  $R_G=25\Omega$ , 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	SOT-223	$\theta_{JA}$	150	$^\circ\text{C}/\text{W}$
	TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case (Note)	SOT-223	$\theta_{JC}$	19.5	$^\circ\text{C}/\text{W}$
	TO-252		3.28	$^\circ\text{C}/\text{W}$

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

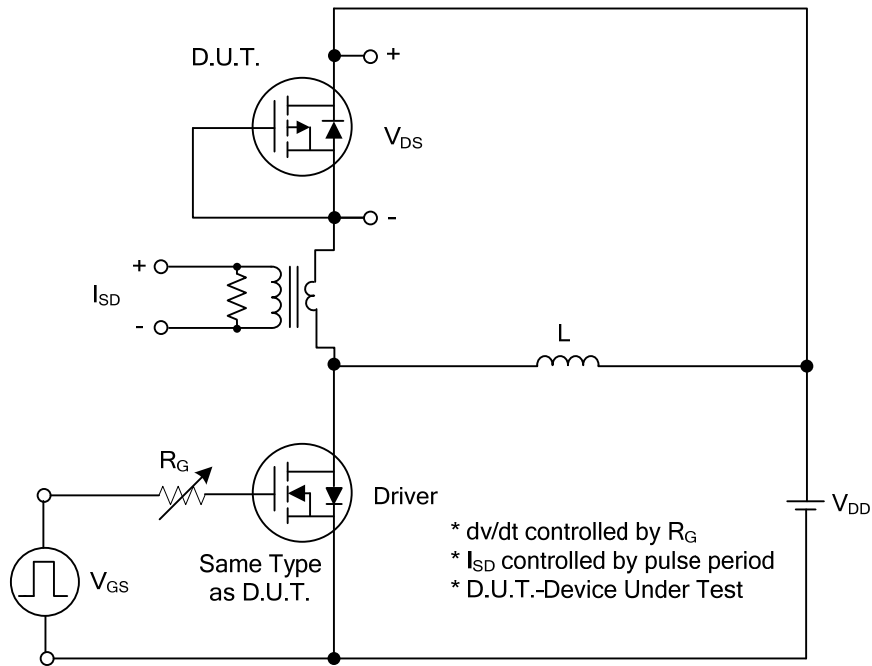
■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =-400V, V <sub>GS</sub> =0V			-1	μA
Gate-Source Leakage Current	Forward	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V			+100	nA
	Reverse	V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =-250μA	-2.0		-4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-0.5A			11.6	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, f=1.0MHz		158		pF
Output Capacitance	C <sub>OSS</sub>			35		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			5		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =-100V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1.0A, I <sub>G</sub> =-1mA (Note 1, 2)		7		nC
Gate to Source Charge	Q <sub>GS</sub>			2.2		nC
Gate to Drain Charge	Q <sub>GD</sub>			1.5		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =-40V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-0.8A, R <sub>G</sub> =-25Ω (Note 1, 2)		4		ns
Rise Time	t <sub>R</sub>			14		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			27		ns
Fall-Time	t <sub>F</sub>			39		ns
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				-1	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				-2	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> =-1.0A, V <sub>GS</sub> =0V			-1.4	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =-1.0A, V <sub>GS</sub> =0V, di/dt=100A/μs		150		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			885		nC

