



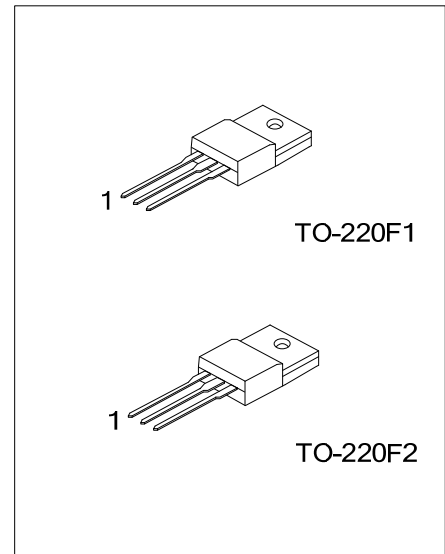
# 14N60-MH

*Power MOSFET*

## 14A, 600V N-CHANNEL POWER MOSFET

■ DESCRIPTION

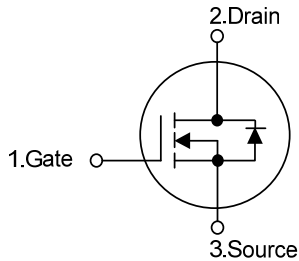
The UTC **14N60-MH** is a high voltage power MOSFET combines advanced planar MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.



■ FEATURES

- \*  $R_{DS(ON)} \leq 0.6 \Omega @ V_{GS}=10V, I_D=7.0A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL



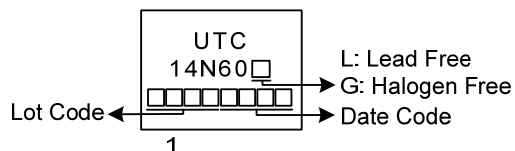
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
14N60L-TF1-T	14N60G-TF1-T	TO-220F1	G	D	S	Tube
14N60L-TF2-T	14N60G-TF2-T	TO-220F2	G	D	S	Tube

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

<p>14N60G-TF1-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TF1: TO-220F1, TF2: TO-220F2</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	$V_{DSS}$	600	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	14	A
Pulsed Drain Current (Note 2)	$I_{DM}$	28	A
Avalanche Energy	Single Pulsed (Note 3) $E_{AS}$	359	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.2	V/ns
Power Dissipation	$P_D$	40	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.  $L = 1.0\text{mH}$ ,  $I_{AS} = 26.8\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 14\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	3.12	$^\circ\text{C}/\text{W}$

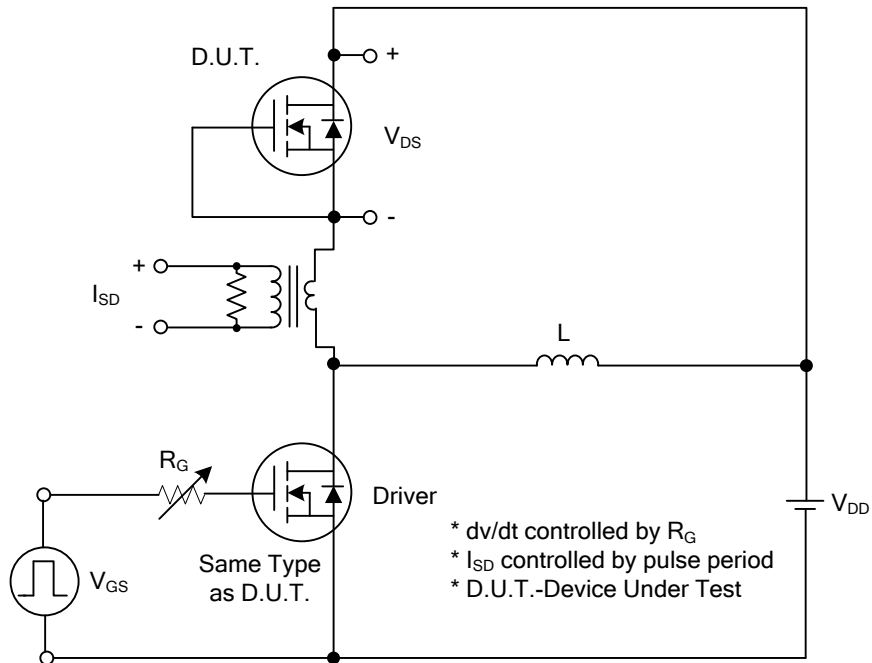
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$	600			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=600\text{V}$ , $V_{GS}=0\text{V}$			10	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$ $V_{GS}=30\text{V}$ , $V_{DS}=0\text{V}$			100	nA
	Reverse				-100	nA
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=7.0\text{A}$			0.6	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1.0\text{MHz}$		1900		pF
Output Capacitance	$C_{OSS}$			185		pF
Reverse Transfer Capacitance	$C_{RSS}$			15		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=480\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=14\text{A}$ $I_G=1\text{mA}$ (Note 1, 2)		45		nC
Gate-Source Charge	$Q_{GS}$			10		nC
Gate-Drain Charge	$Q_{GD}$			14		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=100\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=14\text{A}$ , $R_G=25\ \Omega$ (Note 1, 2)		28		ns
Turn-On Rise Time	$t_R$			26		ns
Turn-Off Delay Time	$t_{D(OFF)}$			135		ns
Turn-Off Fall Time	$t_F$			38		ns
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Maximum Body-Diode Continuous Current	$I_S$				14	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				28	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=14\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=14\text{A}$ , $V_{GS}=0\text{V}$ $di/dt=100\text{A}/\mu\text{s}$		410		ns
Reverse Recovery Charge	$Q_{rr}$			13		$\mu\text{C}$

