



## 1N60K-TA

Power MOSFET

### 1A, 600V N-CHANNEL POWER MOSFET

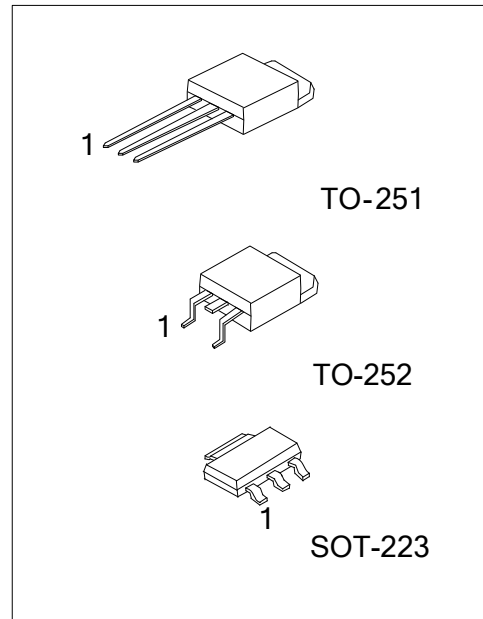
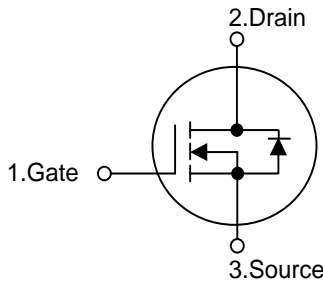
#### DESCRIPTION

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



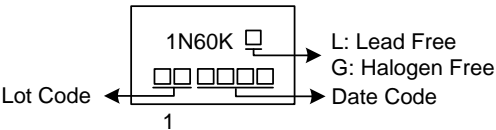
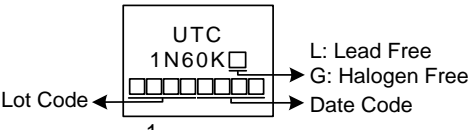
#### ORDERING INFORMATION

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

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

## MARKING

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

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■ **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	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	1	A
Avalanche Energy	Single Pulsed (Note 2)	$E_{AS}$	60
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4	V/ns
Power Dissipation	SOT-223	$P_D$	8
	TO-251/TO-252		28
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	$\theta_{JA}$	SOT-223	150
		TO-251/TO-252	110
Junction to Case	$\theta_{JC}$	SOT-223	14
		TO-251/TO-252	4.53

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

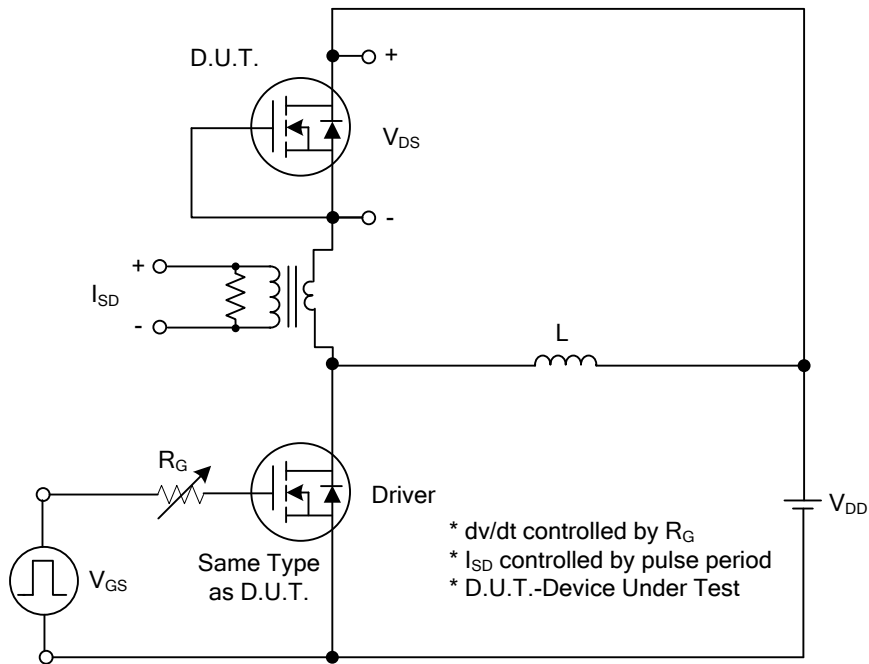
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$			10	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$		0.4		$V/^\circ C$
<b>ON CHARACTERISTICS</b>						
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	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
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
<b>SWITCHING CHARACTERISTICS</b>						
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
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
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	$t_{rr}$	$V_{GS}=0V, I_S=1A, dI_F/dt=100A/\mu s$ (Note 1)		220		nS
Reverse Recovery Charge	$Q_{rr}$			0.6		$\mu C$

