



2N50Q-TA

Power MOSFET

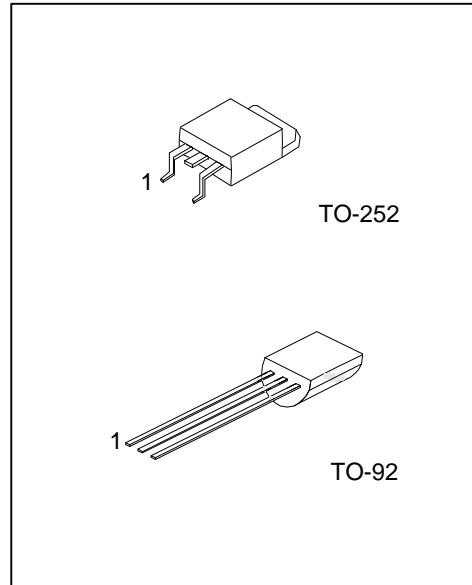
2A, 500V N-CHANNEL POWER MOSFET

DESCRIPTION

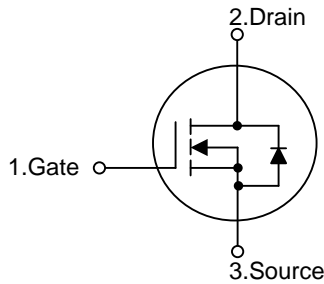
The UTC **2N50Q-TA** is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 5.5\Omega$ @ $V_{GS}=10V, I_D=1.0A$
- * High Switching Speed
- * 100% Avalanche Tested



SYMBOL



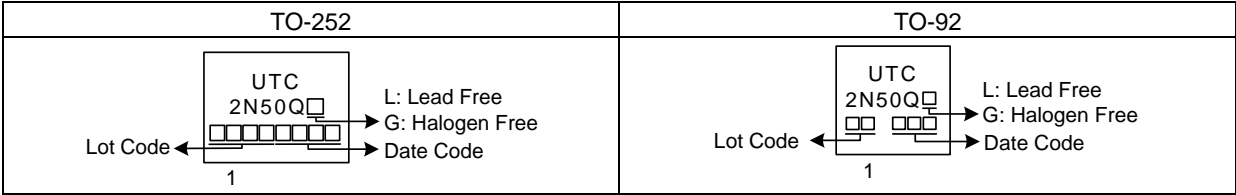
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N50QL-TN3-R	2N50QG-TN3-R	TO-252	G	D	S	Tape Reel
2N50QL-T92-B	2N50QG-T92-B	TO-92	G	D	S	Tape Box
2N50QL-T92-K	2N50QG-T92-K	TO-92	G	D	S	Bulk

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

<p>2N50QG-TN3-R</p>	<p>(1) R: Tape Reel, B: Tape Box, K: Bulk</p> <p>(2) TN3: TO-252, T92: TO-92</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ **ABSOLUTE MAXIMUM RATINGS** ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	2	A
	Pulsed (Note 2)	I_{DM}	4	A
Avalanche Current (Note 2)		I_{AR}	1.4	A
Avalanche Energy (Note 3)	Single Pulsed	E_{AS}	40	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.4	V/ns
Power Dissipation	TO-252	P_D	30	W
	TO-92		1.42	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. $L=41\text{mH}$, $I_{AS}=1.4\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, 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	TO-252	θ_{JA}	110	$^\circ\text{C}/\text{W}$
	TO-92		60	$^\circ\text{C}/\text{W}$
Junction to Case	TO-252	θ_{JC}	4.17 (Note)	$^\circ\text{C}/\text{W}$
	TO-92		88	$^\circ\text{C}/\text{W}$

