



1N60-LC1

Power MOSFET

1A, 600V N-CHANNEL POWER MOSFET

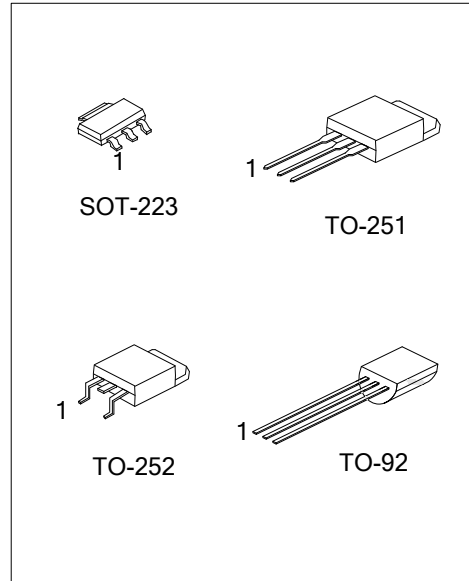
DESCRIPTION

The UTC **1N60-LC1** is an N-channel power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance and superior switching performance.

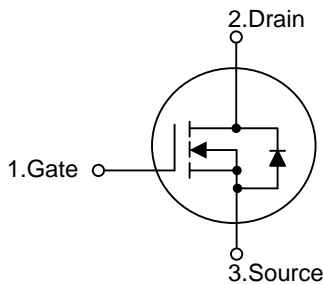
The UTC **1N60-LC1** is generally applied in low power switching mode power appliances and electronic ballast.

FEATURES

- * $R_{DS(ON)} \leq 10 \Omega$ @ $V_{GS}=10V, I_D=0.5A$
- * High Switching Speed
- * 100% Avalanche Tested



SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60L-AA3-R	1N60G-AA3-R	SOT-223	G	D	S	Tape Reel
1N60L-TM3-T	1N60G-TM3-T	TO-251	G	D	S	Tube
1N60L-TN3-R	1N60G-TN3-R	TO-252	G	D	S	Tape Reel
1N60L-T92-B	1N60G-T92-B	TO-92	G	D	S	Tape Box
1N60L-T92-K	1N60G-T92-K	TO-92	G	D	S	Bulk

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

<p>1N60G-AA3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel, B: Tape Box, K: Bulk, T: Tube</p> <p>(2) AA3: SOT-223, TM3: TO-251, TN3: TO-252, T92: TO-92</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

TO-251 / TO-252	TO-92
<p>UTC 1N60 Lot Code 1 L: Lead Free G: Halogen Free Date Code</p>	<p>UTC 1N60 Lot Code 1 L: Lead Free G: Halogen Free Date Code</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}	± 30	V
Drain Current	Continuous	I_D	1	A
	Pulsed (Note 2)	I_{DM}	2	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	11.3	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.675	V/ns
Power Dissipation	SOT-223	P_D	8	W
	TO-251/TO-252		27	W
	TO-92		2.5	W
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. $L = 10\text{mH}$, $I_{AS} = 1.5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, 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	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		100	$^\circ\text{C}/\text{W}$
	TO-92		132	$^\circ\text{C}/\text{W}$
Junction to Case (Note)	SOT-223	θ_{JC}	14	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		4.63	$^\circ\text{C}/\text{W}$
	TO-92		50	$^\circ\text{C}/\text{W}$