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

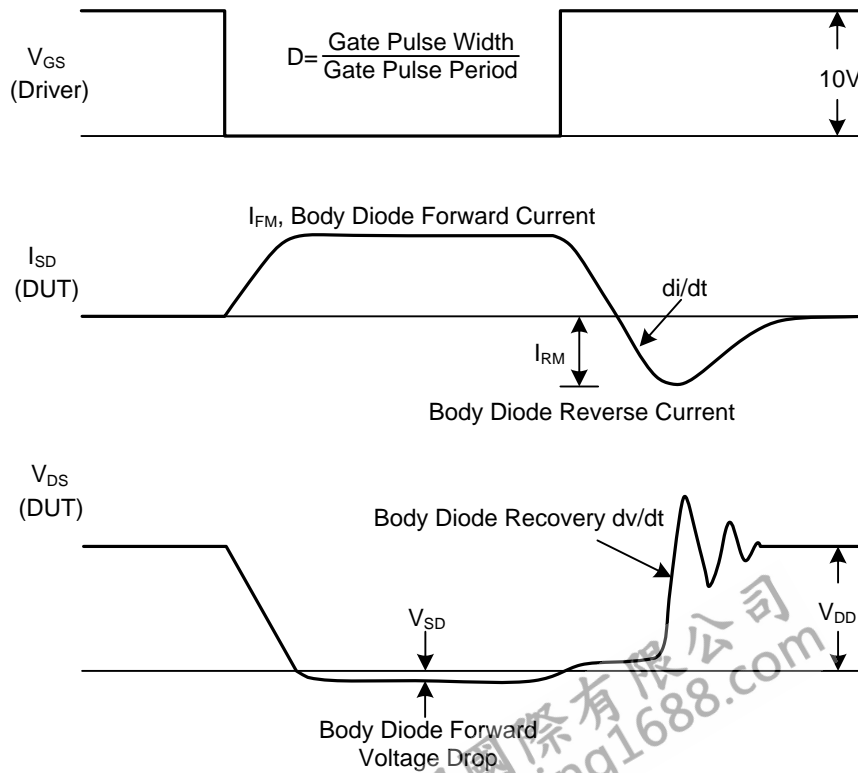
2. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

