



1N60K-TA

Power MOSFET

1A, 600V N-CHANNEL POWER MOSFET

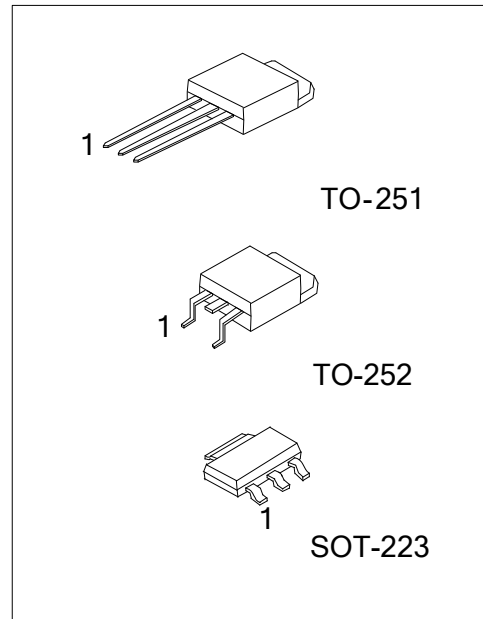
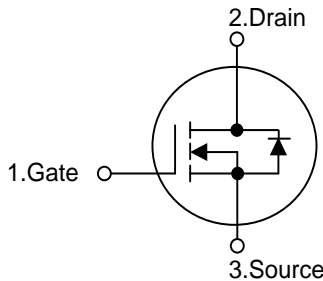
DESCRIPTION

The UTC 1N60K-TA is a high voltage MOSFET 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 AC to DC converters and bridge circuits.

FEATURES

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

SYMBOL



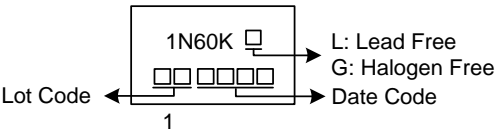
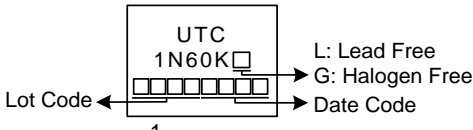
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60KL-AA3-R	1N60KG-AA3-R	SOT-223	G	D	S	Tape Reel
1N60KL-TM3-T	1N60KG-TM3-T	TO-251	G	D	S	Tube
1N60KL-TN3-R	1N60KG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>1N60KG-AA3-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) AA3: SOT-223, TM3: TO-251, TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

SOT-223	TO-251 / TO-252
 <p>1N60K □ □□ □□ □□ □□ Lot Code ← → Date Code</p> <p>L: Lead Free G: Halogen Free</p> <p>1</p>	 <p>UTC 1N60K □ □□ □□ □□ □□ □□ □□ □□ □□ Lot Code ← → Date Code</p> <p>L: Lead Free G: Halogen Free</p> <p>1</p>

■ **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
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	60	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4	V/ns
Power Dissipation	SOT-223	P_D	8	W
	TO-251/TO-252		28	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Operating Temperature		T_{OPR}	-55 ~ +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. $L = 120\text{mH}$, $I_{AS} = 1\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

3. $I_{SD} \leq 1\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, 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-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	14	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		4.53	$^\circ\text{C}/\text{W}$

