



## 13N50K-MT

Power MOSFET

### 13A, 500V N-CHANNEL POWER MOSFET

#### DESCRIPTION

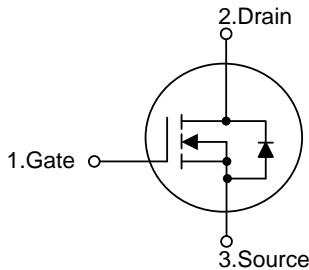
The UTC 13N50K-MT is a N-Channel enhancement mode power MOSFET. The device adopts planar stripe and uses DMOS technology to minimize and provide lower on-state resistance and faster switching speed. It can also withstand high energy pulse under the avalanche and commutation mode conditions.

The UTC 13N50K-MT is ideally suitable for high efficiency switch mode power supply, power factor correction, electronic lamp ballast based on half bridge topology.

#### FEATURES

- \*  $R_{DS(ON)} \leq 0.41\Omega @ V_{GS}=10V, I_D=6.5A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL

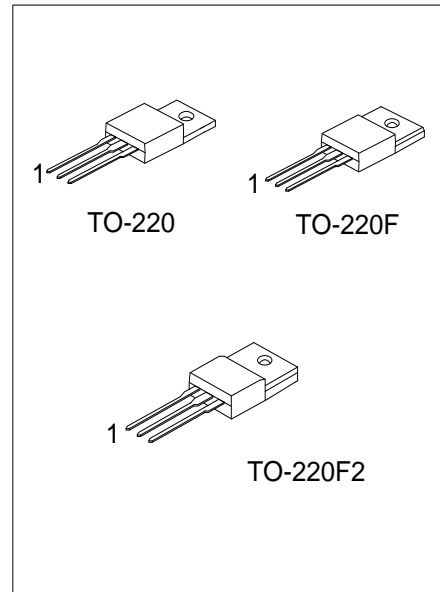


#### ORDERING INFORMATION

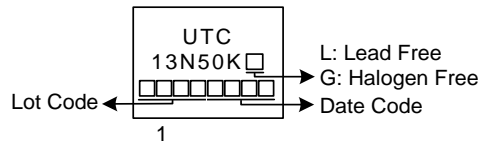
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13N50KL-TA3-T	13N50KG-TA3-T	TO-220	G	D	S	Tube
13N50KL-TF2-T	13N50KG-TF2-T	TO-220F2	G	D	S	Tube
13N50KL-TF3-T	13N50KG-TF3-T	TO-220F	G	D	S	Tube

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

<p>13N50KG-TA3-T</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF2: TO-220F2, TF3: TO-220F</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING



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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	13	A
Pulsed Drain Current (Note 2)	$I_{DM}$	26	A
Single Pulsed Avalanche Energy (Note 3)	$E_{AS}$	625	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	TO-220	160	W
	TO-220F/TO-220F2	35	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.  $L = 7.39\text{mH}$ ,  $I_{AS} = 13\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 13\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	1.28	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F2	3.57	$^\circ\text{C}/\text{W}$