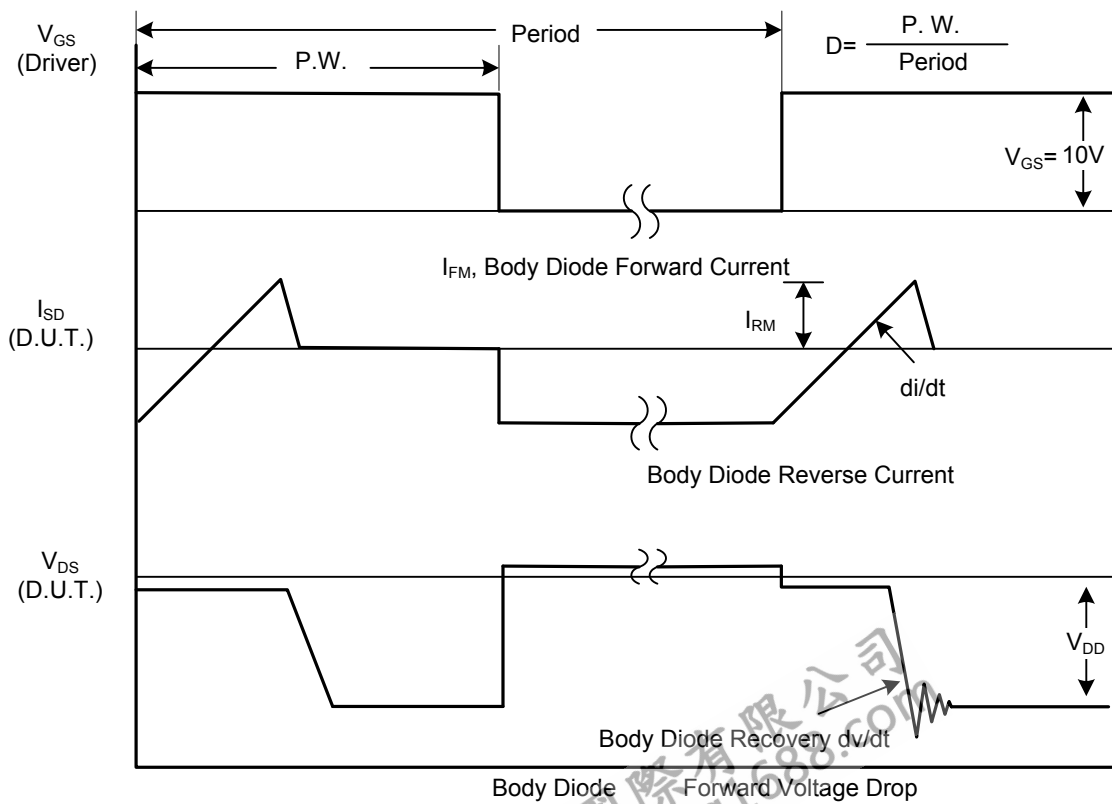
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