3. Essentially Independent of Operating Temperature.

## TEST CIRCUITS AND WAVEFORMS

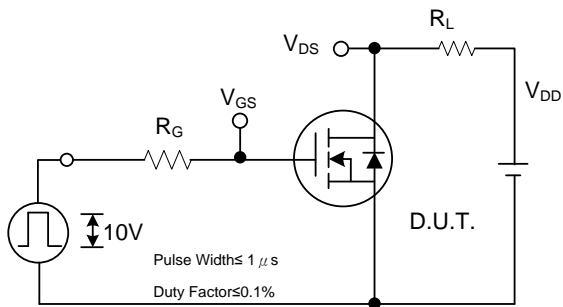


Peak Diode Recovery  $dv/dt$  Test Circuit

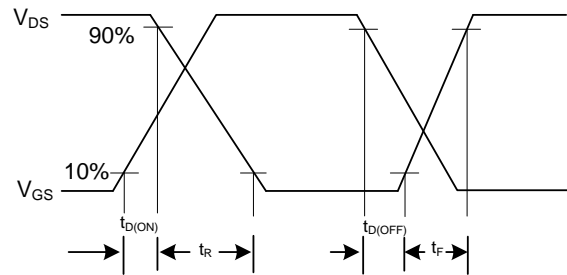


Peak Diode Recovery  $dv/dt$  Waveforms

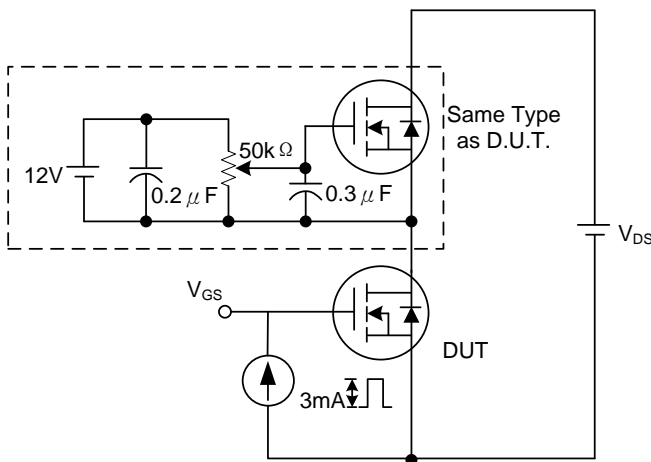
## TEST CIRCUITS AND WAVEFORMS



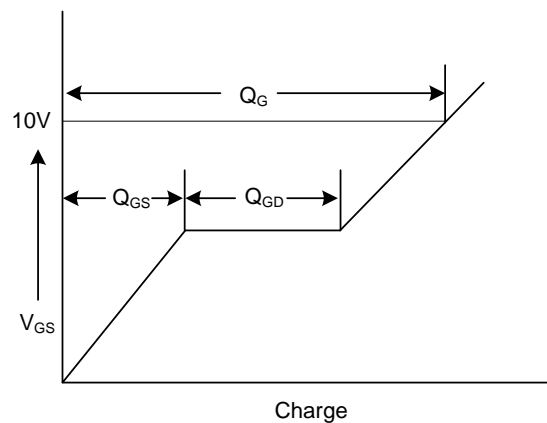
Switching Test Circuit