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

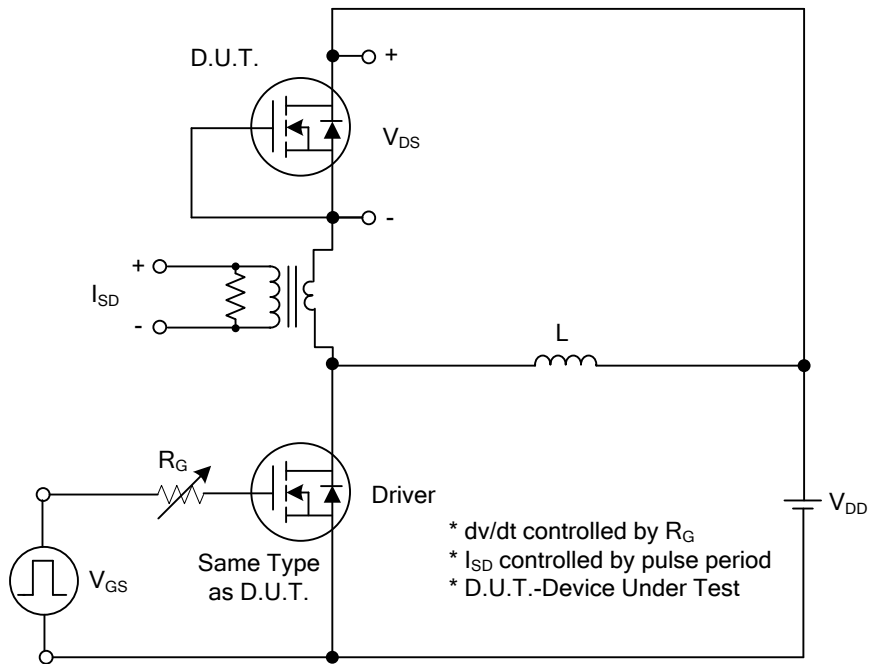
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$		0.4		$V/^\circ C$
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=0.5A$			10	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		190		pF
Output Capacitance	C_{OSS}			26		pF
Reverse Transfer Capacitance	C_{RSS}			2		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	$V_{DS}=480V, V_{GS}=10V, I_D=1A, I_G=1mA$ (Note 2,3)		4.5		nC
Gate-Source Charge	Q_{GS}			2.5		nC
Gate-Drain Charge	Q_{GD}			0.9		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=1A, R_G=25\Omega$ (Note 2,3)		4		ns
Turn-On Rise Time	t_R			14		ns
Turn-Off Delay Time	$t_{D(OFF)}$			13		ns
Turn-Off Fall Time	t_F			33		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				1	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				2	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=1A$			1.4	V
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_S=1A,$		220		nS
Reverse Recovery Charge	Q_{rr}	$dI_F / dt = 100A/\mu s$ (Note 1)		0.6		μC

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

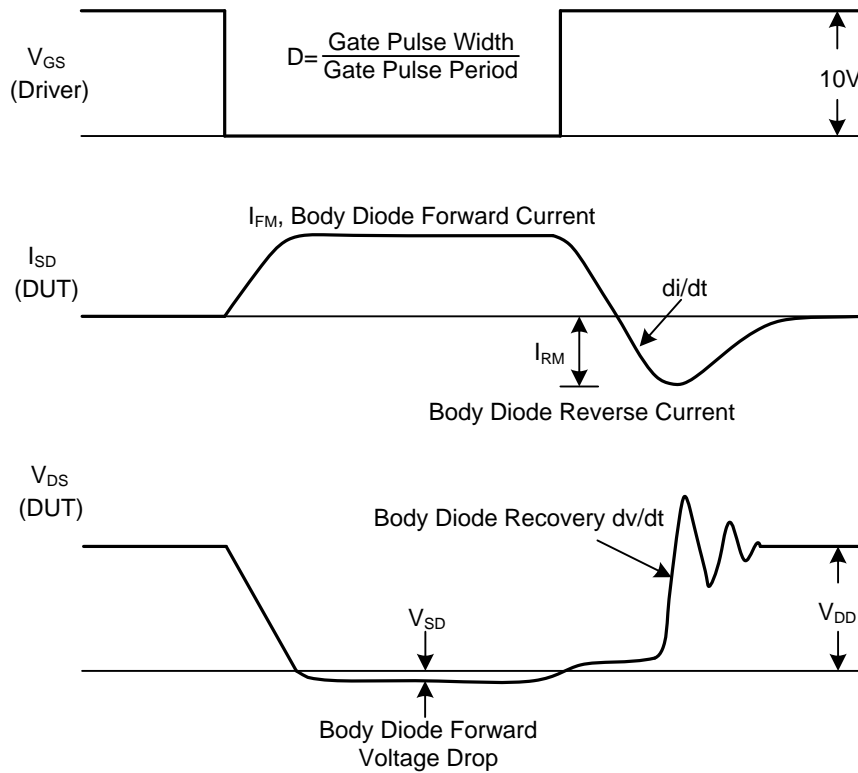
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.