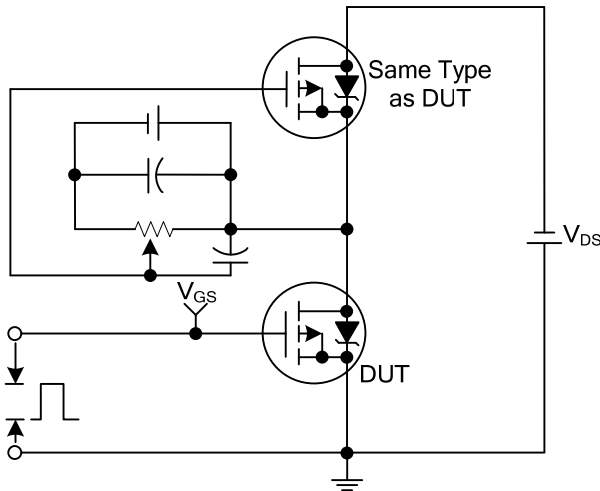


Peak Diode Recovery  $dv/dt$  Test Circuit

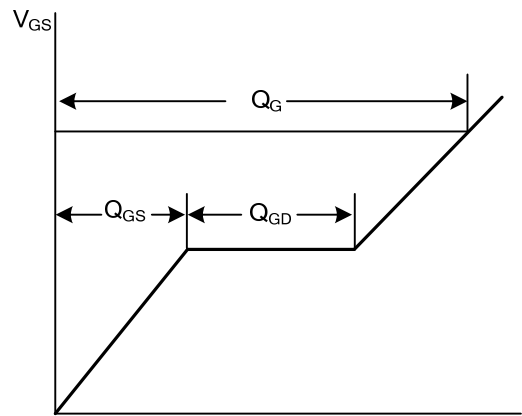


Peak Diode Recovery  $dv/dt$  Waveforms

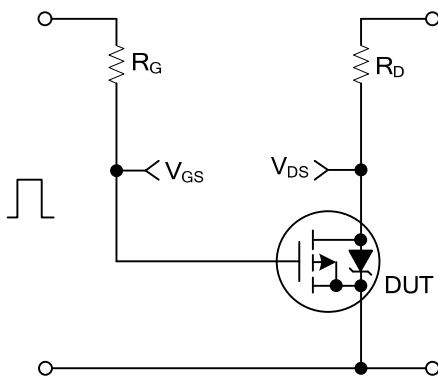
■ TEST CIRCUITS AND WAVEFORMS



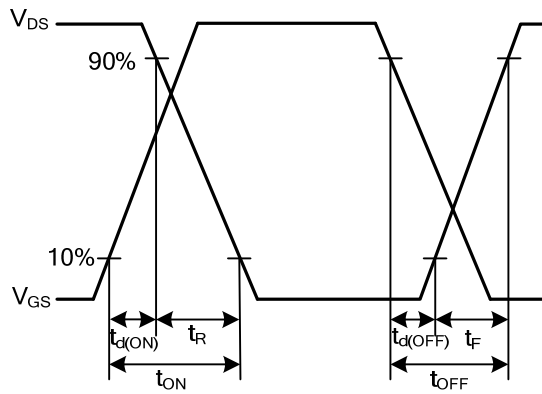
Gate Charge Test Circuit



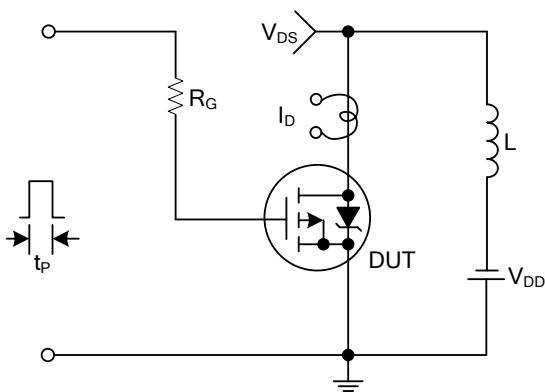
Gate Charge Waveforms