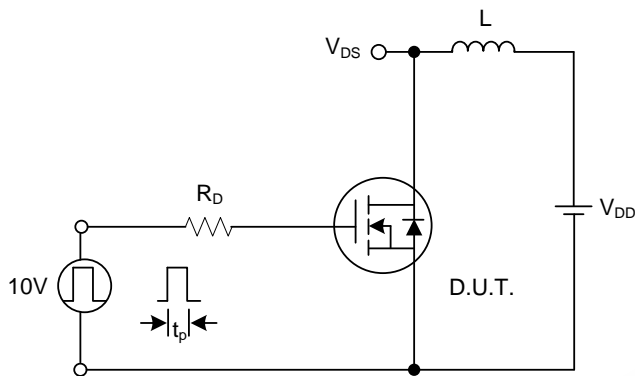
Switching Waveforms



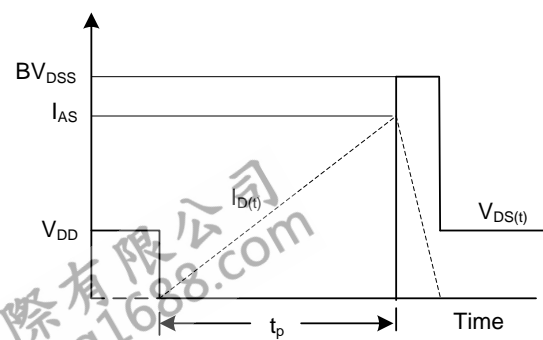
Gate Charge Test Circuit



Gate Charge Waveform

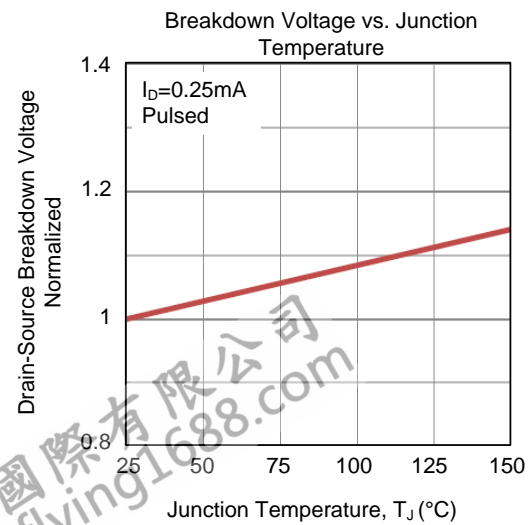
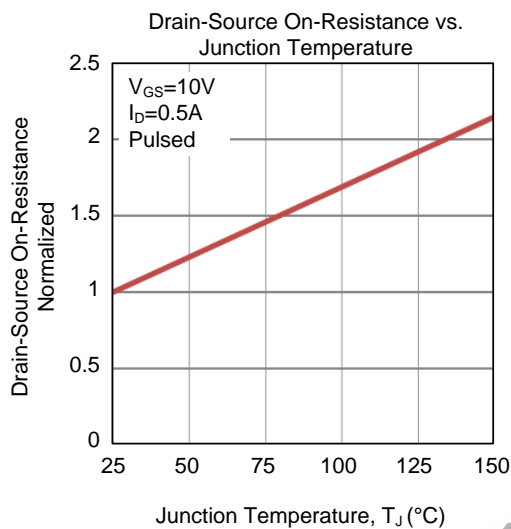
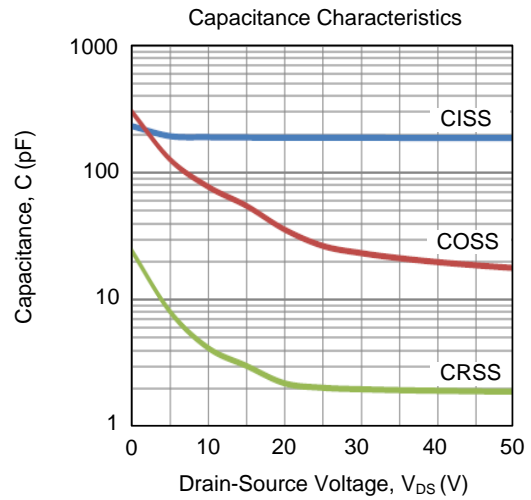
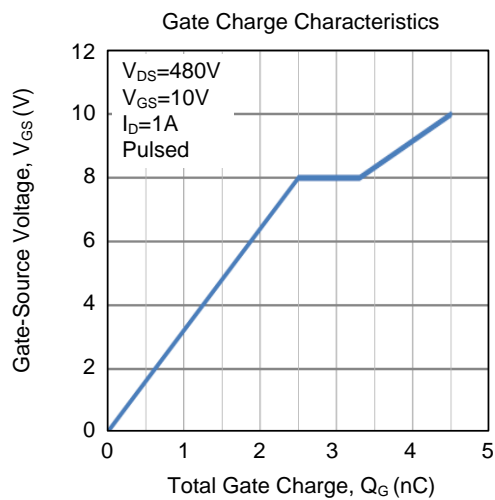
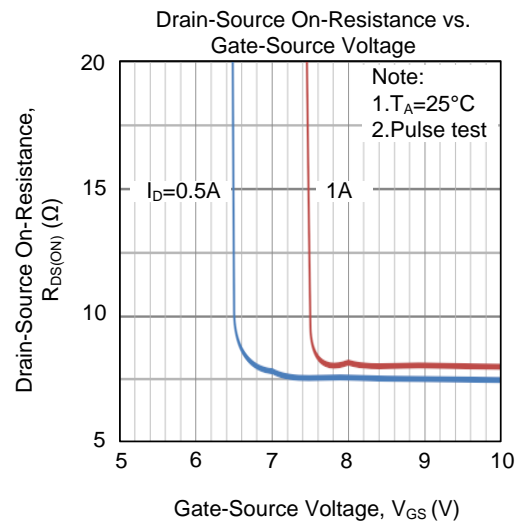
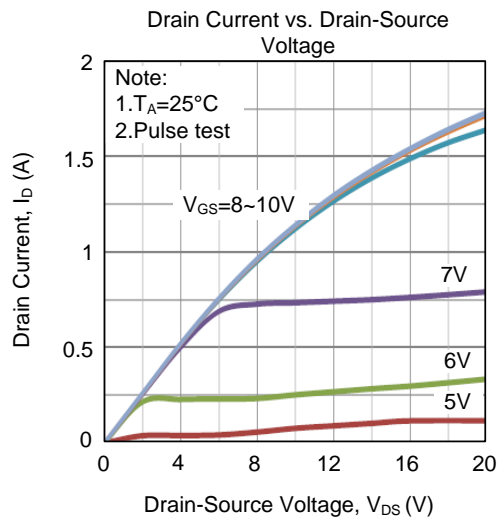