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

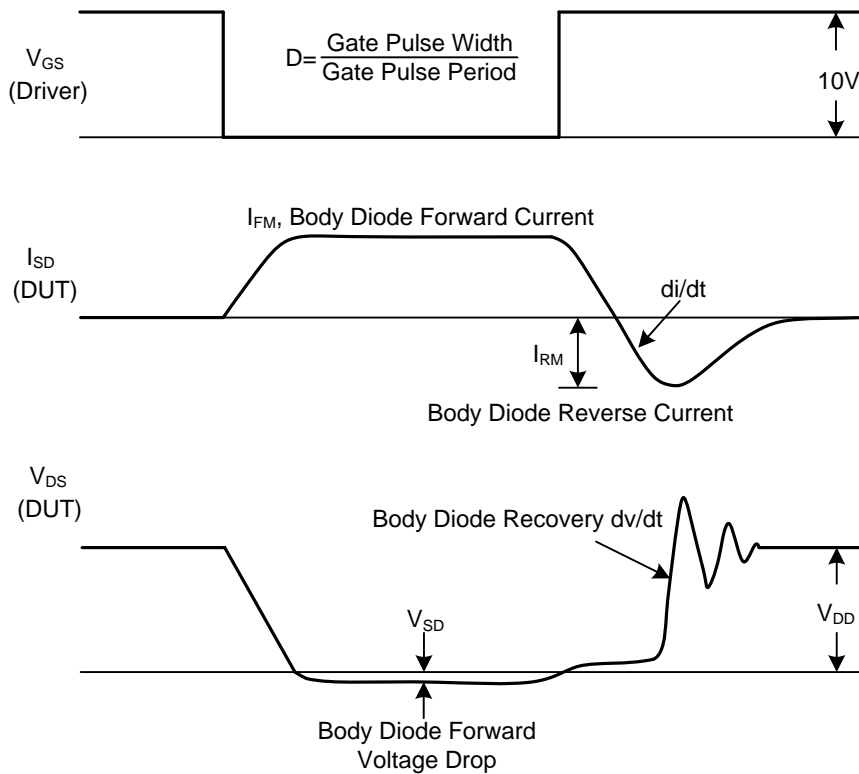
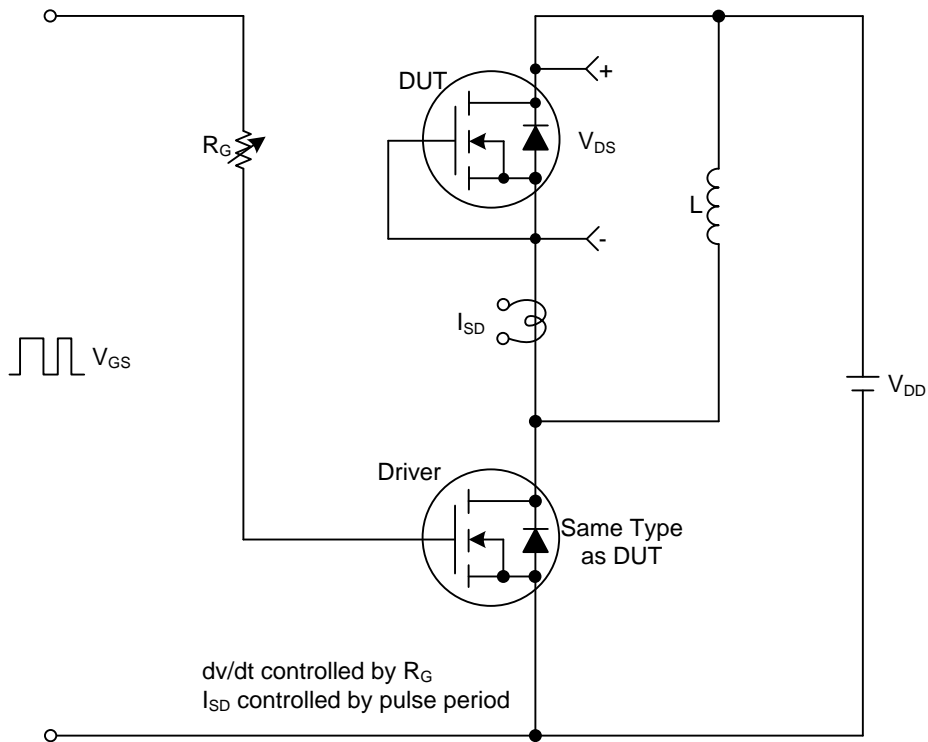
■ **ELECTRICAL CHARACTERISTICS** ($T_C=25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	500			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=500\text{V}$, $V_{GS}=0\text{V}$			10	μA
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=1.0\text{A}$			5.5	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		140		pF
Output Capacitance	C_{OSS}			22		pF
Reverse Transfer Capacitance	C_{RSS}			3		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DS}=400\text{V}$, $V_{GS}=10\text{V}$, $I_D=2\text{A}$, $I_G=1\text{mA}$ (Note 1, 2)		4.9		nC
Gate to Source Charge	Q_{GS}			2.3		nC
Gate to Drain Charge	Q_{GD}			0.8		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=100\text{V}$, $V_{GS}=1.0\text{V}$, $I_D=2\text{A}$, $R_G=25\Omega$ (Note 1, 2)		4		ns
Rise Time	t_R			15		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			12		ns
Fall-Time	t_F			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				2	A
Maximum Body-Diode Pulsed Current	I_{SM}				4	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=2.0\text{A}$, $V_{GS}=0\text{V}$			1.2	V
Reverse Recovery Time	t_{RR}	$V_{GS}=0\text{V}$, $I_{SD}=2.0\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		280		ns
Reverse Recovery Charge	Q_{RR}			0.58		μC