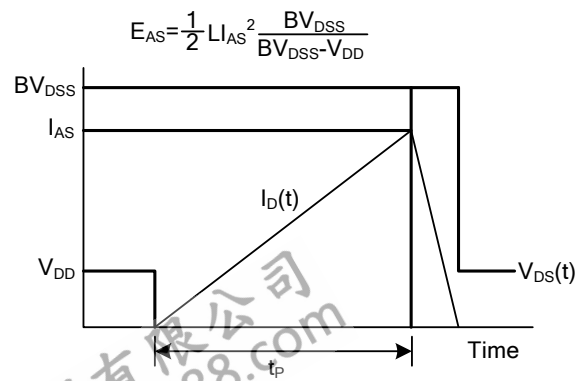
Resistive Switching Test Circuit



Resistive Switching Waveforms

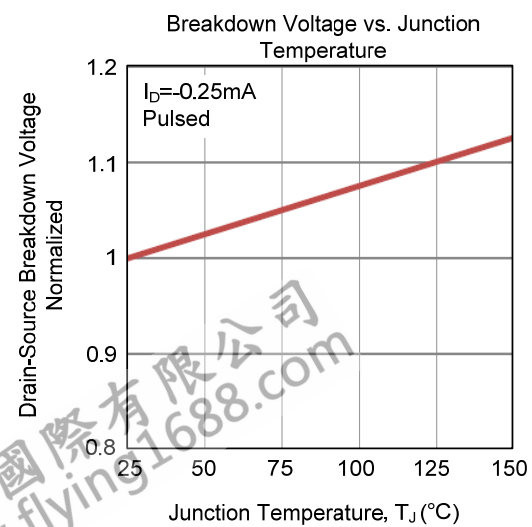
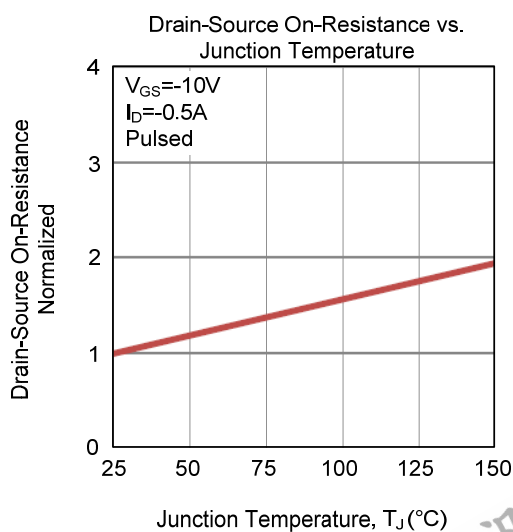
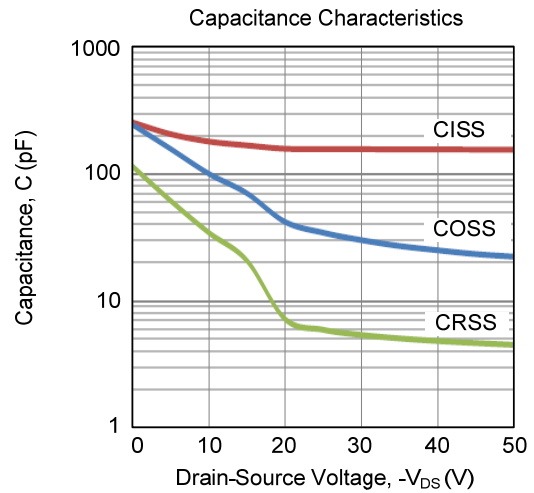
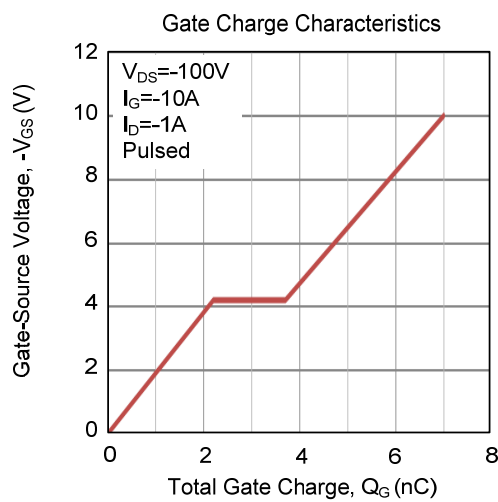
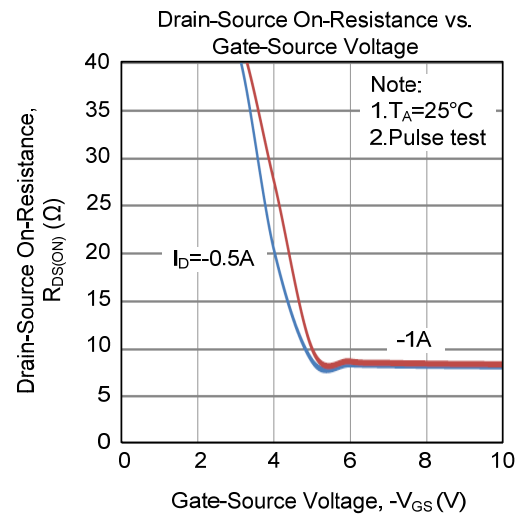
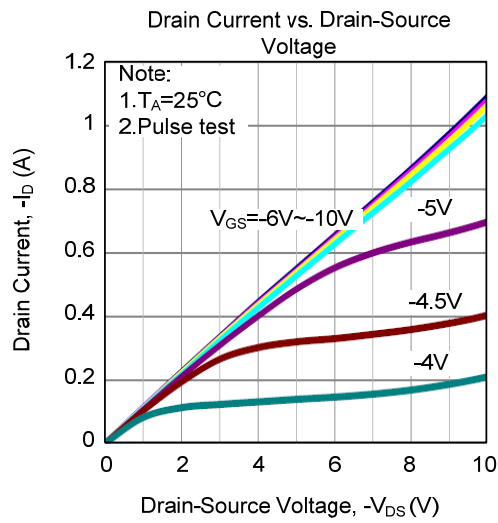