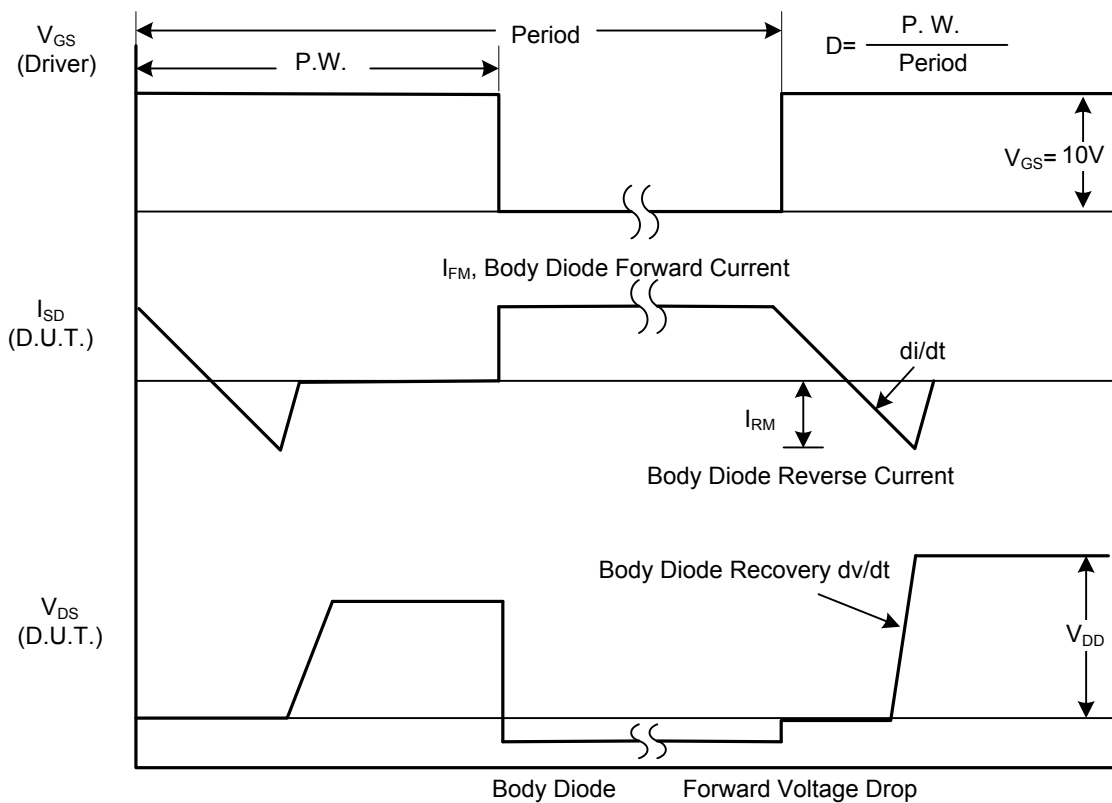
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