3. Essentially Independent of Operating Temperature.

TEST CIRCUITS AND WAVEFORMS

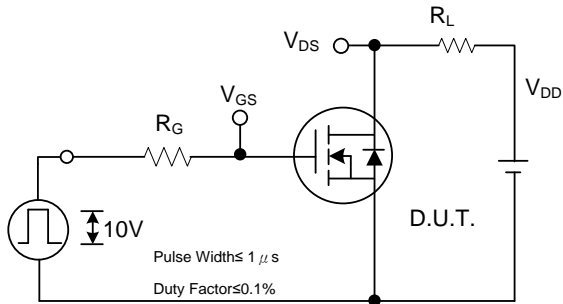


Peak Diode Recovery dv/dt Test Circuit

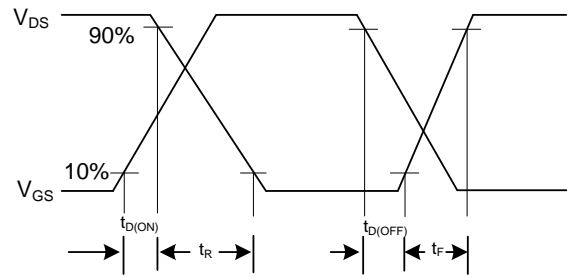


Peak Diode Recovery dv/dt Waveforms

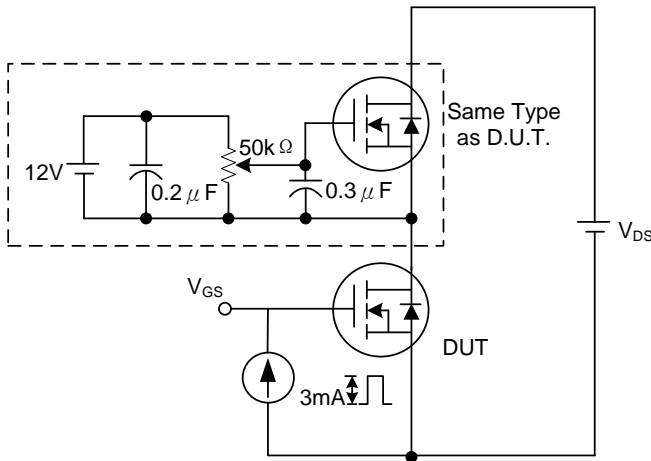
TEST CIRCUITS AND WAVEFORMS



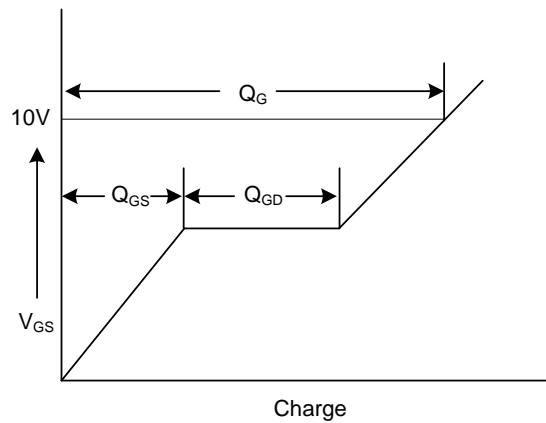
Switching Test Circuit



