

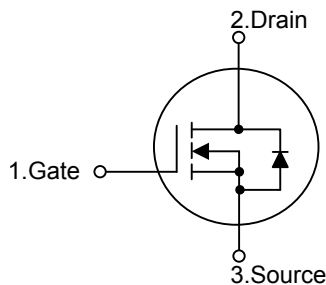
**1N60-LC1****Power MOSFET****1.0A, 600V N-CHANNEL
POWER MOSFET****DESCRIPTION**

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

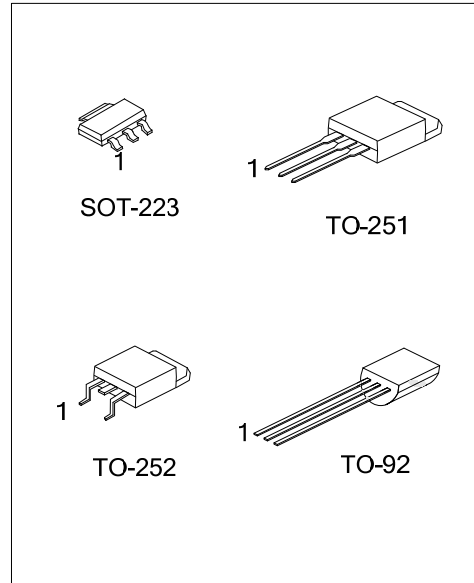
- * $R_{DS(ON)} \leq 11 \Omega$ @ $V_{GS}=10V$, $I_D=0.5A$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL**ORDERING INFORMATION**

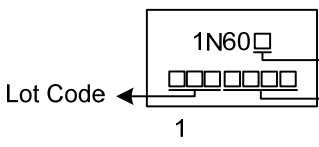
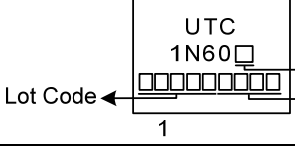
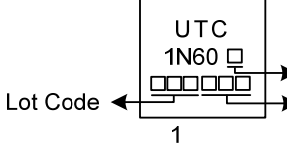
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60L-AA3-R	1N60G-AA3-R	SOT-223	G	D	S	Tape Reel
1N60L-TM3-T	1N60G-TM3-T	TO-251	G	D	S	Tube
1N60L-TN3-R	1N60G-TN3-R	TO-252	G	D	S	Tape Reel
1N60L-T92-B	1N60G-T92-B	TO-92	G	D	S	Tape Box
1N60L-T92-K	1N60G-T92-K	TO-92	G	D	S	Bulk

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

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

PACKAGE	MARKING
SOT-223	 Lot Code → 1N60 → Date Code 1 L: Lead Free G: Halogen Free
TO-251 / TO-252	 Lot Code → UTC 1N60 → Date Code 1 L: Lead Free G: Halogen Free
TO-92	 Lot Code → UTC 1N60 → Date Code 1 L: Lead Free G: Halogen Free

■ **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.