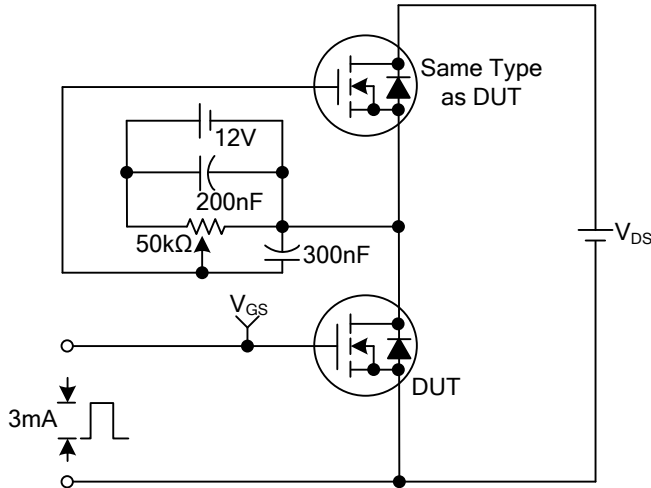
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

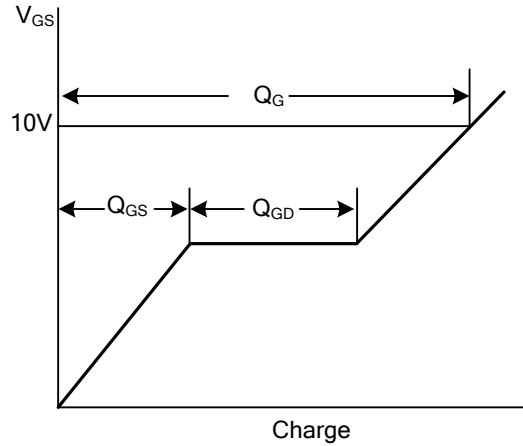
■ TEST CIRCUITS AND WAVEFORMS



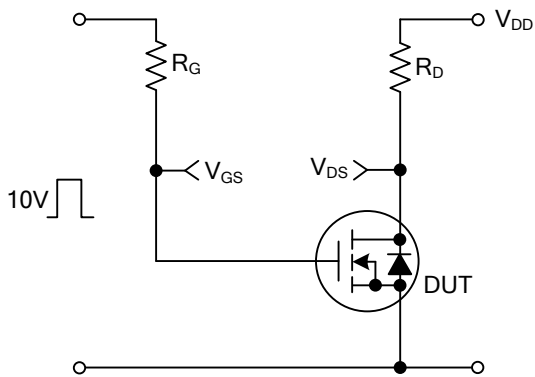
TEST CIRCUITS AND WAVEFORMS



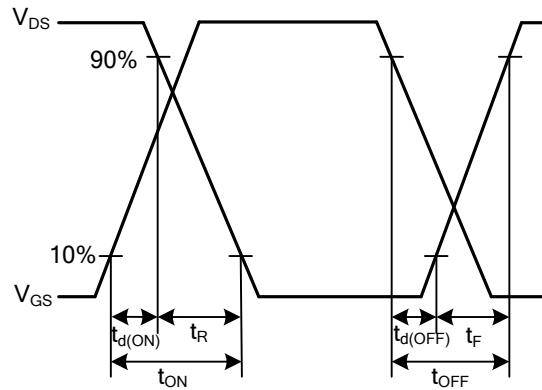
Gate Charge Test Circuit



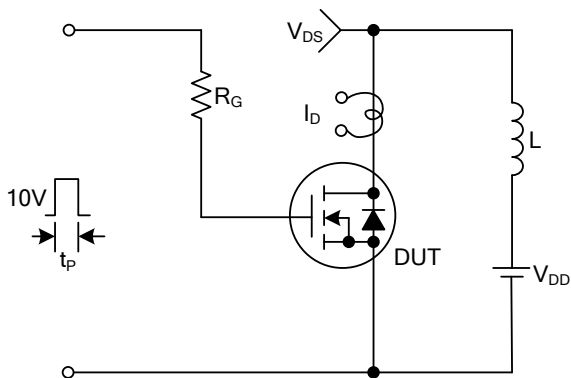
Gate Charge Waveforms