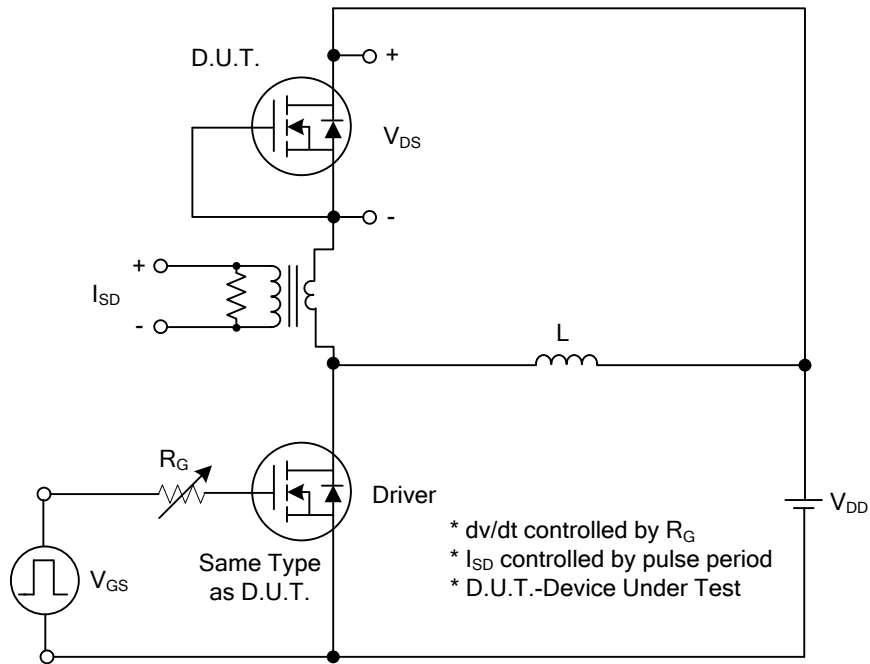
■ **ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 500V, V_{GS} = 0V$			10	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = 30V, V_{DS} = 0V$			100	nA
		$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 6.5A$		0.35	0.41	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$		1960		pF
Output Capacitance	$C_{OSS}$			204		pF
Reverse Transfer Capacitance	$C_{RSS}$			13		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=400V, V_{GS}=10V, I_D=13A$ (Note 1, 2)		39		nC
Gate-Source Charge	$Q_{GS}$			8		nC
Gate-Drain Charge	$Q_{GD}$			9		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DS}=100V, I_D=13A, R_G=25\Omega$ (Note 1, 2)		24		nS
Turn-On Rise Time	$t_R$			22		nS
Turn-Off Delay Time	$t_{D(OFF)}$			138		nS
Turn-Off Fall Time	$t_F$			35		nS
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				13	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				26	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=13A$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=13A, V_{GS}=0V$		340		ns
Reverse Recovery Charge	$Q_{rr}$		$di/dt=100A/\mu s$		3.9	

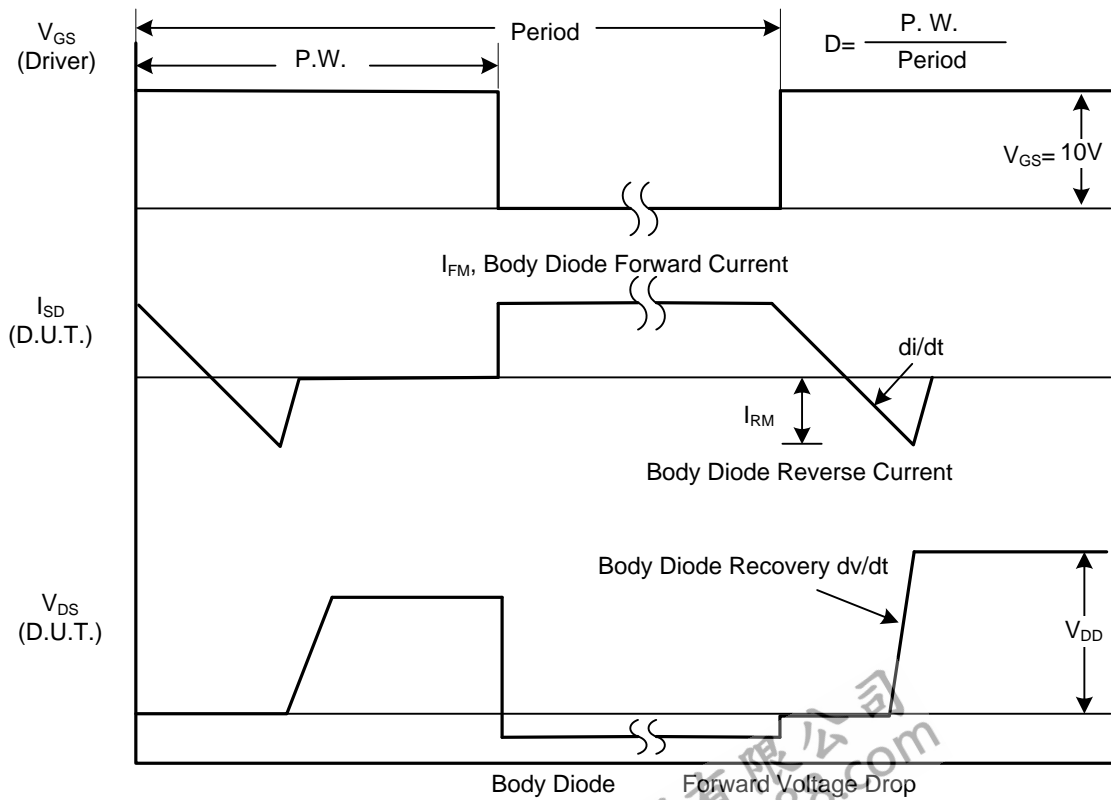
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$ , Duty cycle $\leq 2\%$