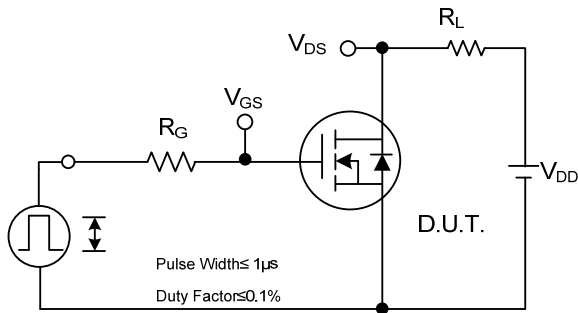


**Peak Diode Recovery  $dv/dt$  Test Circuit**

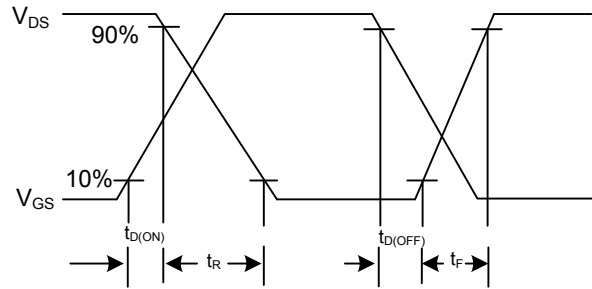


**Peak Diode Recovery  $dv/dt$  Waveforms**

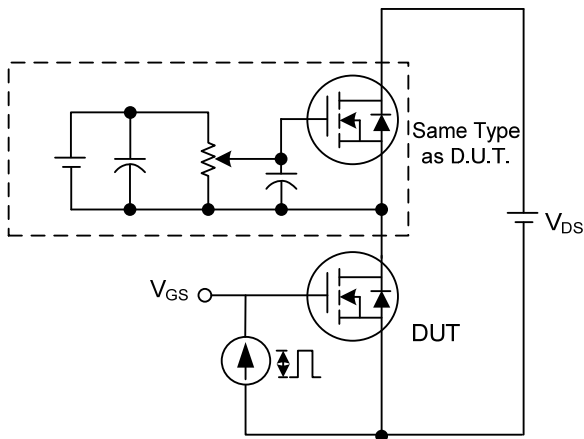
## TEST CIRCUITS AND WAVEFORMS



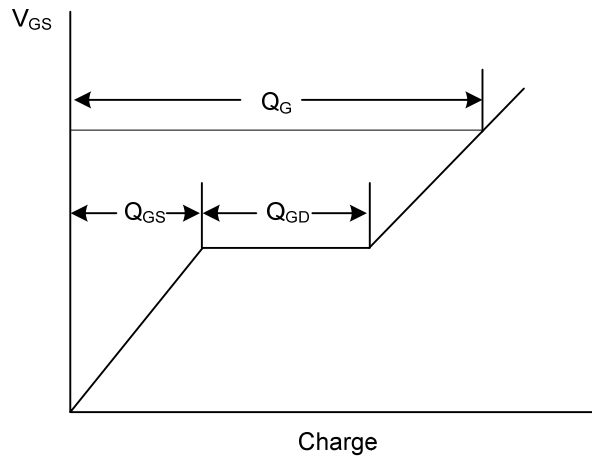
**Switching Test Circuit**



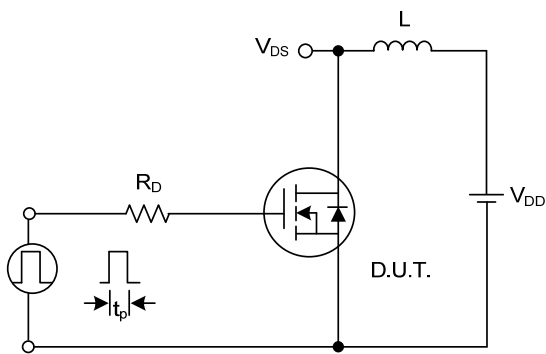