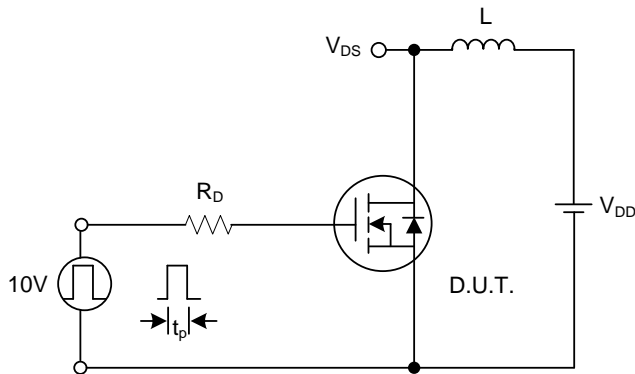
Switching Waveforms



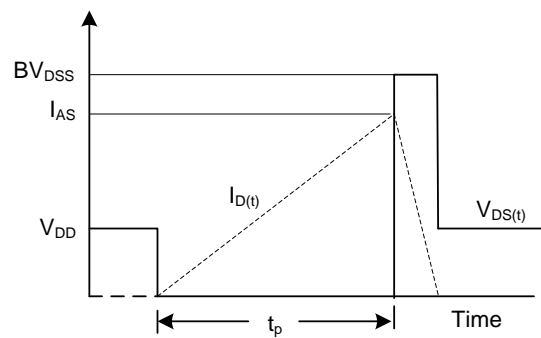
Gate Charge Test Circuit



Gate Charge Waveform

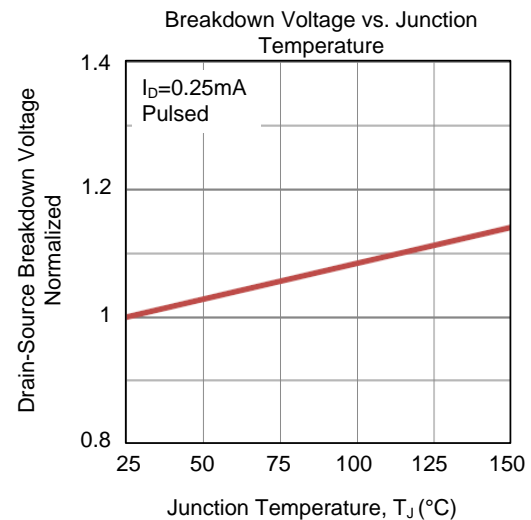
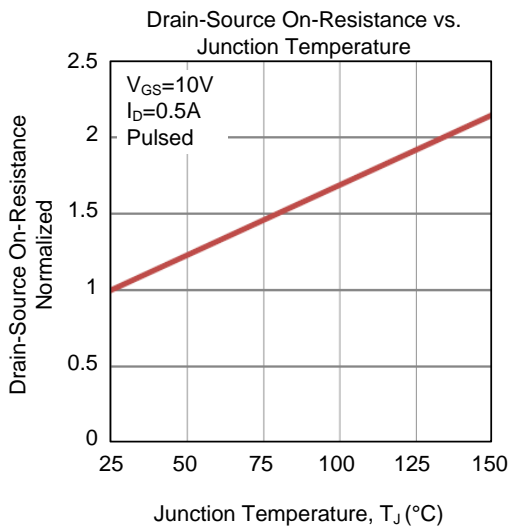
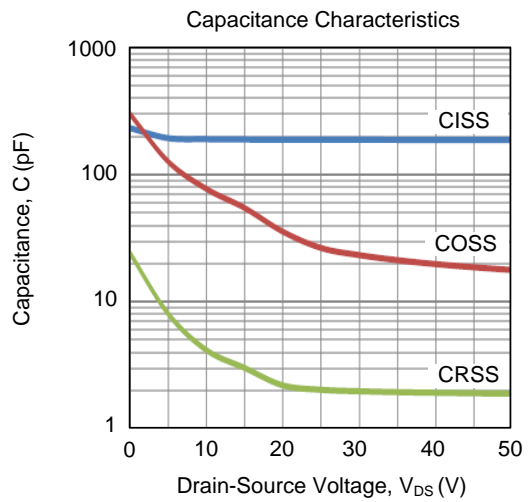
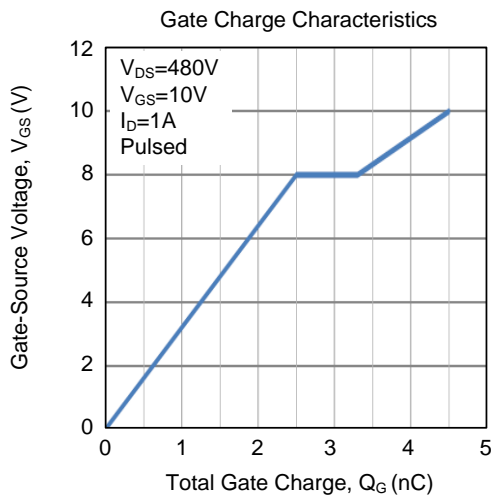
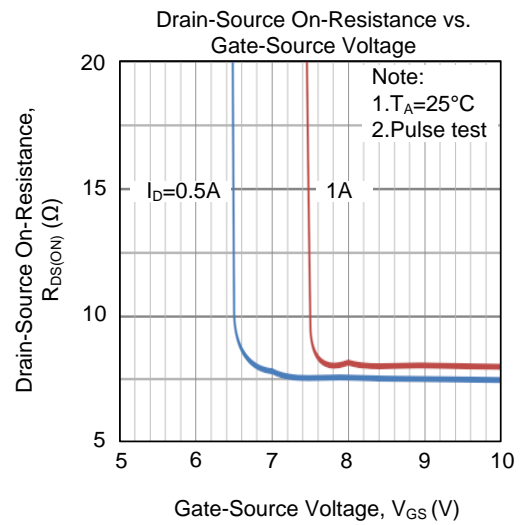
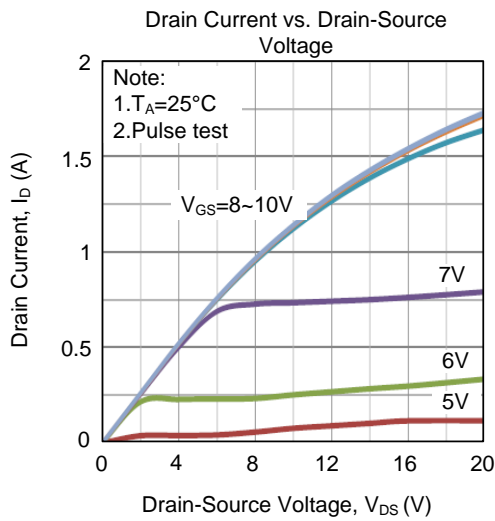