Unclamped Inductive Switching Test Circuit

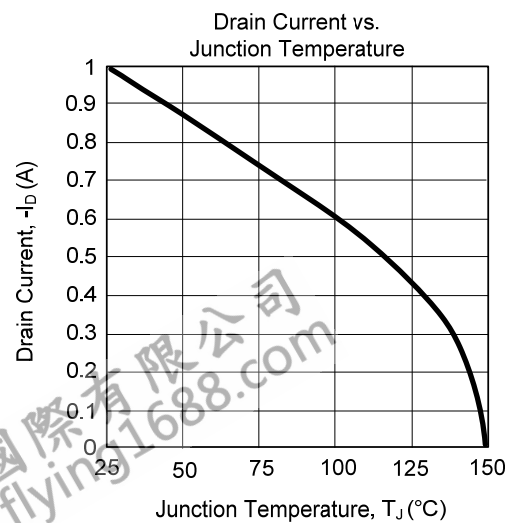
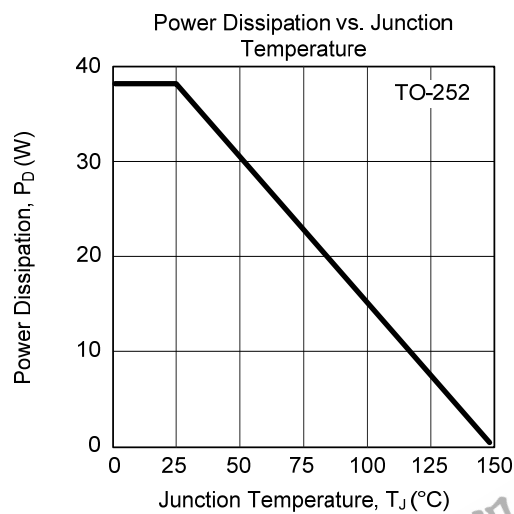
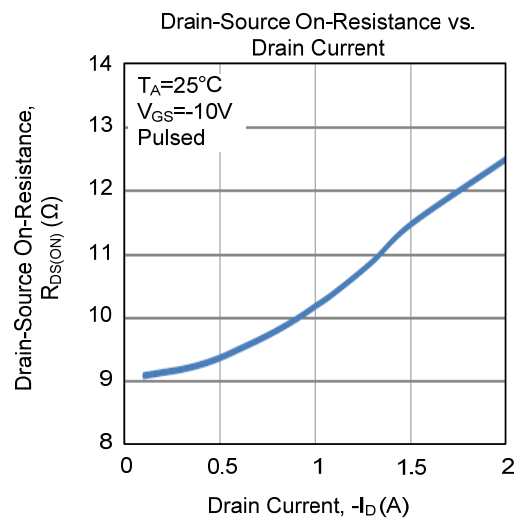
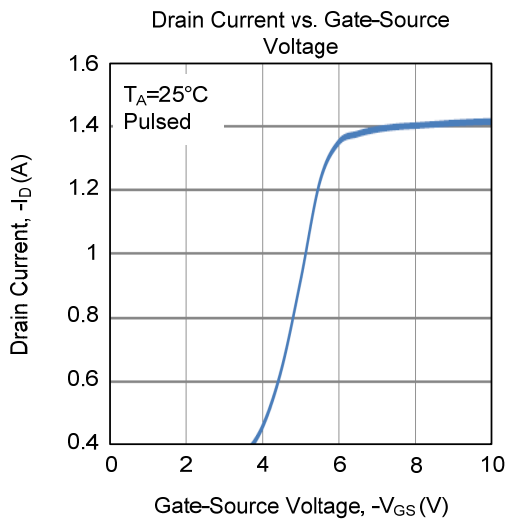
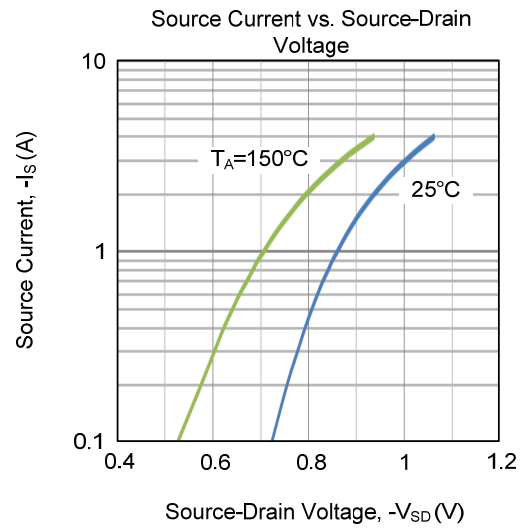
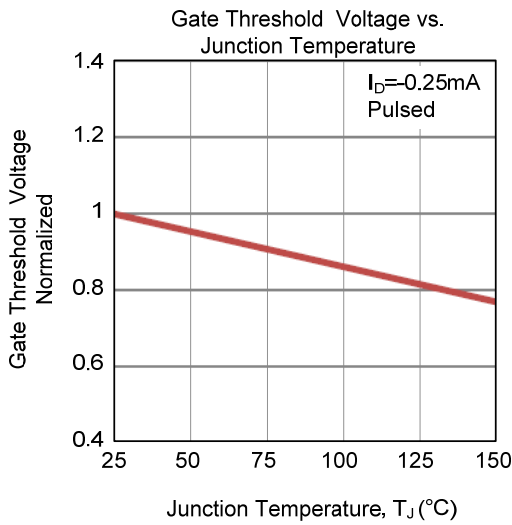


Unclamped Inductive Switching Waveforms

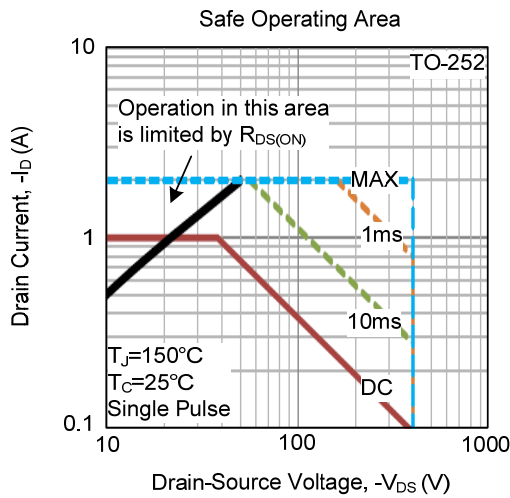
## TYPICAL CHARACTERISTICS



## ■ 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.