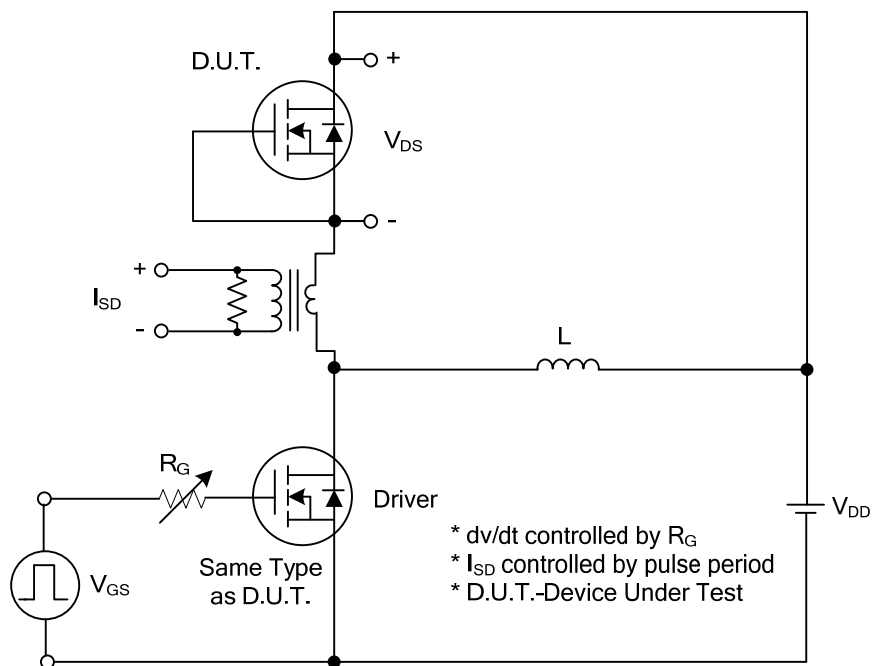
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =0.5A			11	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		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} =480V, V _{GS} =10V, I _D =1A I _G =1mA (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} =100V, V _{GS} =10V, I _D =1A, R _G =25Ω (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 =1A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =1A, V _{GS} =0V,		200		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs		0.45		μC

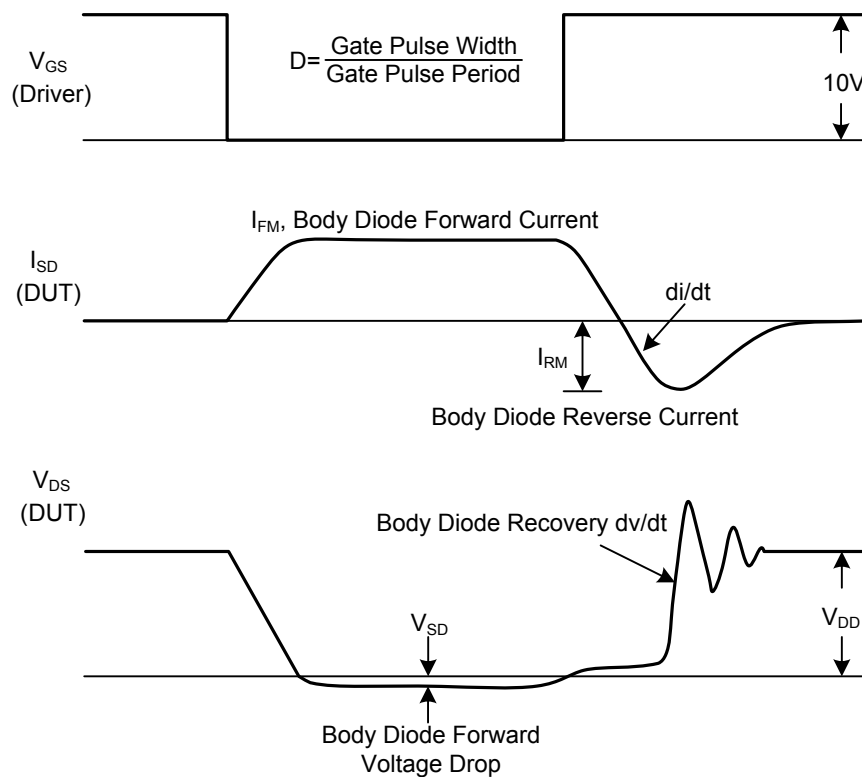
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