Unclamped Inductive Switching Test Circuit

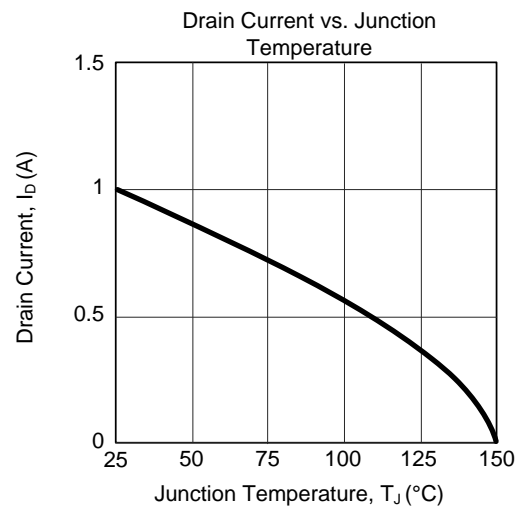
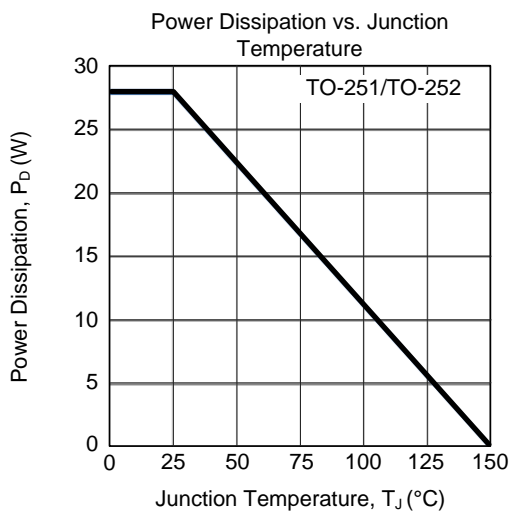
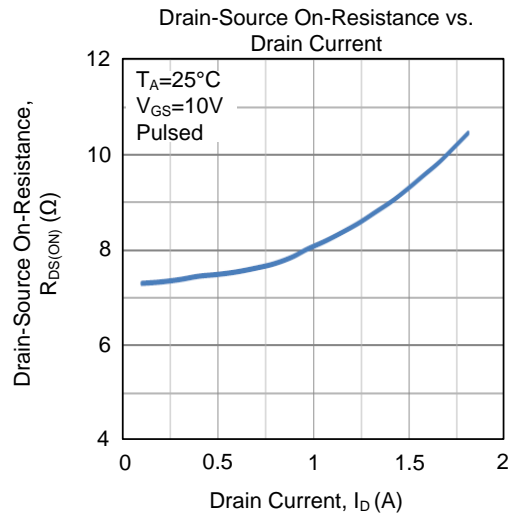
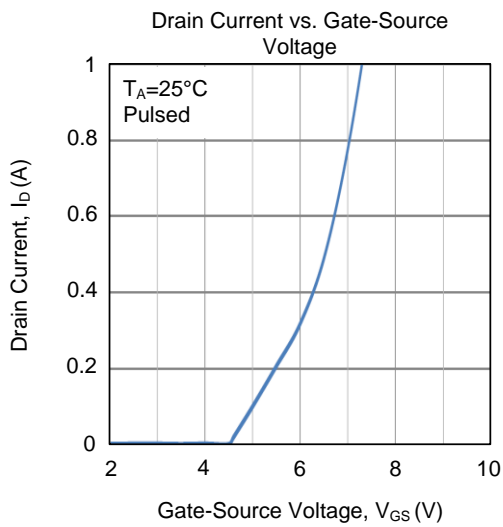
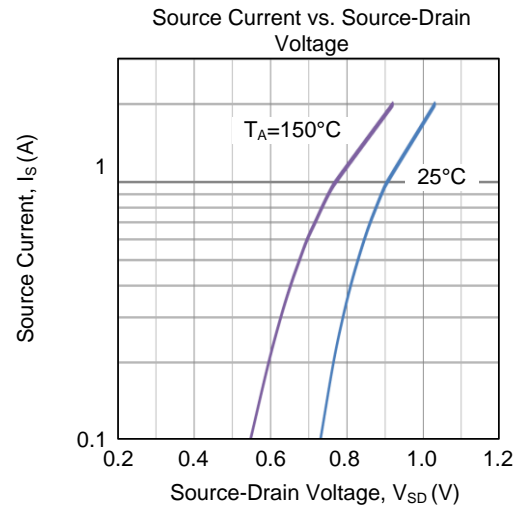