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

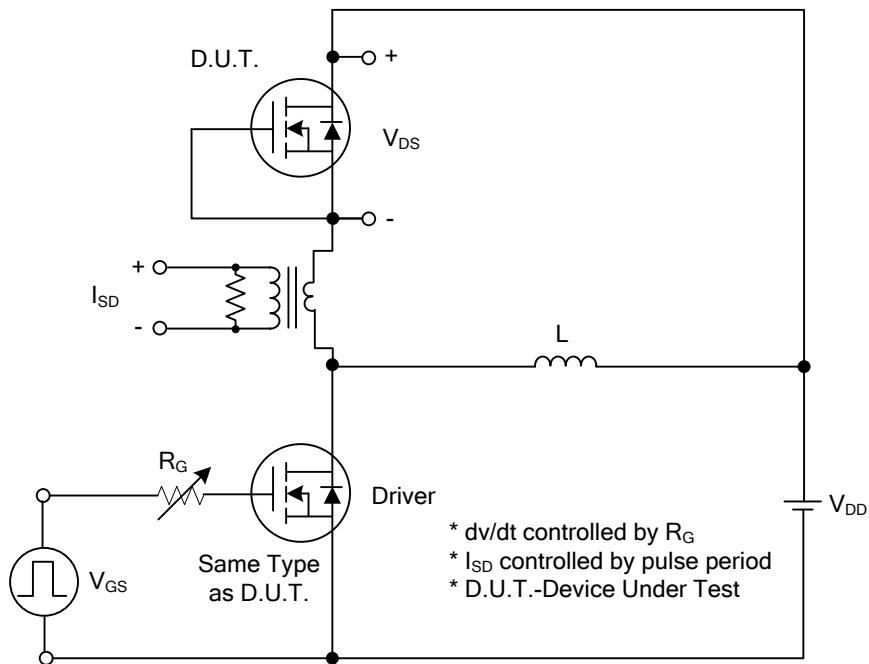
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$			10	μA
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$ $V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse				-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=0.5\text{A}$			10	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		134		pF
Output Capacitance	C_{OSS}			18		pF
Reverse Transfer Capacitance	C_{RSS}			1.9		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=480\text{V}$, $V_{GS}=10\text{V}$, $I_D=1\text{A}$ $I_G=1\text{mA}$ (Note 1, 2)		4.6		nC
Gate to Source Charge	Q_{GS}			2.3		nC
Gate to Drain Charge	Q_{GD}			0.7		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100\text{V}$, $V_{GS}=10\text{V}$, $I_D=1\text{A}$, $R_G=25\Omega$ (Note 1, 2)		2.5		ns
Rise Time	t_R			15.3		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			12.5		ns
Fall-Time	t_F			33		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				1	A
Maximum Body-Diode Pulsed Current (Note 1)	I_{SM}				2	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=1\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=1\text{A}$, $V_{GS}=0\text{V}$, $di_F/dt=100\text{A}/\mu\text{s}$		200		ns
Body Diode Reverse Recovery Charge	Q_{rr}			0.45		μC

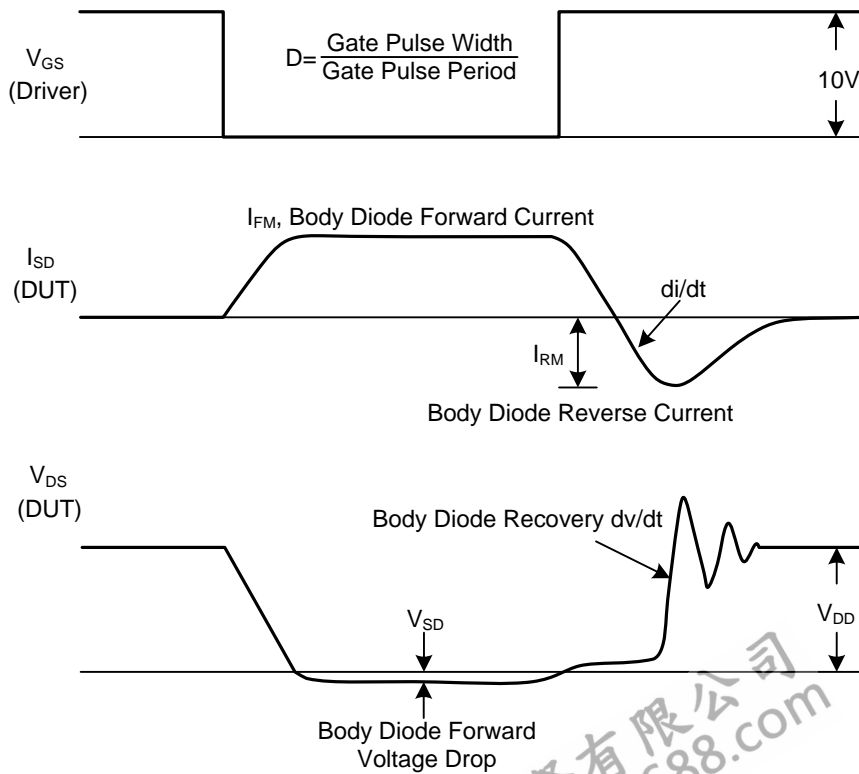
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