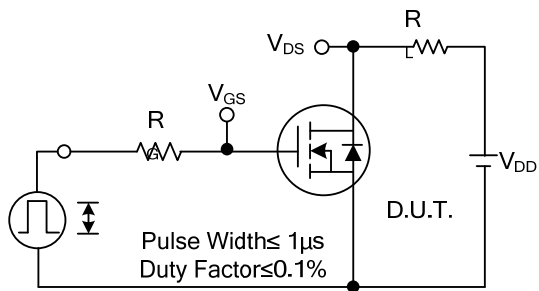


Peak Diode Recovery dv/dt Test Circuit

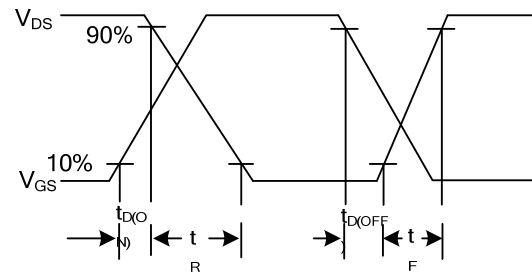


Peak Diode Recovery dv/dt Waveforms

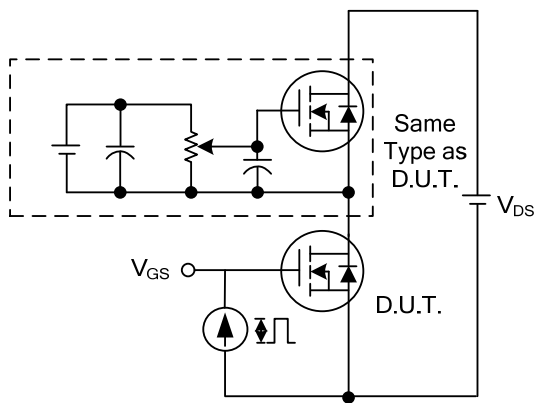
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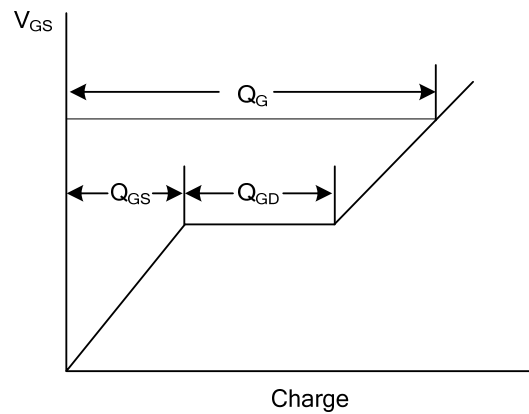
Switching Test Circuit