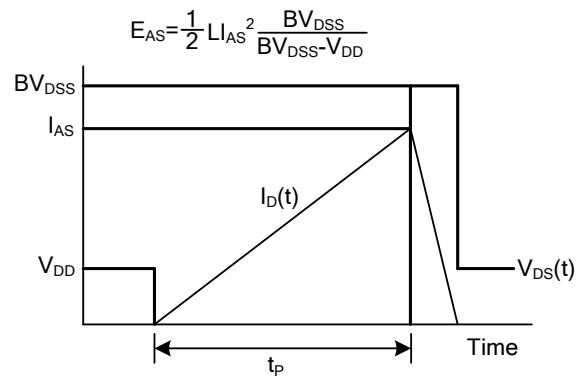
Resistive Switching Test Circuit



Resistive Switching Waveforms

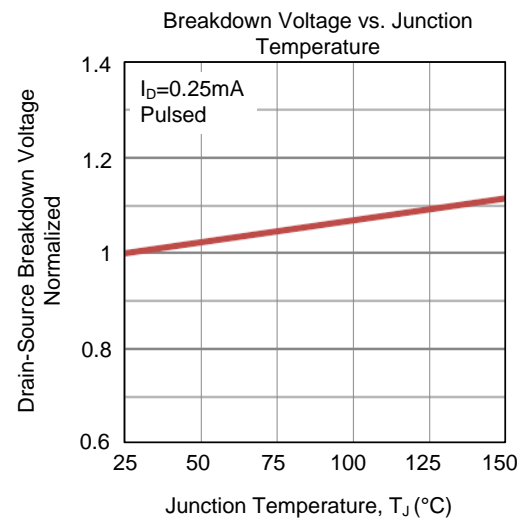
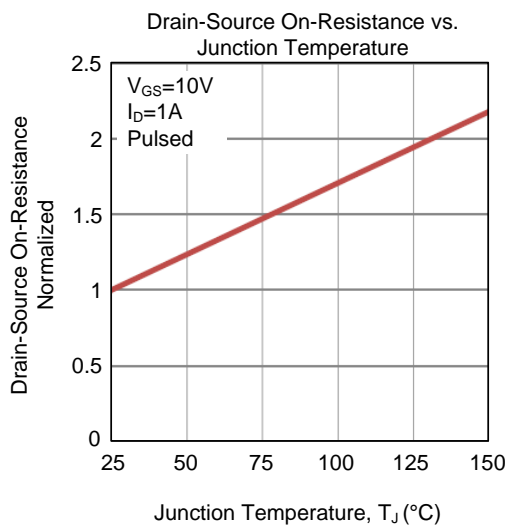
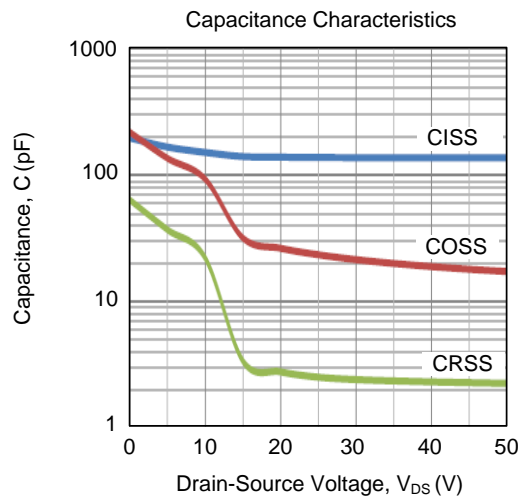
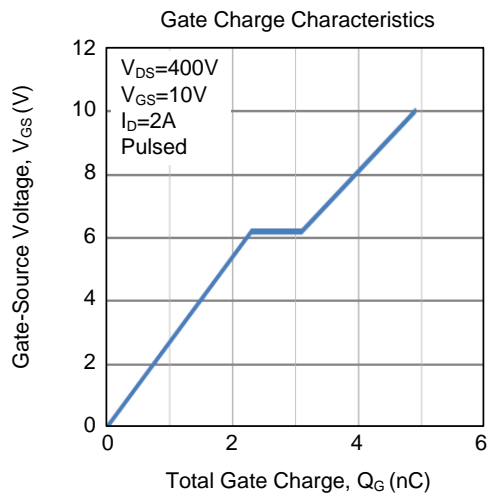
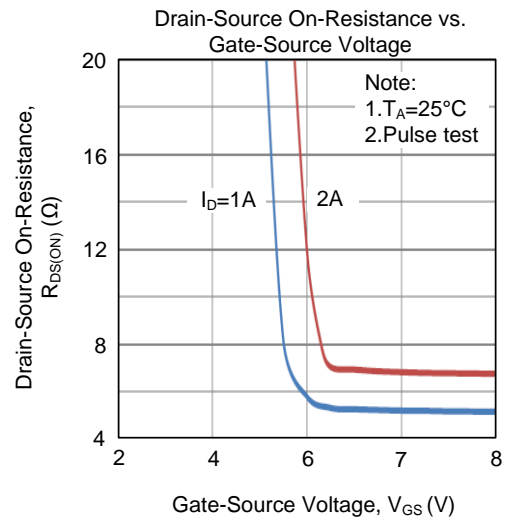
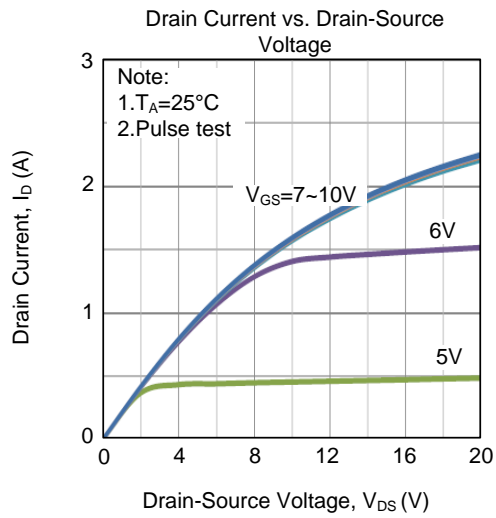


