



## 2P40

## POWER MOSFET

### -2.0A, -400V P-CHANNEL POWER MOSFET

#### DESCRIPTION

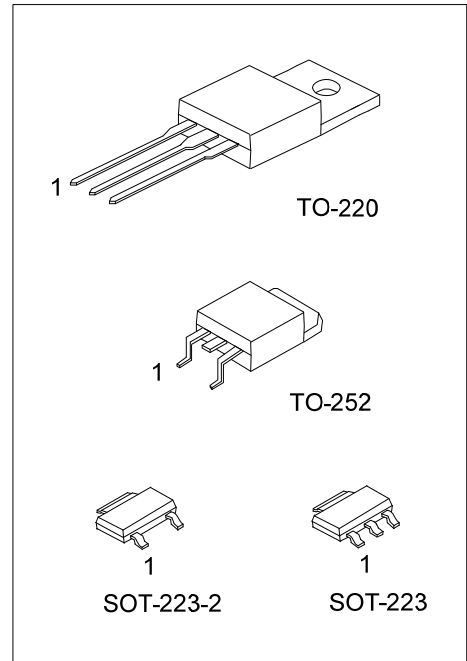
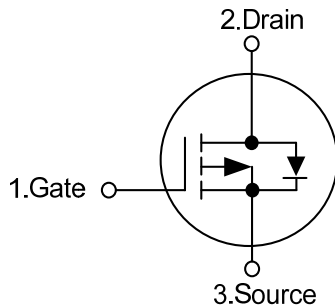
The UTC **2P40** is a P-channel MOS Field Effect Transistor. it uses UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance.

The UTC **2P40** is suitable for high voltage switching applications.

#### FEATURES

- \*  $R_{DS(ON)} \leq 6.1 \Omega @ V_{GS} = -10V, I_D = -1.0A$
- \* High switching speed
- \* Low input capacitance

#### SYMBOL



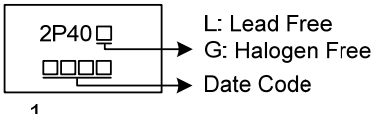
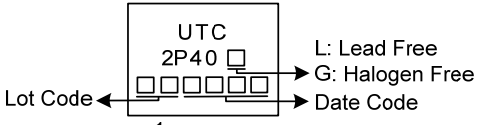
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2P40L-AA2-R	2P40G-AA2-R	SOT-223-2	G	D	S	Tape Reel
2P40L-AA3-R	2P40G-AA3-R	SOT-223	G	D	S	Tape Reel
2P40L-TA3-T	2P40G-TA3-T	TO-220	G	D	S	Tube
2P40L-TN3-R	2P40G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>2P40G-AA2-R</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) AA2: SOT-223-2, AA3: SOT-223, TA3: TO-220 TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

SOT-223-2 / SOT-223	TO-220 / TO-252
 <p>2P40 □ □□□□ 1</p> <p>L: Lead Free G: Halogen Free Date Code</p>	 <p>UTC 2P40 □ □□□□□□ 1</p> <p>Lot Code ← L: Lead Free G: Halogen Free Date Code</p>

■ 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	$I_D$	-2	A
	DC( $T_C=100^\circ\text{C}$ )		-1.2	A
	Pulsed (Note 2)	$I_{DM}$	-8	A
Single Avalanche Energy (Note 3)		$E_{AS}$	156	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	17	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	SOT-223-2	$P_D$	7	W
	SOT-223			
	SOT-220		68	W
	TO-252		40	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.  $L=86\text{mH}$ ,  $I_{AS}=-1.9\text{A}$ ,  $V_{DD}=-90\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$ .

4.  $I_{SD}\leq -2.0\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223-2	$\theta_{JA}$	150	$^\circ\text{C}/\text{W}$
	SOT-223			
	SOT-220		62.5	$^\circ\text{C}/\text{W}$
	TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case (Note)	SOT-223-2	$\theta_{JC}$	17.8	$^\circ\text{C}/\text{W}$
	SOT-223			
	SOT-220		1.8	$^\circ\text{C}/\text{W}$
	TO-252		3.125	$^\circ\text{C}/\text{W}$