2. Essentially independent of operating ambient temperature

## TEST CIRCUITS AND WAVEFORMS

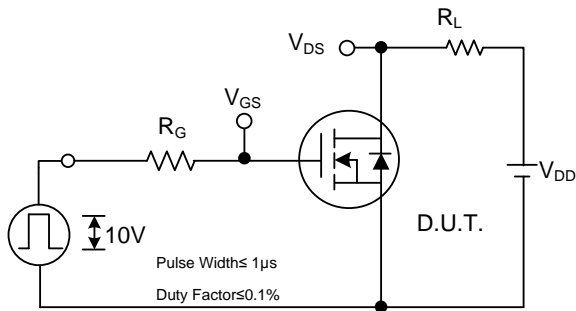


Peak Diode Recovery  $dv/dt$  Test Circuit

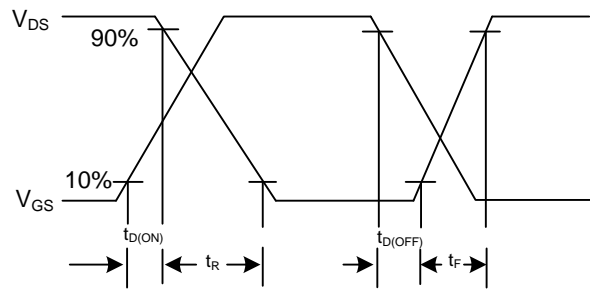


Peak Diode Recovery  $dv/dt$  Waveforms

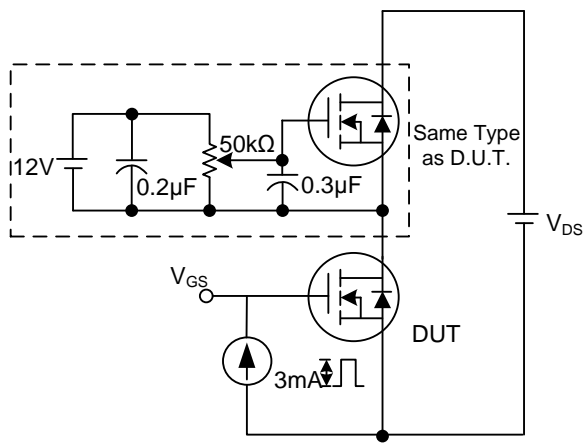
## TEST CIRCUITS AND WAVEFORMS



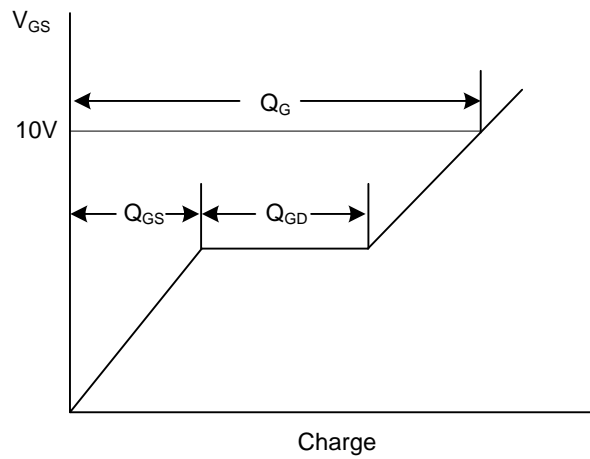
Switching Test Circuit