Unclamped Inductive Switching Test Circuit

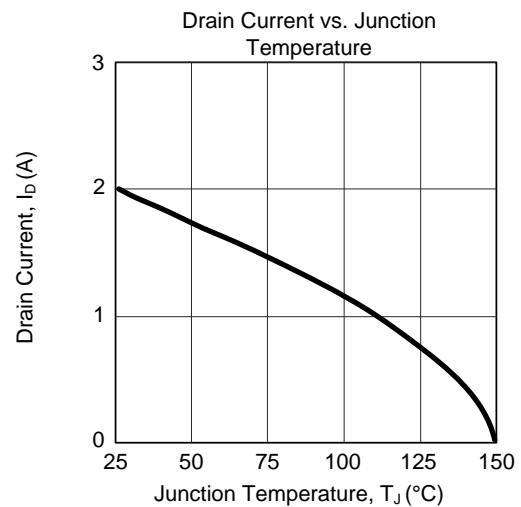
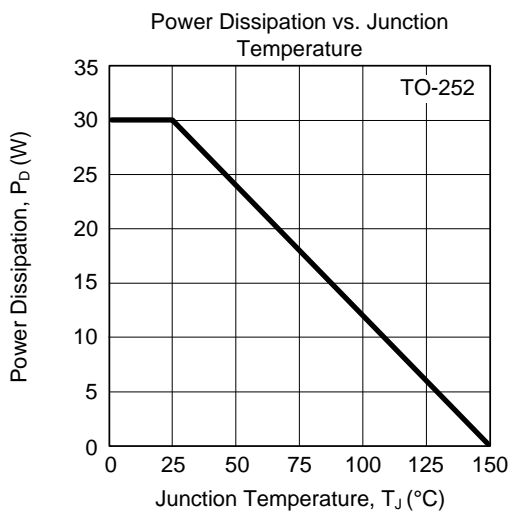
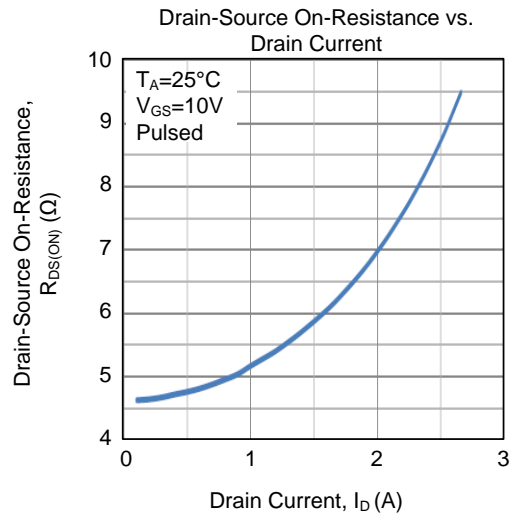
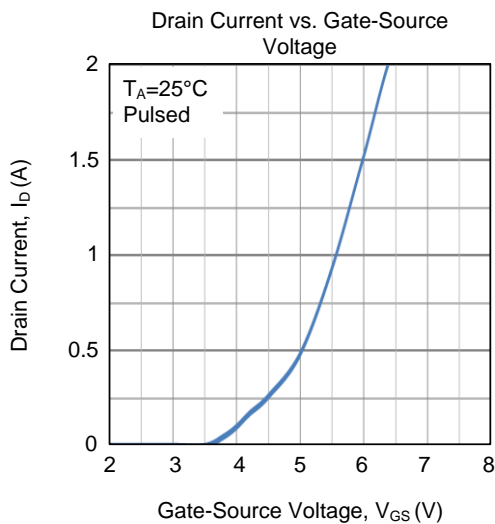
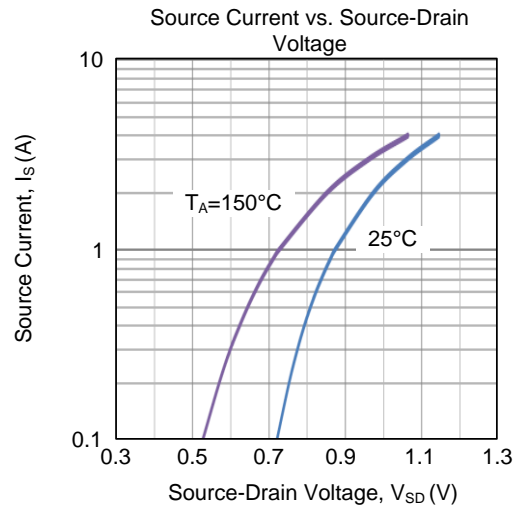