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

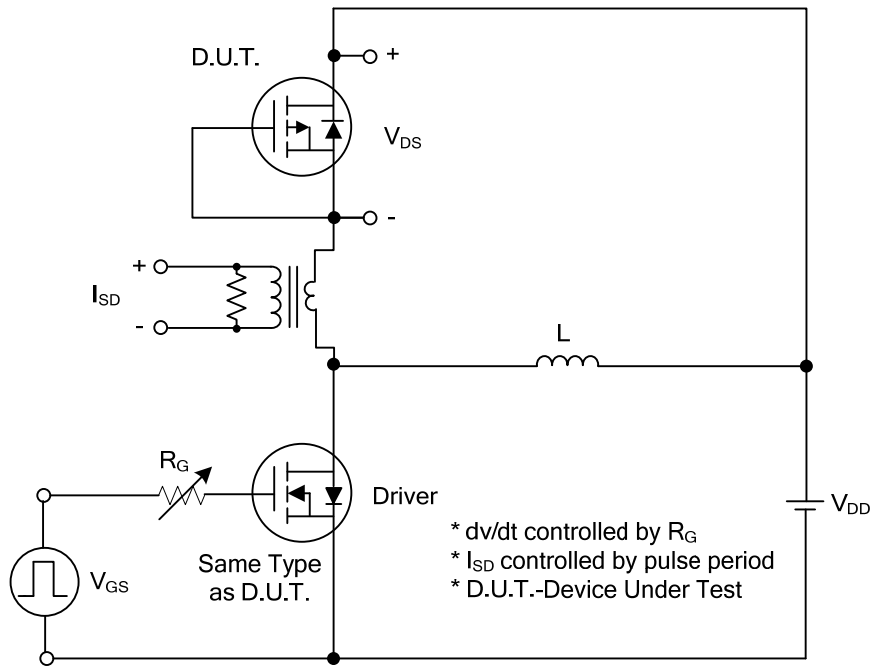
■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise specified)

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> =-1.0A		4.9	6.1	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, f=1.0MHz		330		pF
Output Capacitance	C <sub>OSS</sub>			60		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			9		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> =-2.0A, I <sub>G</sub> =-1mA (Note 1, 2)		11.6		nC
Gate to Source Charge	Q <sub>GS</sub>			2.6		nC
Gate to Drain Charge	Q <sub>GD</sub>			3.1		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)		5		ns
Rise Time	t <sub>R</sub>			15		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			45		ns
Fall-Time	t <sub>F</sub>			45		ns
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				-2	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				-8	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> =-2.0A, V <sub>GS</sub> =0V			-1.4	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =-2.0A, V <sub>GS</sub> =0V, di/dt=100A/μs		196		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			1700		nC

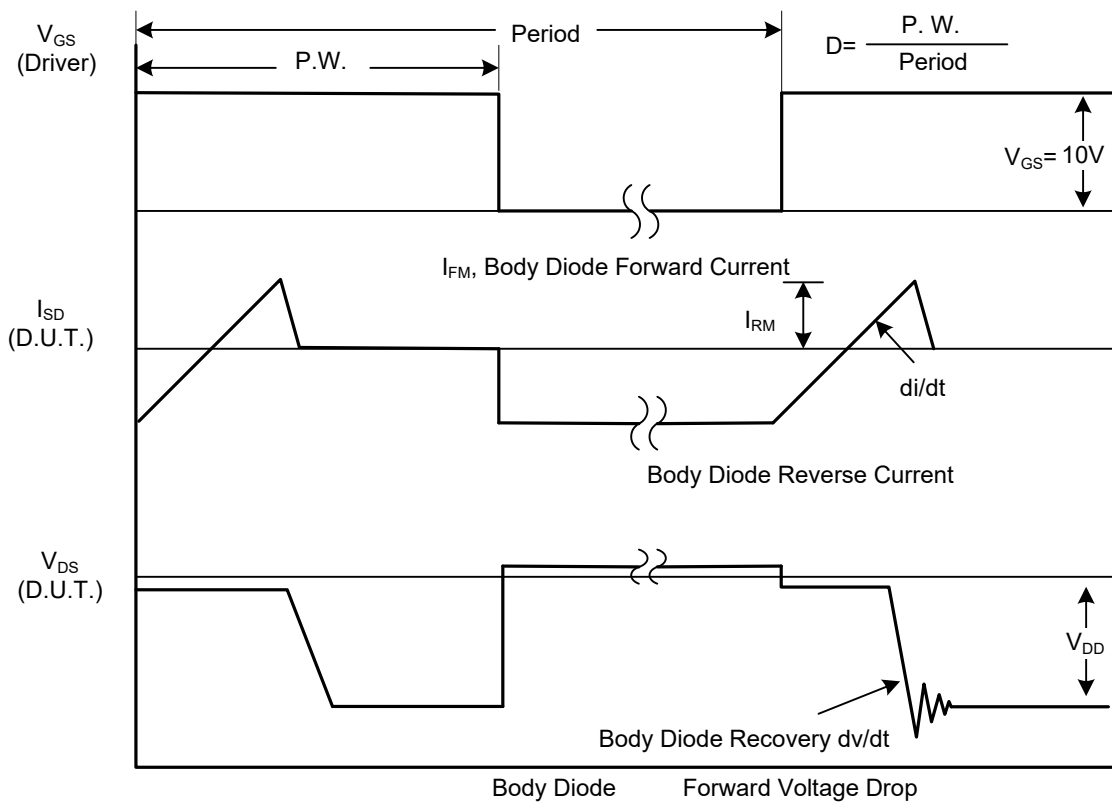
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