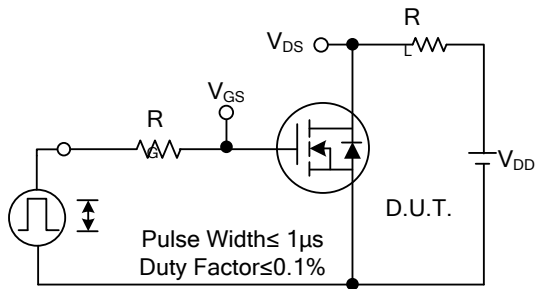


Peak Diode Recovery dv/dt Test Circuit

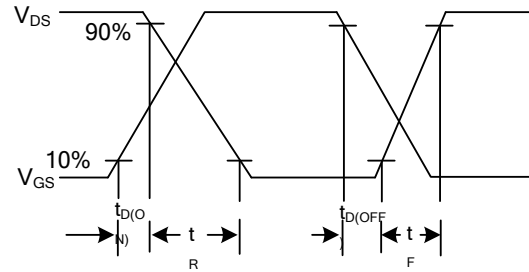


Peak Diode Recovery dv/dt Waveforms

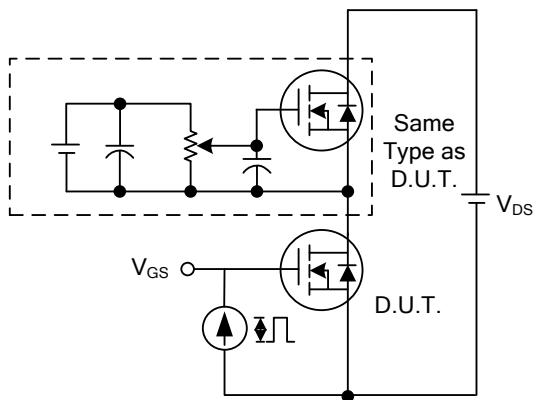
TEST CIRCUITS AND WAVEFORMS



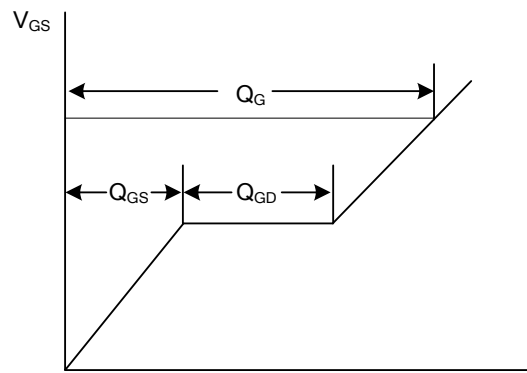
Switching Test Circuit



Switching Waveforms

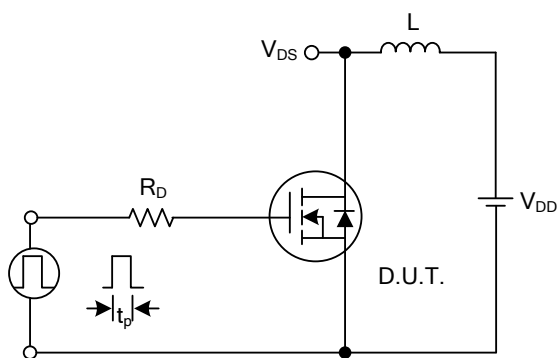