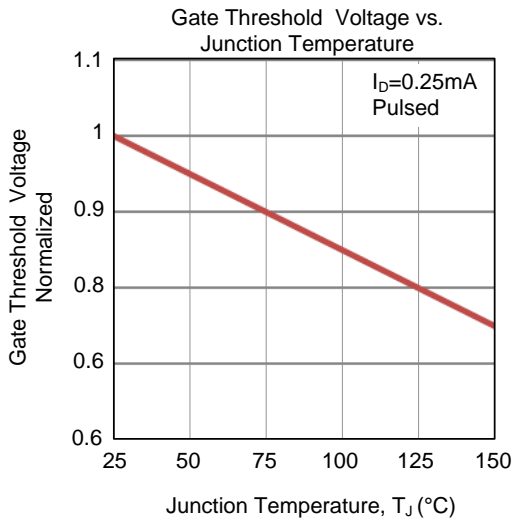


Unclamped Inductive Switching Waveforms

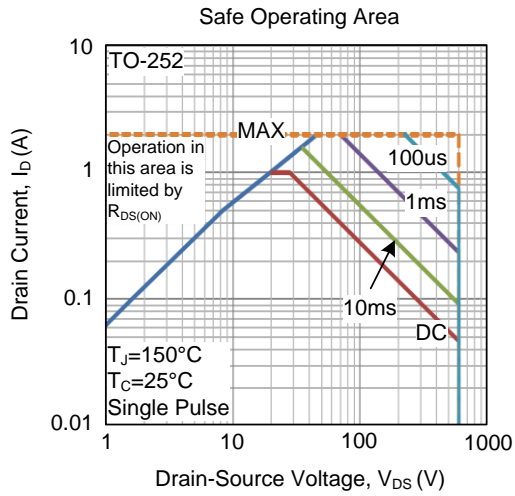
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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