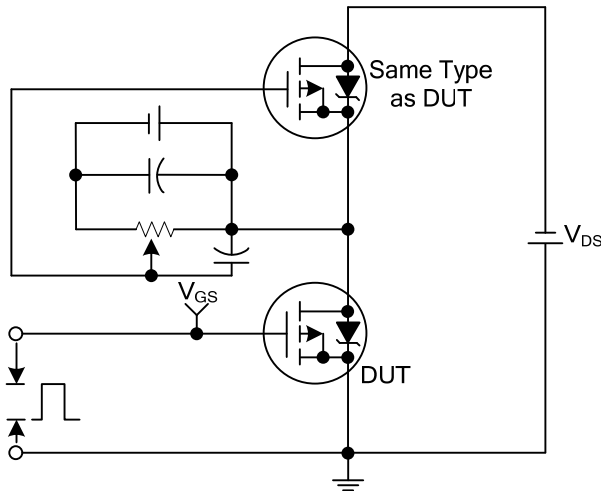


Peak Diode Recovery  $dv/dt$  Test Circuit

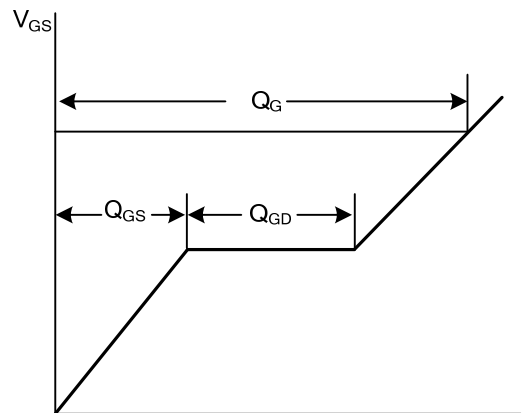


Peak Diode Recovery  $dv/dt$  Waveforms

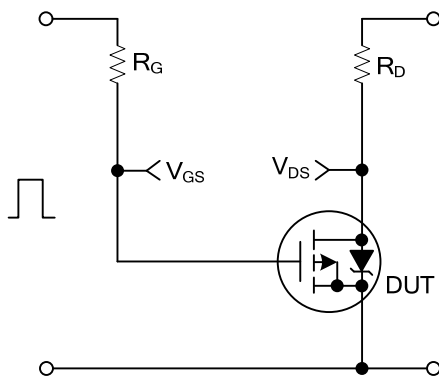
■ TEST CIRCUITS AND WAVEFORMS



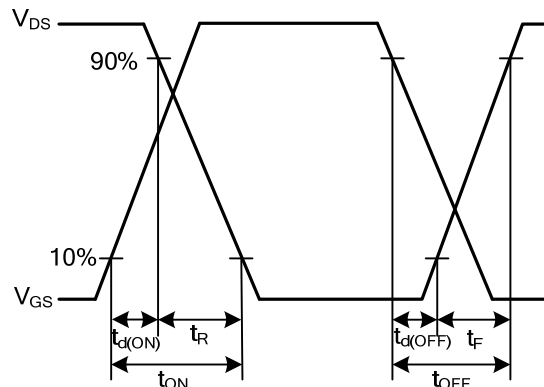
Gate Charge Test Circuit



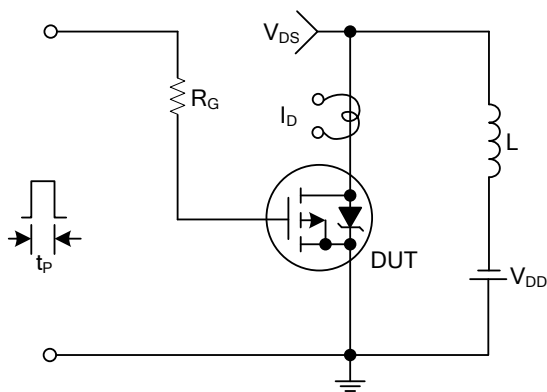
Gate Charge Waveforms