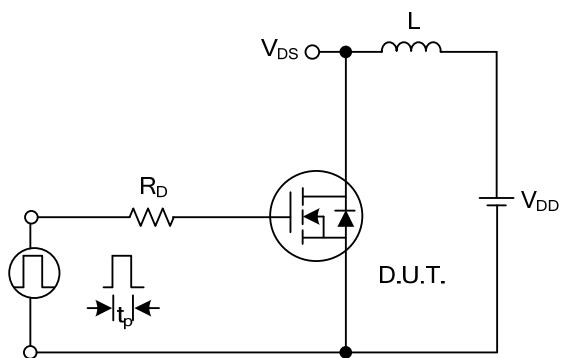
Switching Waveforms



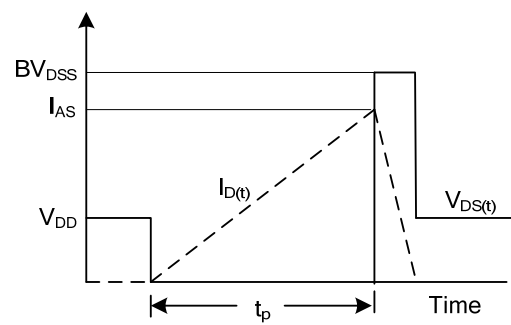
Gate Charge Test Circuit



Gate Charge Waveform

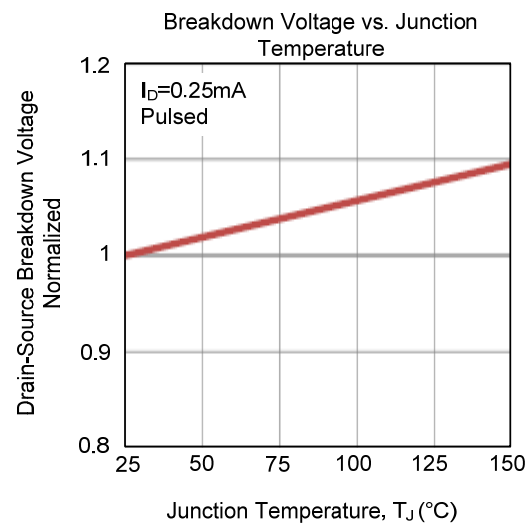