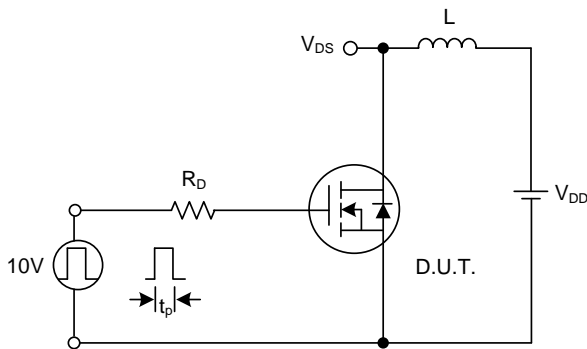
Switching Waveforms



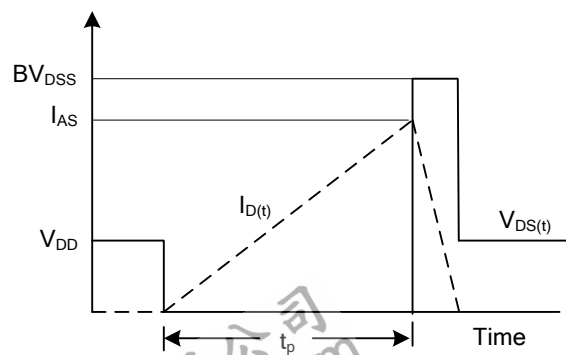
Gate Charge Test Circuit



Gate Charge Waveform

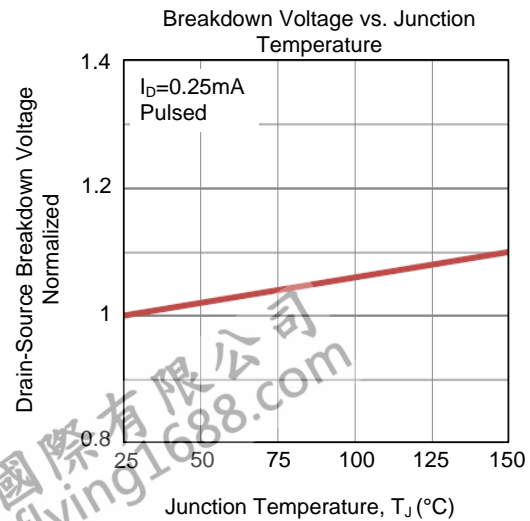
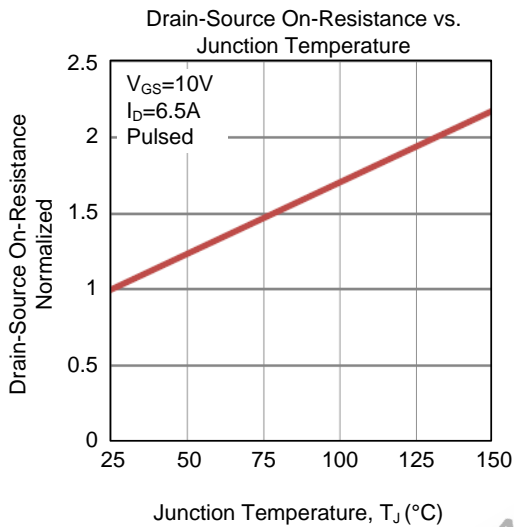
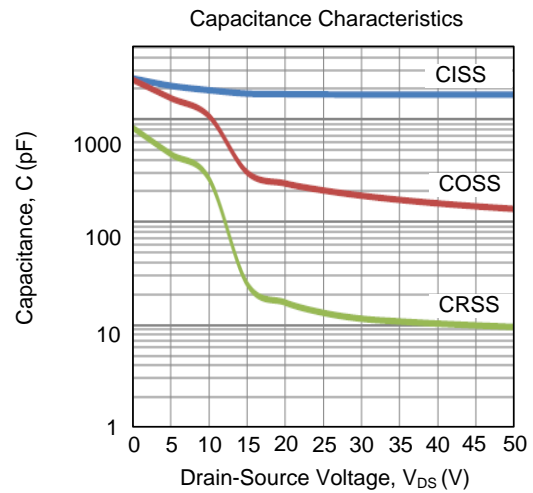
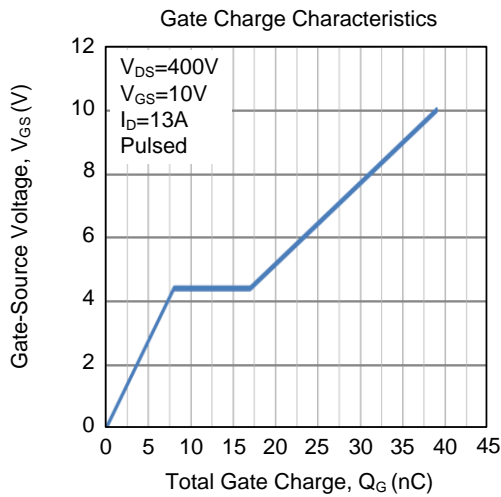
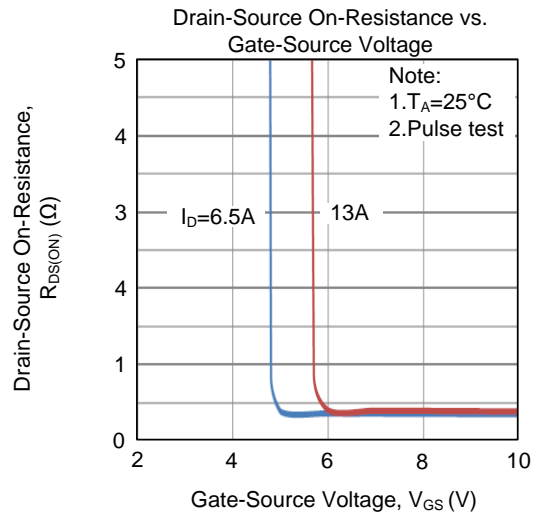
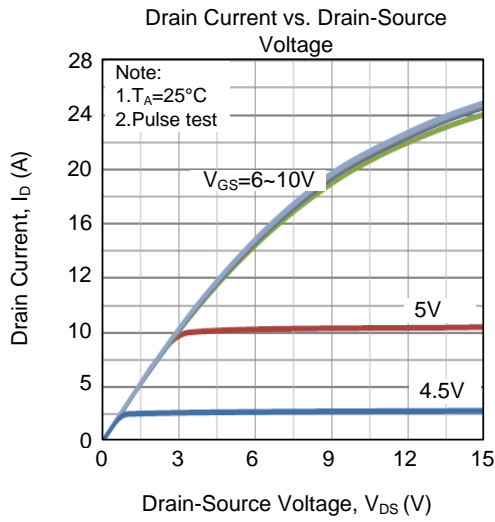