Gate Charge Test Circuit

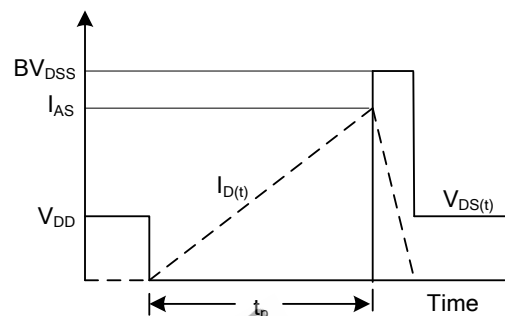


Charge

Gate Charge Waveform

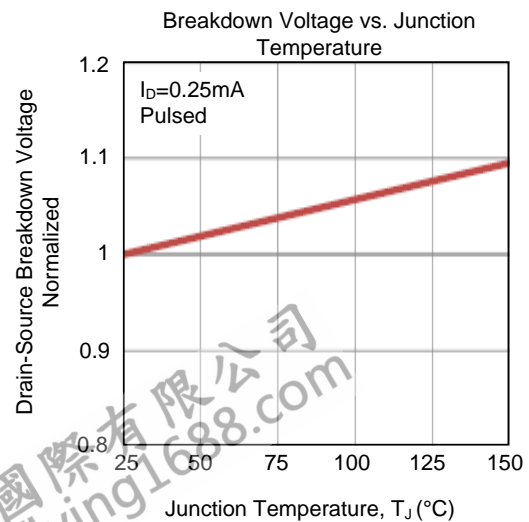
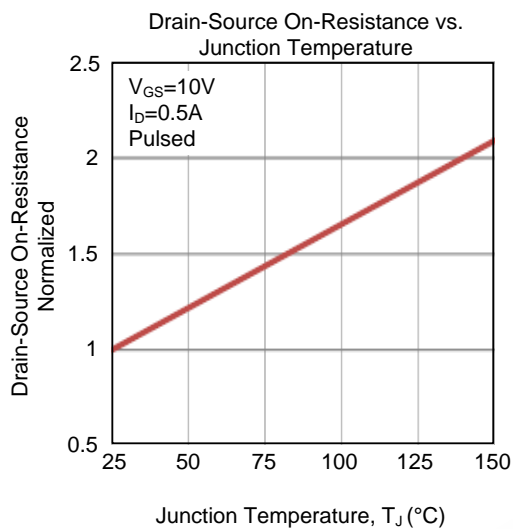
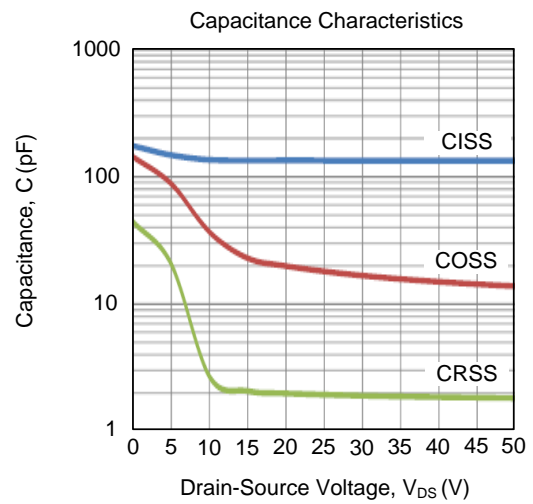
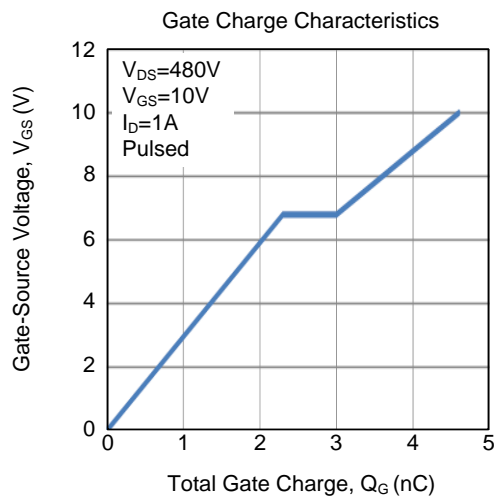
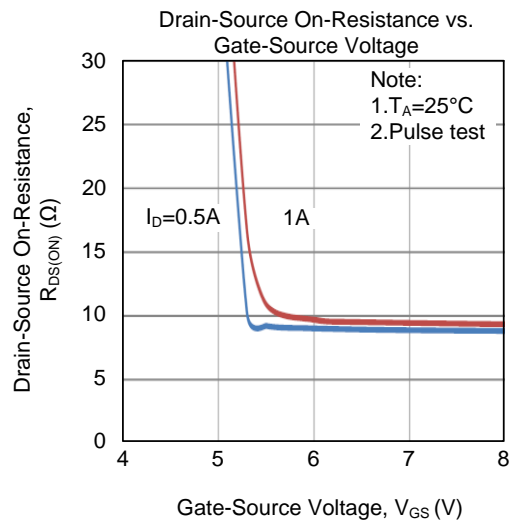
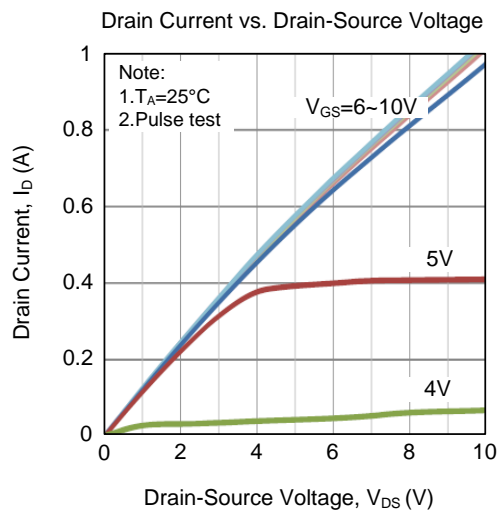