**Switching Waveforms**



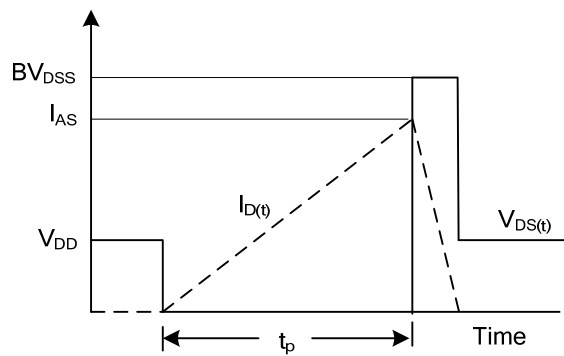
**Gate Charge Test Circuit**



**Gate Charge Waveform**

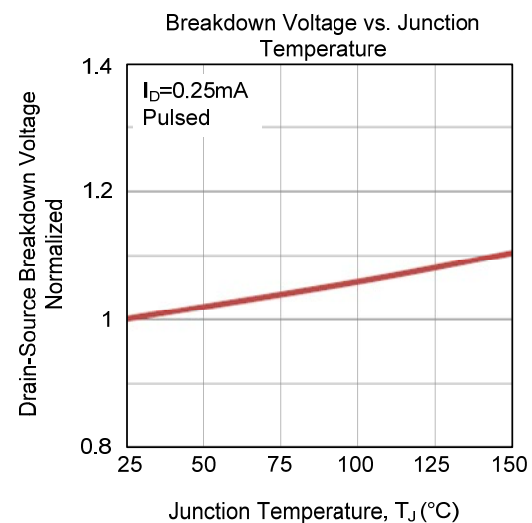
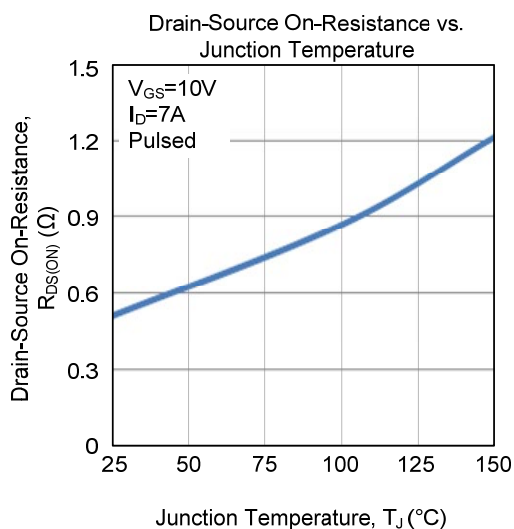
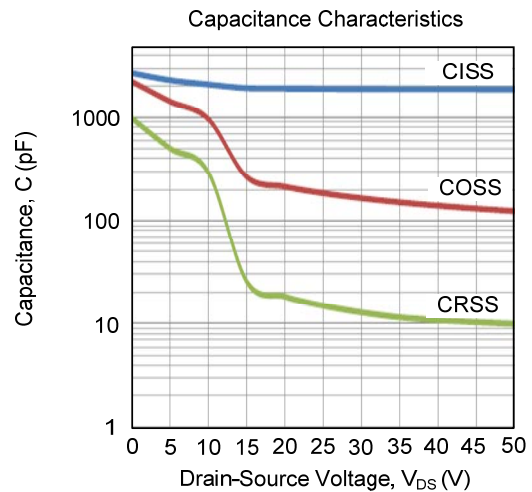
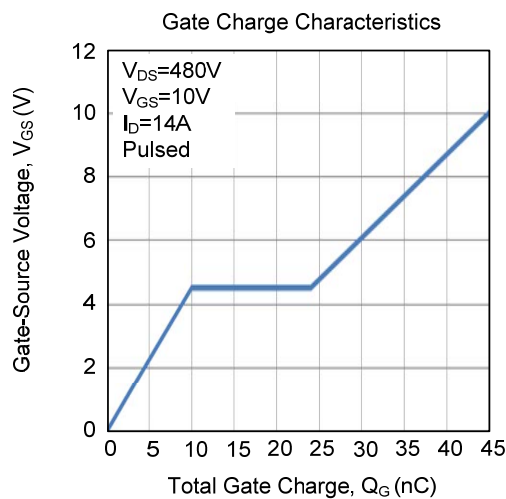
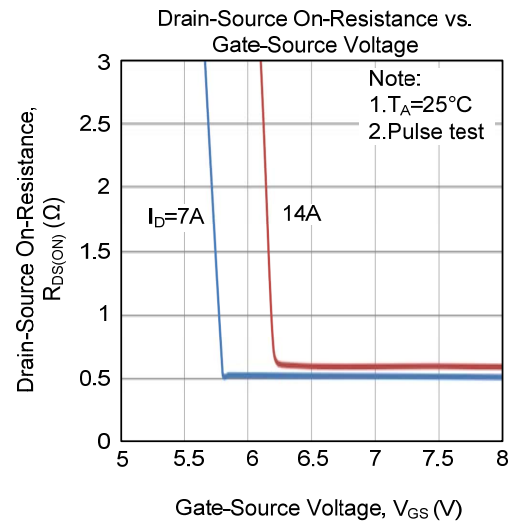
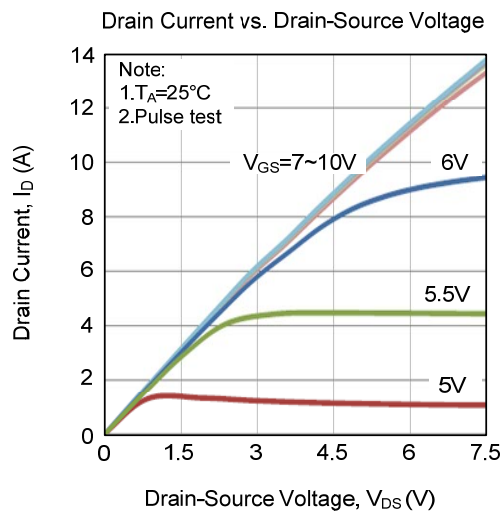