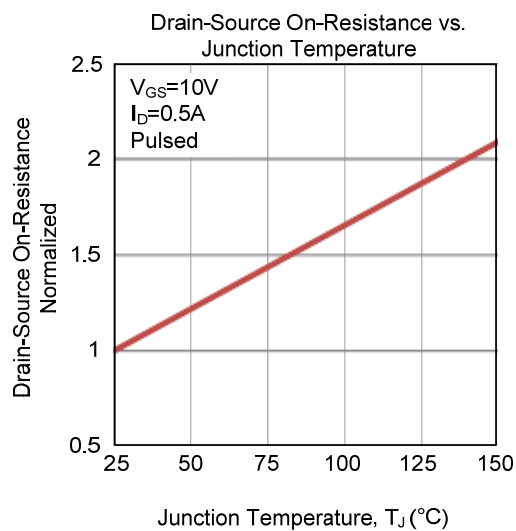
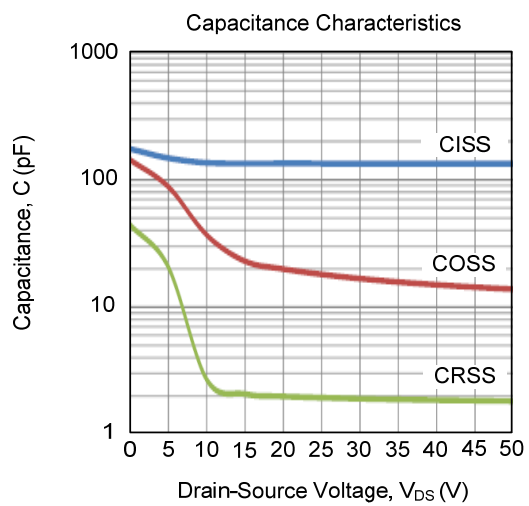
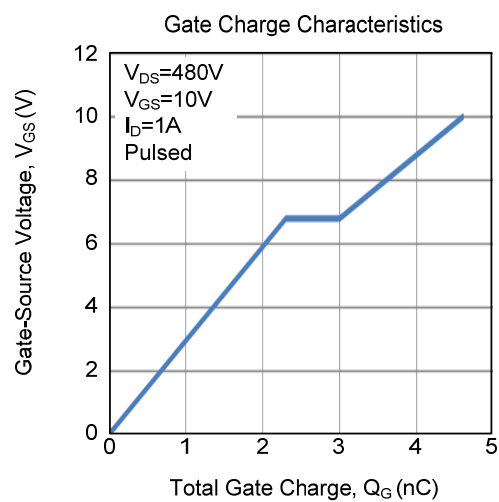
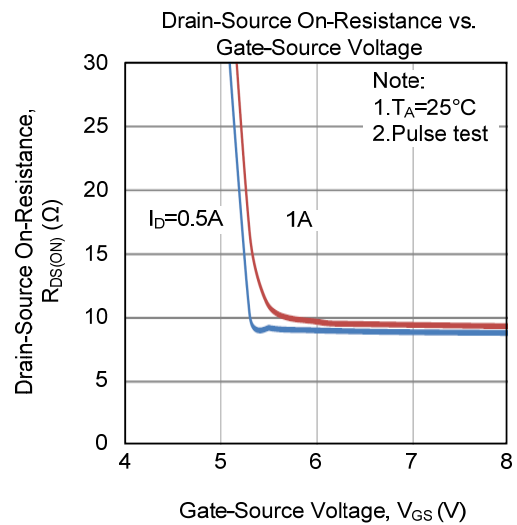
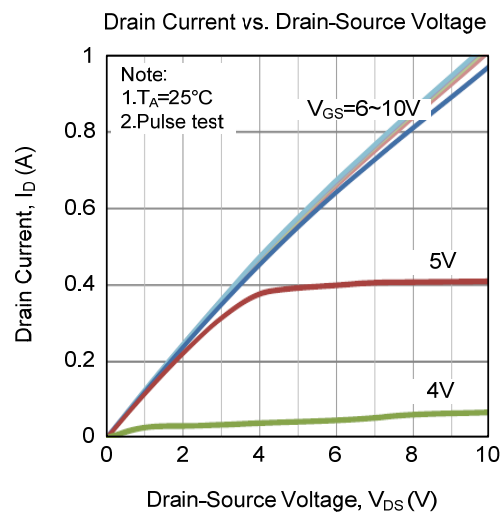