Unclamped Inductive Switching Test Circuit

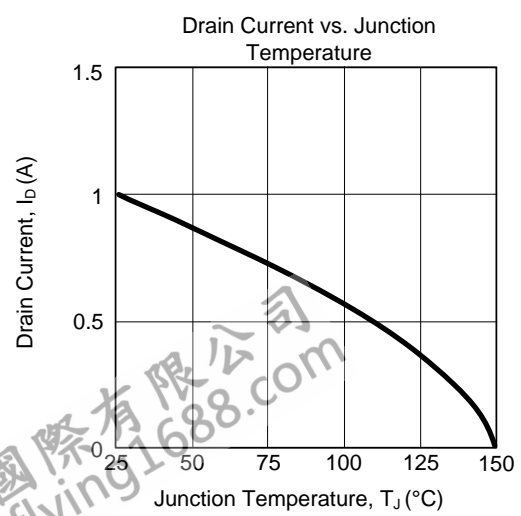
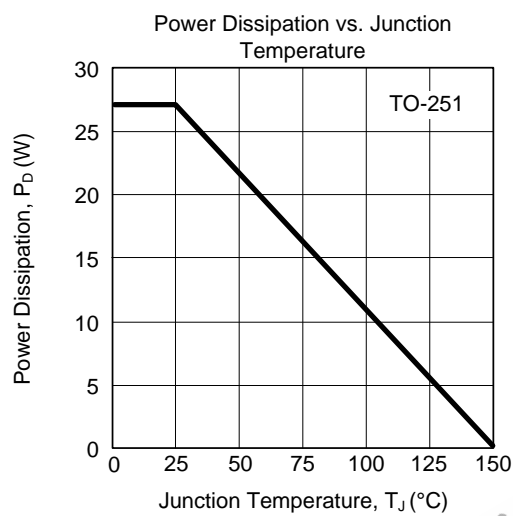
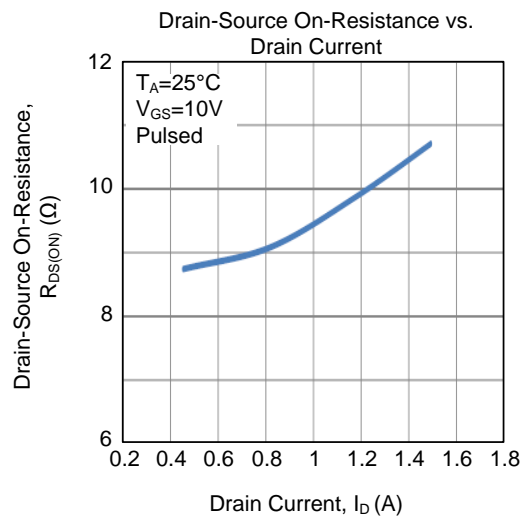
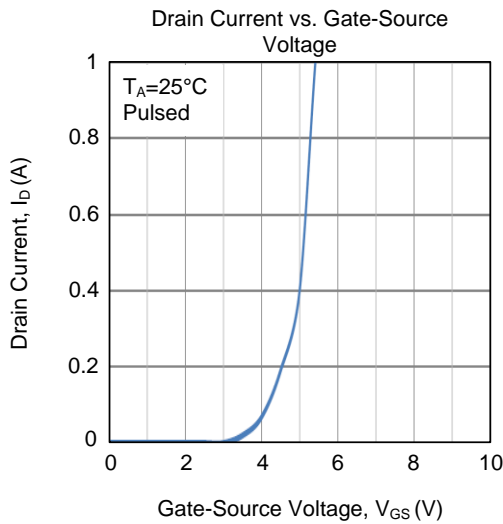
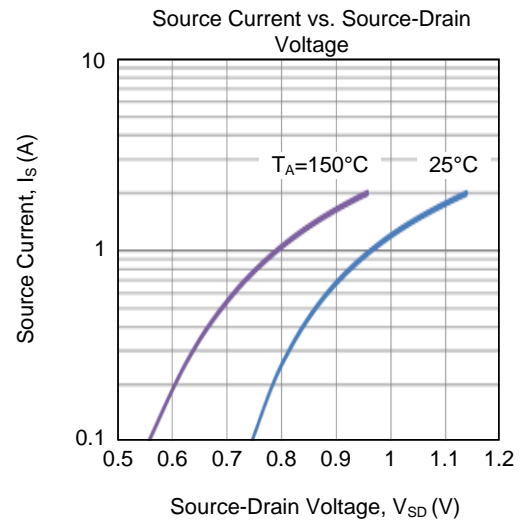