**Unclamped Inductive Switching Test Circuit**

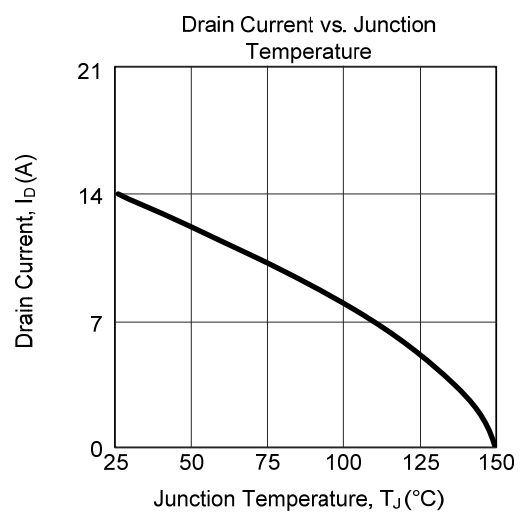
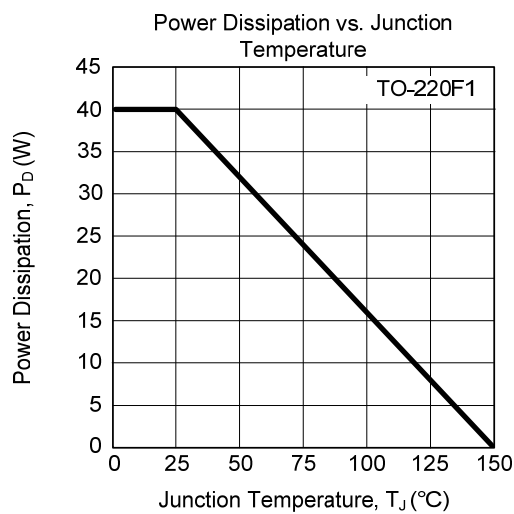
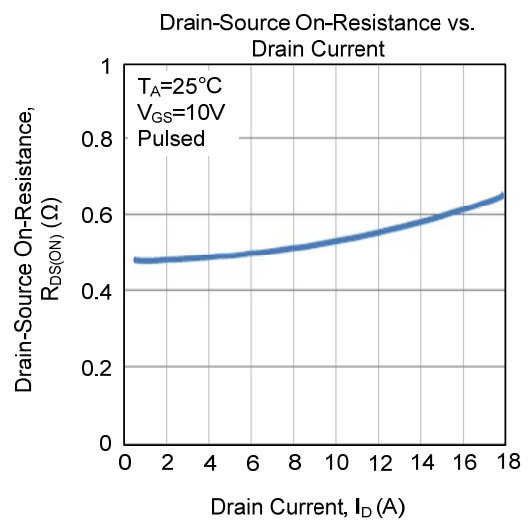
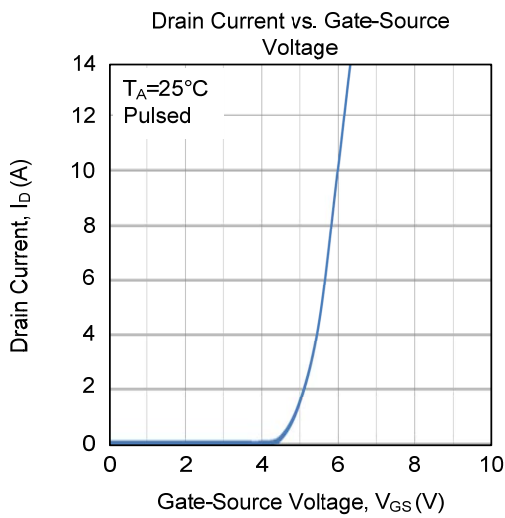
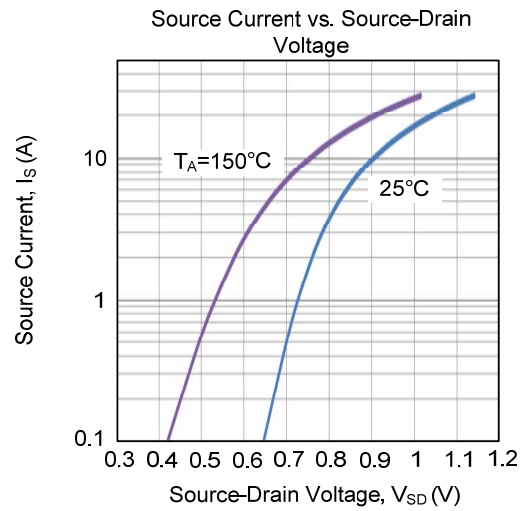