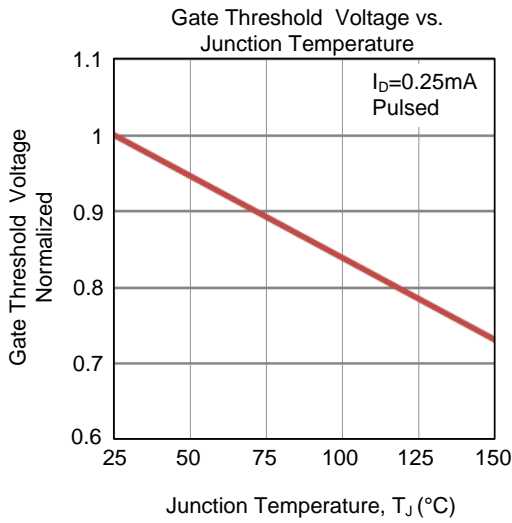


Unclamped Inductive Switching Waveforms

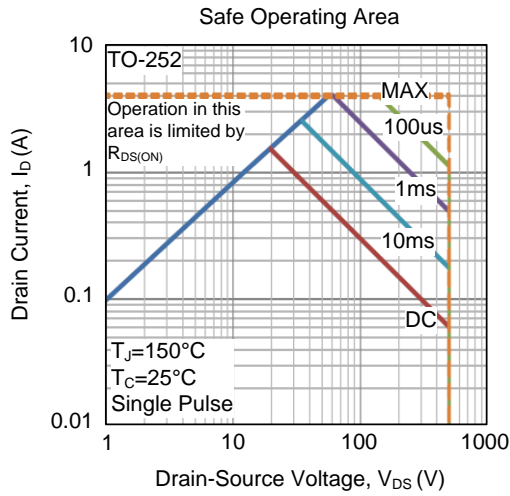
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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