Unclamped Inductive Switching Test Circuit

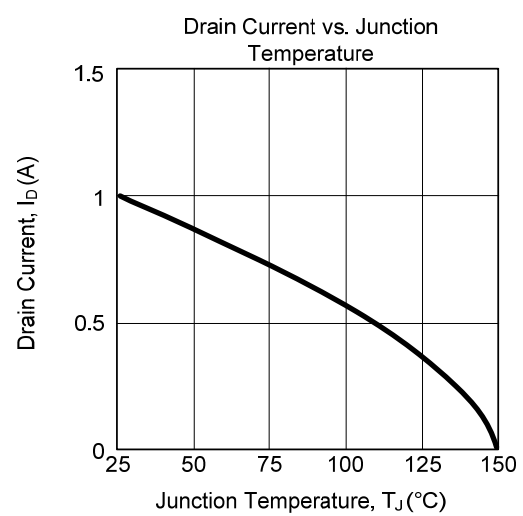
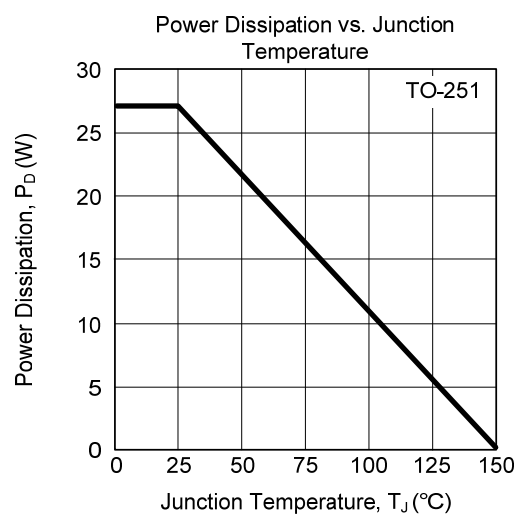
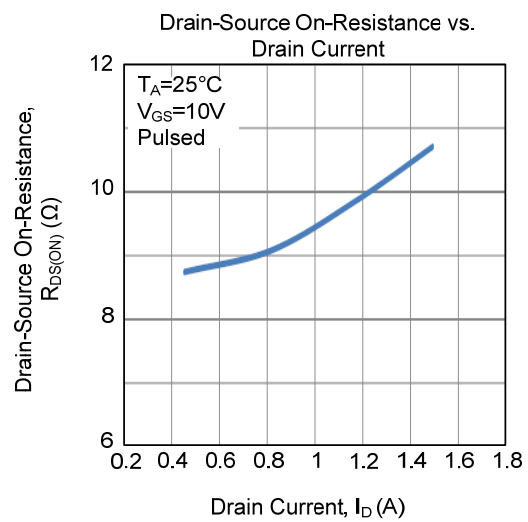
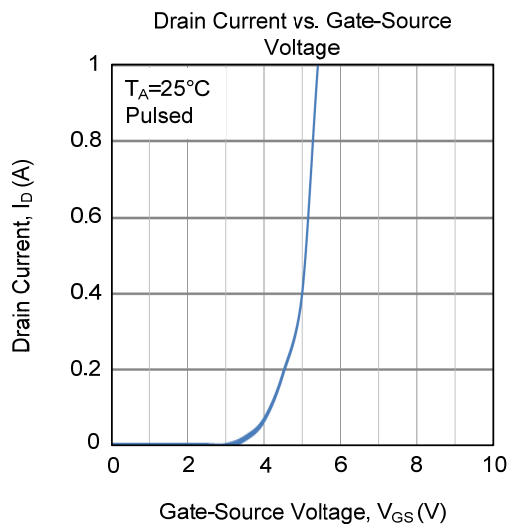
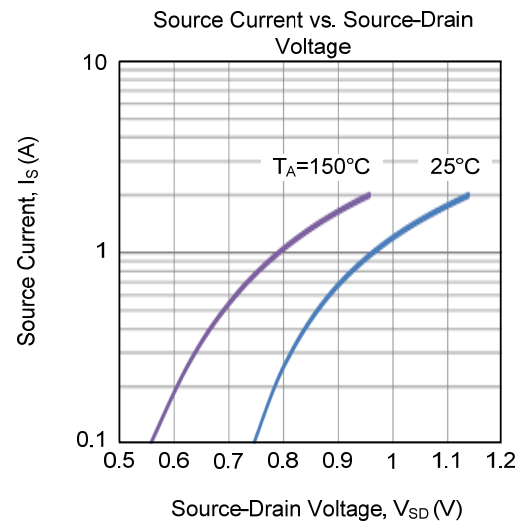
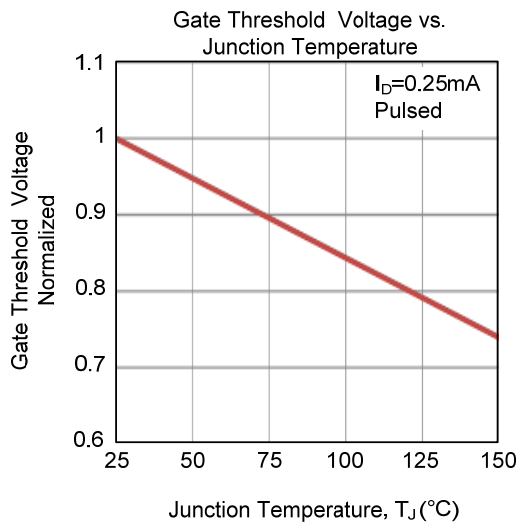


Unclamped Inductive Switching Waveforms

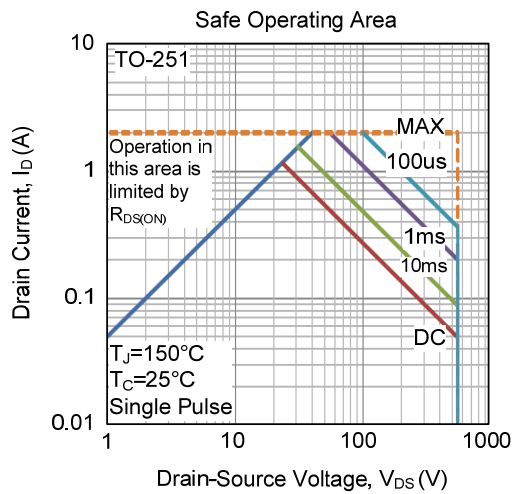
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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