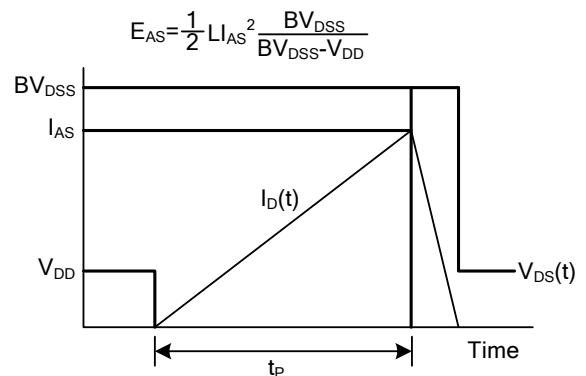
Resistive Switching Test Circuit



Resistive Switching Waveforms

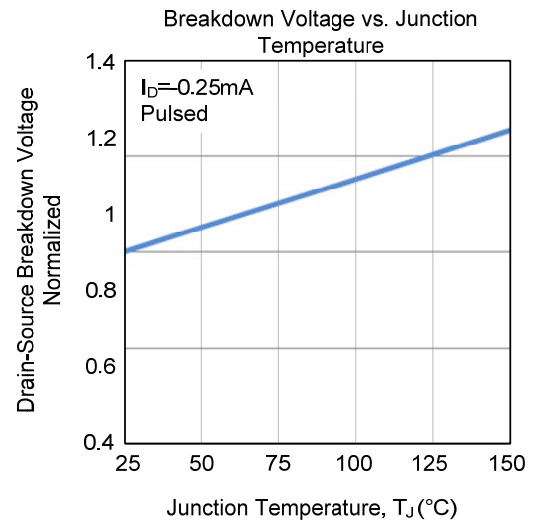
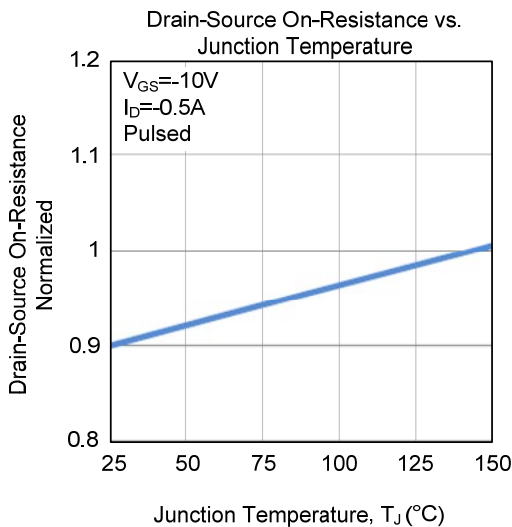
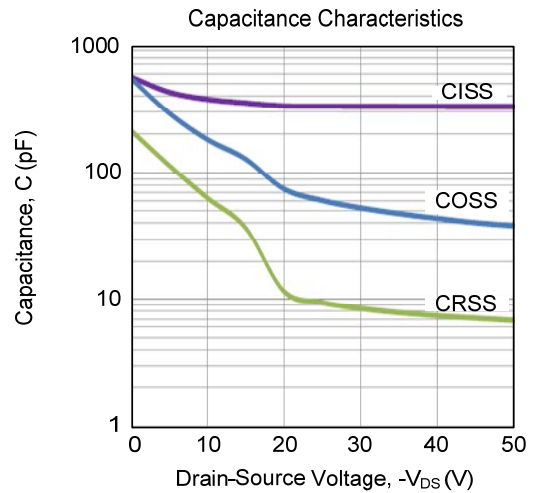
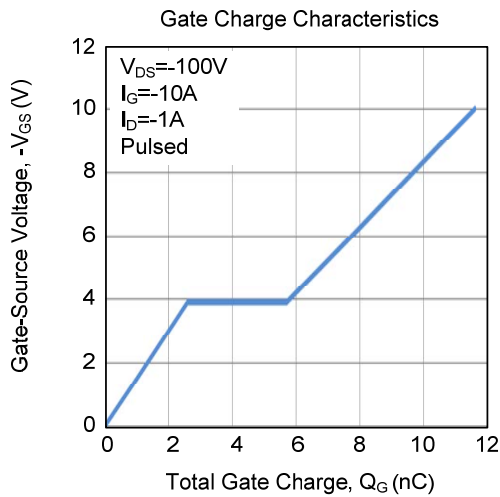
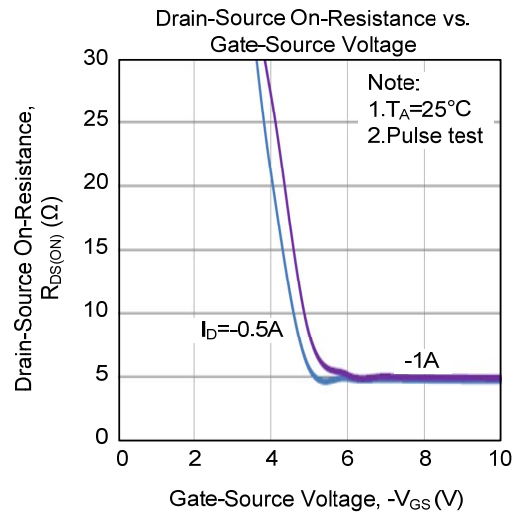
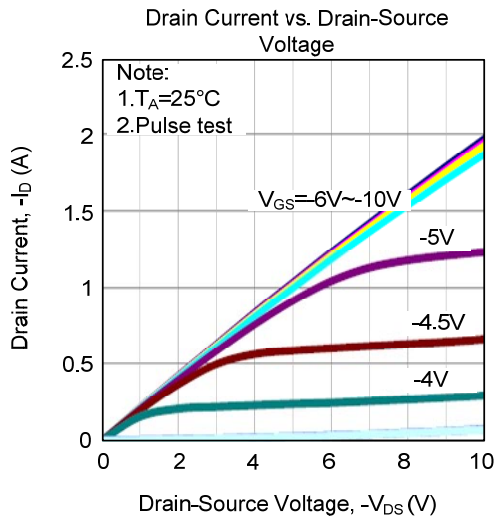