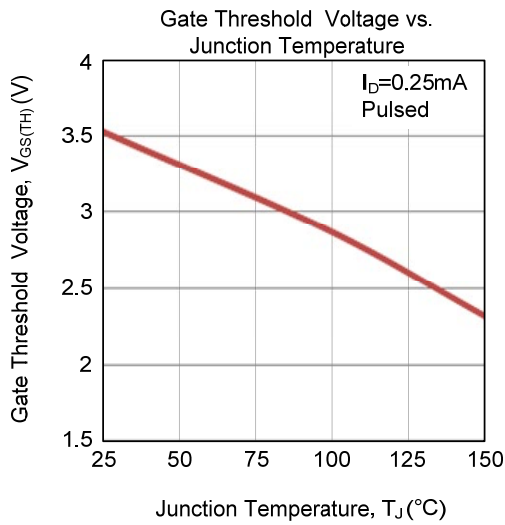


**Unclamped Inductive Switching Waveforms**

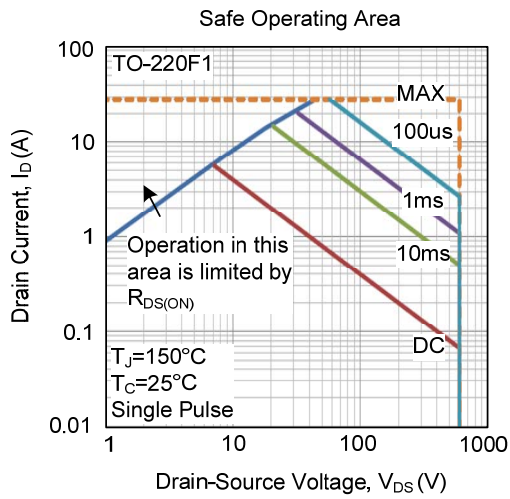
## TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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