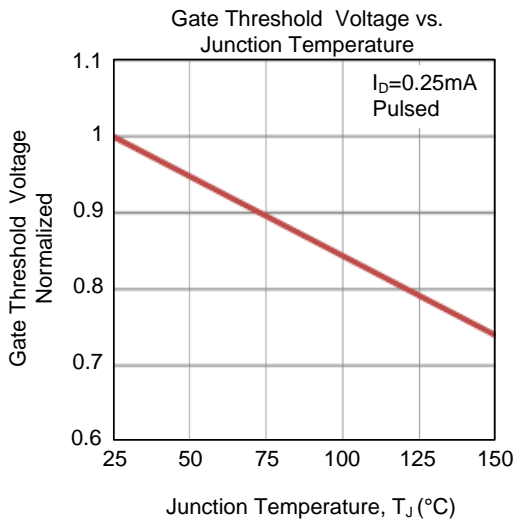


Unclamped Inductive Switching Waveforms

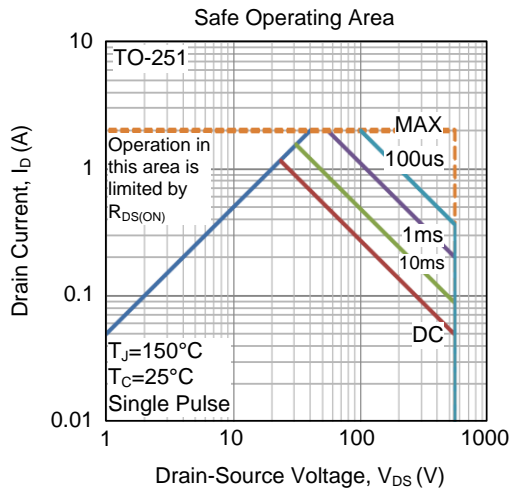
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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