Unclamped Inductive Switching Test Circuit

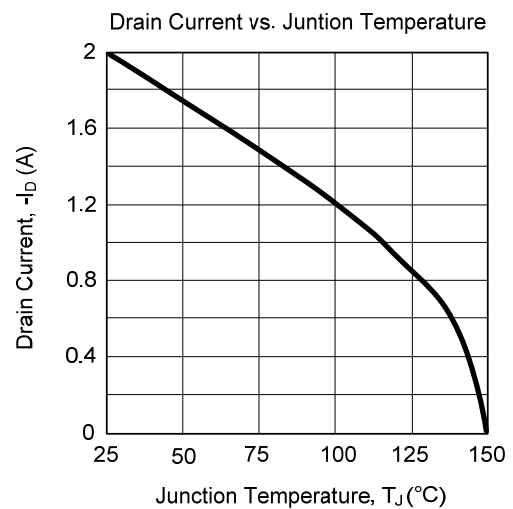
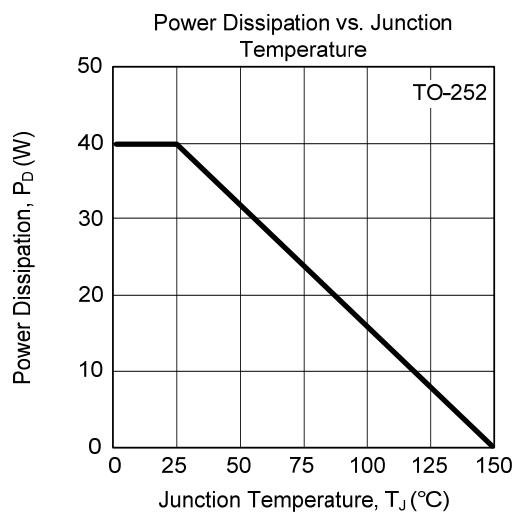
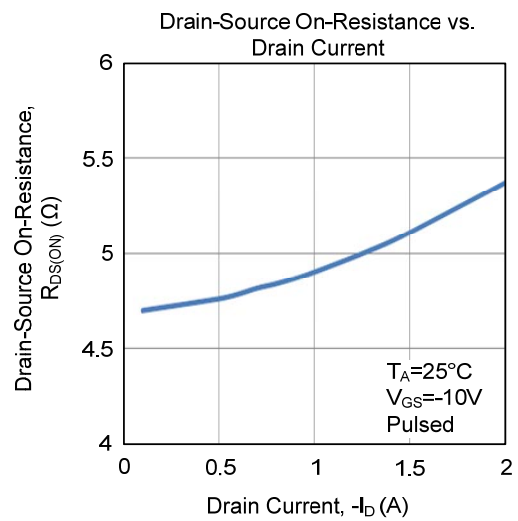
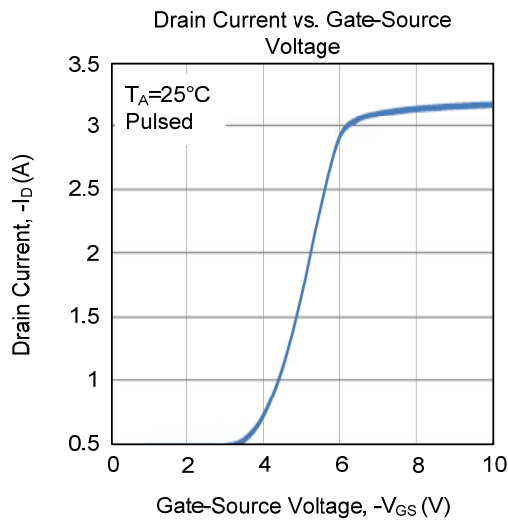
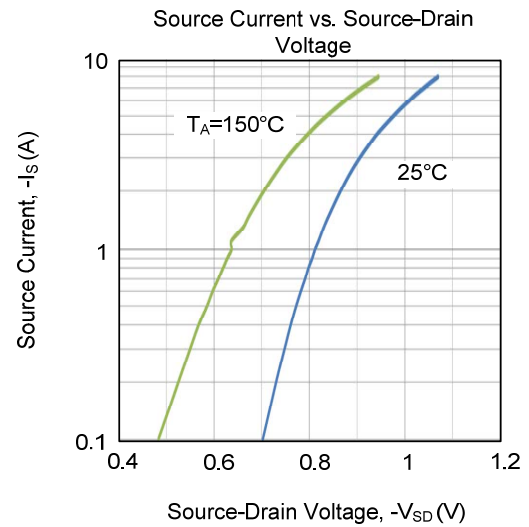