Unclamped Inductive Switching Test Circuit

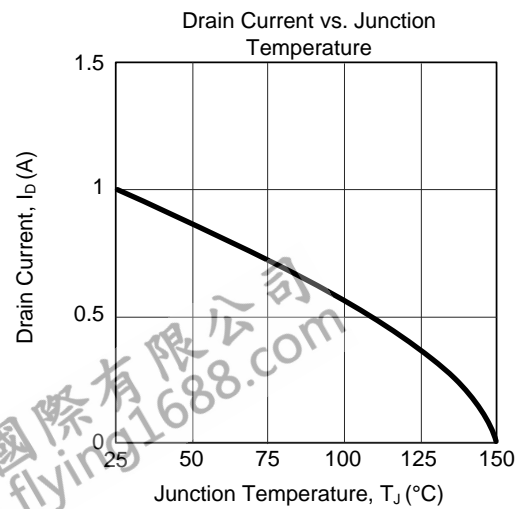
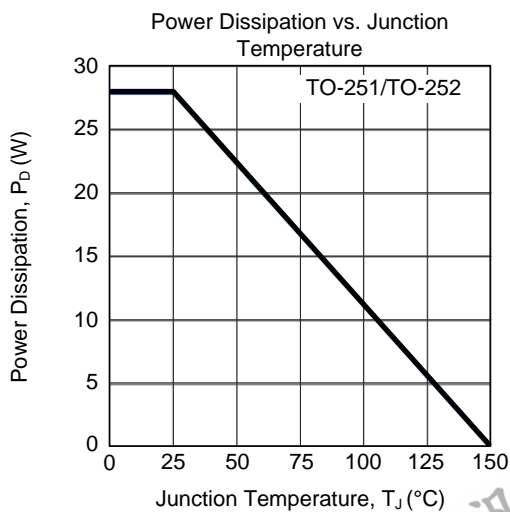
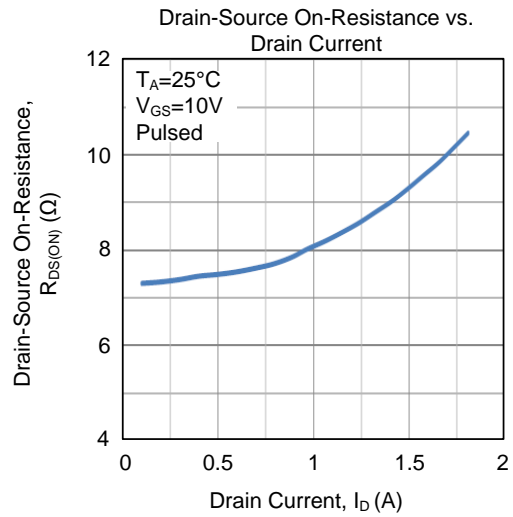
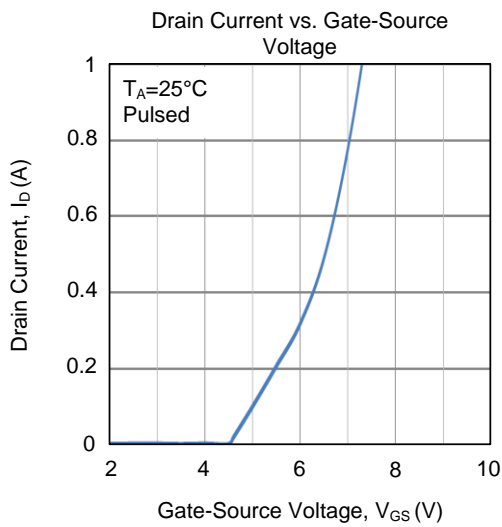
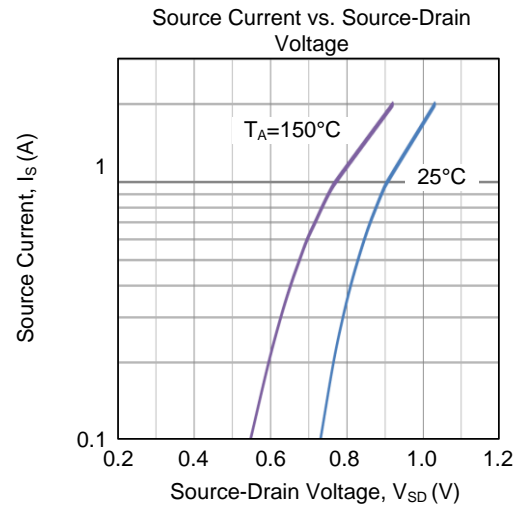