Unclamped Inductive Switching Test Circuit

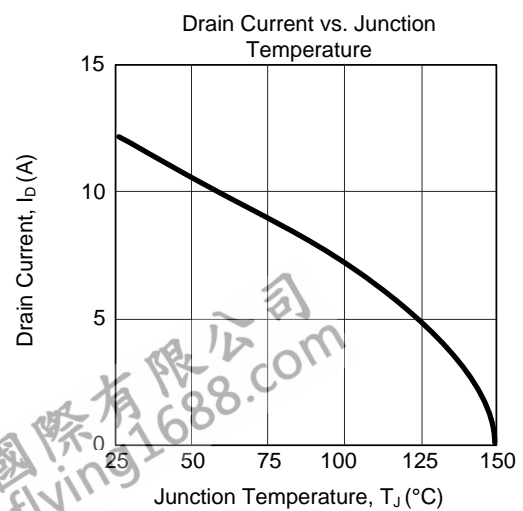
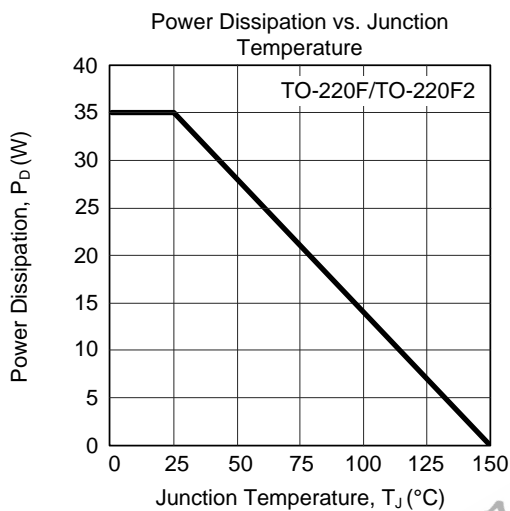
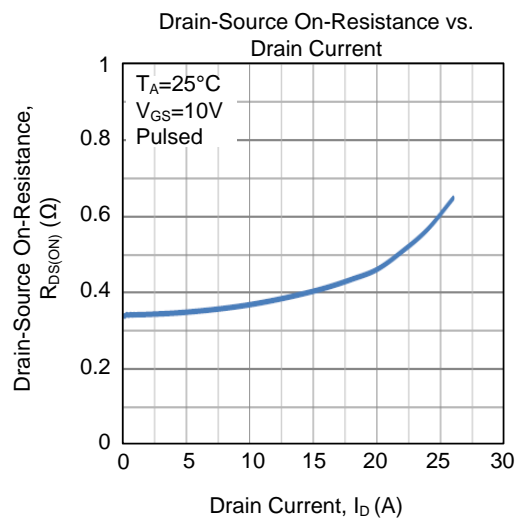
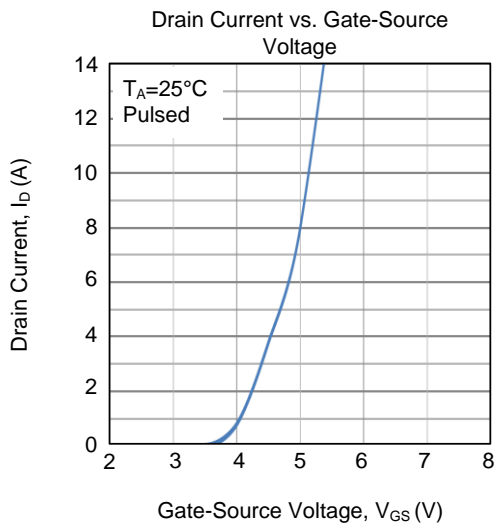
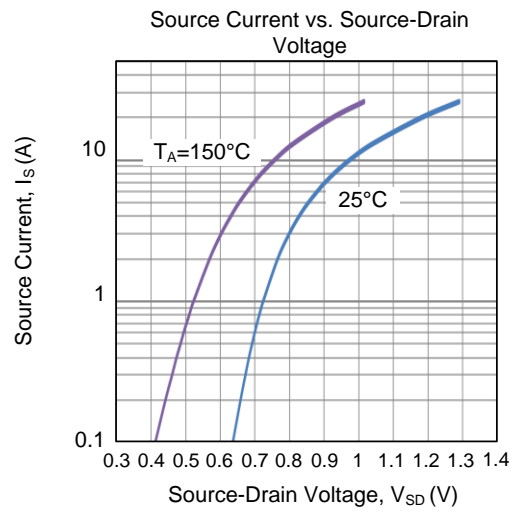