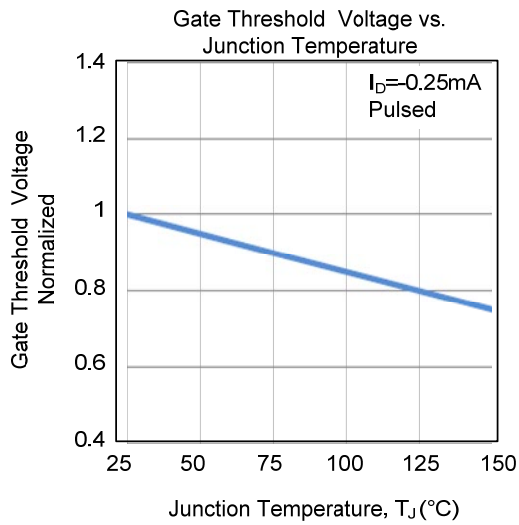


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

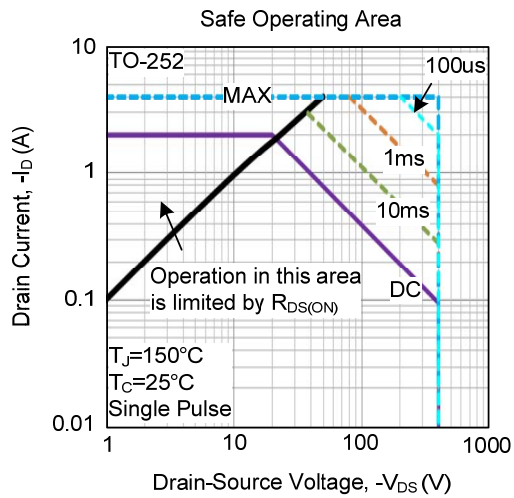


## ■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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