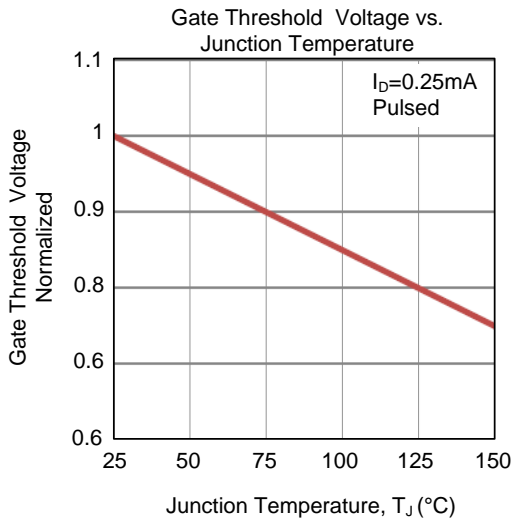


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

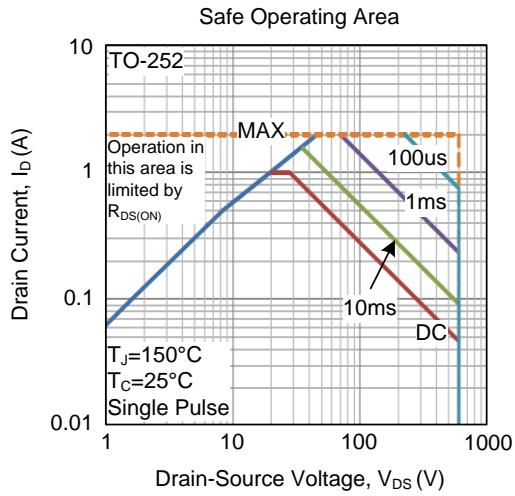


## ■ TYPICAL CHARACTERISTICS (Cont.)





## ■ TYPICAL CHARACTERISTICS (Cont.)



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