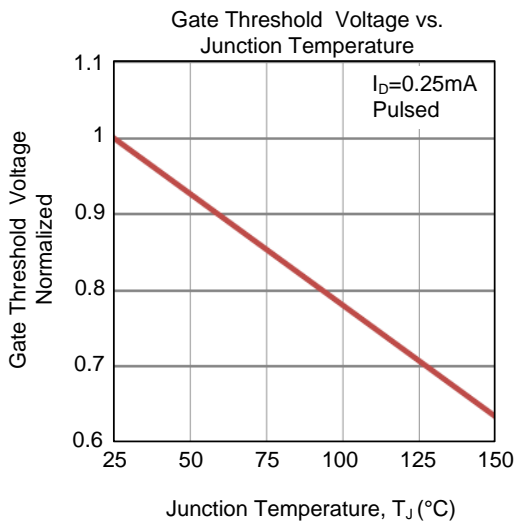


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

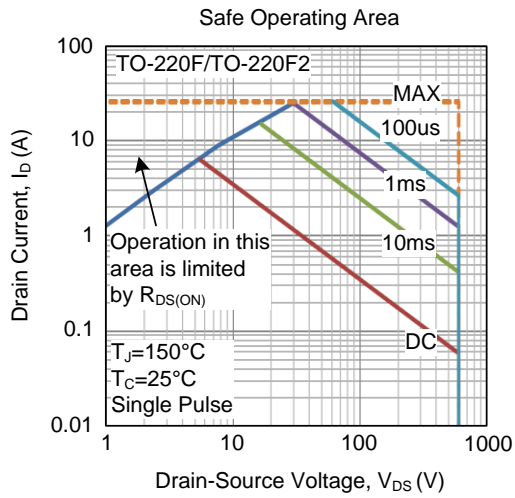


### TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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