



# 20N50K-MT

**Power MOSFET**

## 20A, 500V N-CHANNEL POWER MOSFET

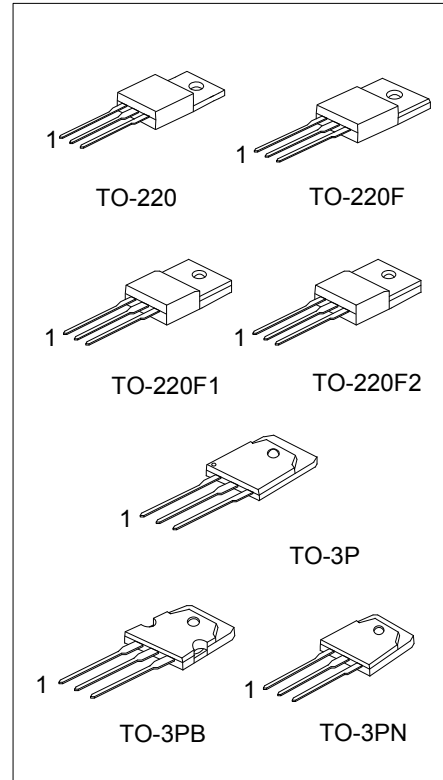
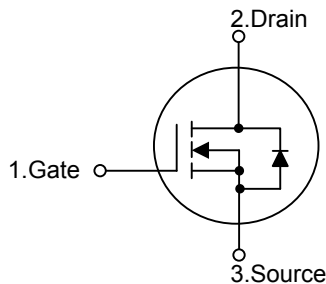
### DESCRIPTION

The UTC **20N50K-MT** is a N-channel power MOSFET using UTC's advanced technology to provide the customers with minimum on-state resistance, superior switching performance and withstand high energy pulse in the avalanche and commutation mode.

### FEATURES

- \*  $R_{DS(ON)} \leq 0.28 \Omega @ V_{GS}=10V, I_D=10A$
- \* High Switching Speed

### SYMBOL



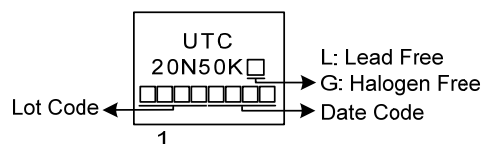
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20N50KL-TA3-T	20N50KG-TA3-T	TO-220	G	D	S	Tube
20N50KL-TF1-T	20N50KG-TF1-T	TO-220F1	G	D	S	Tube
20N50KL-TF2-T	20N50KG-TF2-T	TO-220F2	G	D	S	Tube
20N50KL-TF3-T	20N50KG-TF3-T	TO-220F	G	D	S	Tube
20N50KL-T3B-T	20N50KG-T3B-T	TO-3PB	G	D	S	Tube
20N50KL-T3P-T	20N50KG-T3P-T	TO-3P	G	D	S	Tube
20N50KL-T3N-T	20N50KG-T3N-T	TO-3PN	G	D	S	Tube

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

<p>20N50KG-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, T3B: TO-3PB, T3P: TO-3P, T3N: TO-3PN (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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	20	A
	Pulsed (Note 2)	$I_{DM}$	80	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	1000	mJ
Peak Diode Recovery dv/dt		dv/dt	2.2	V/ns
Power Dissipation	TO-220	$P_D$	200	W
	TO-220F/TO-220F1 TO-220F2		43	W
	TO-3PB/TO-3P TO-3PN		220	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.  $L = 10\text{mH}$ ,  $I_{AS} = 14\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 20\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

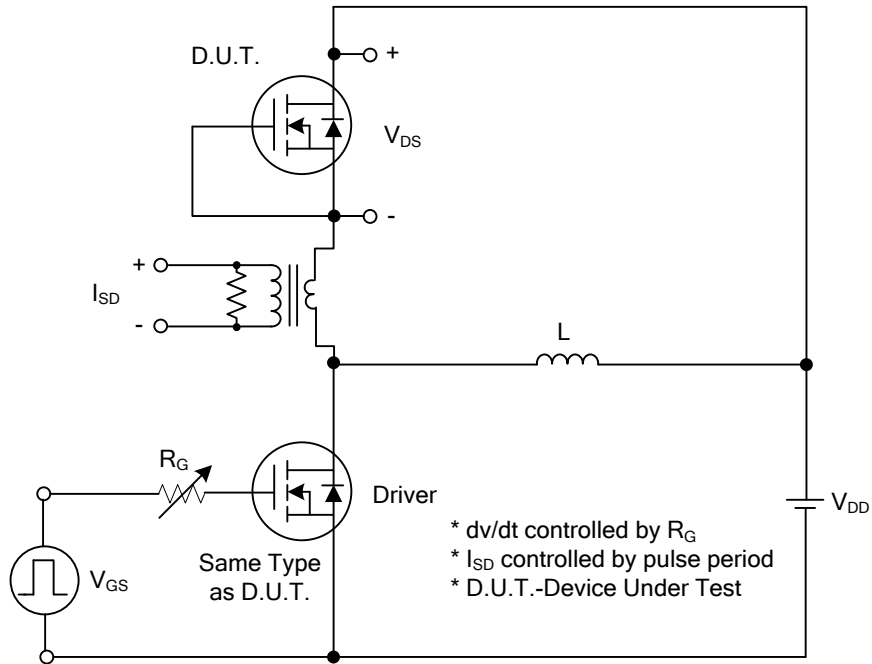
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-3PB/TO-3P TO-3PN		40	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	0.625	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2		2.9	$^\circ\text{C}/\text{W}$
	TO-3PB/TO-3P TO-3PN		0.56	$^\circ\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C, unless otherwise specified)

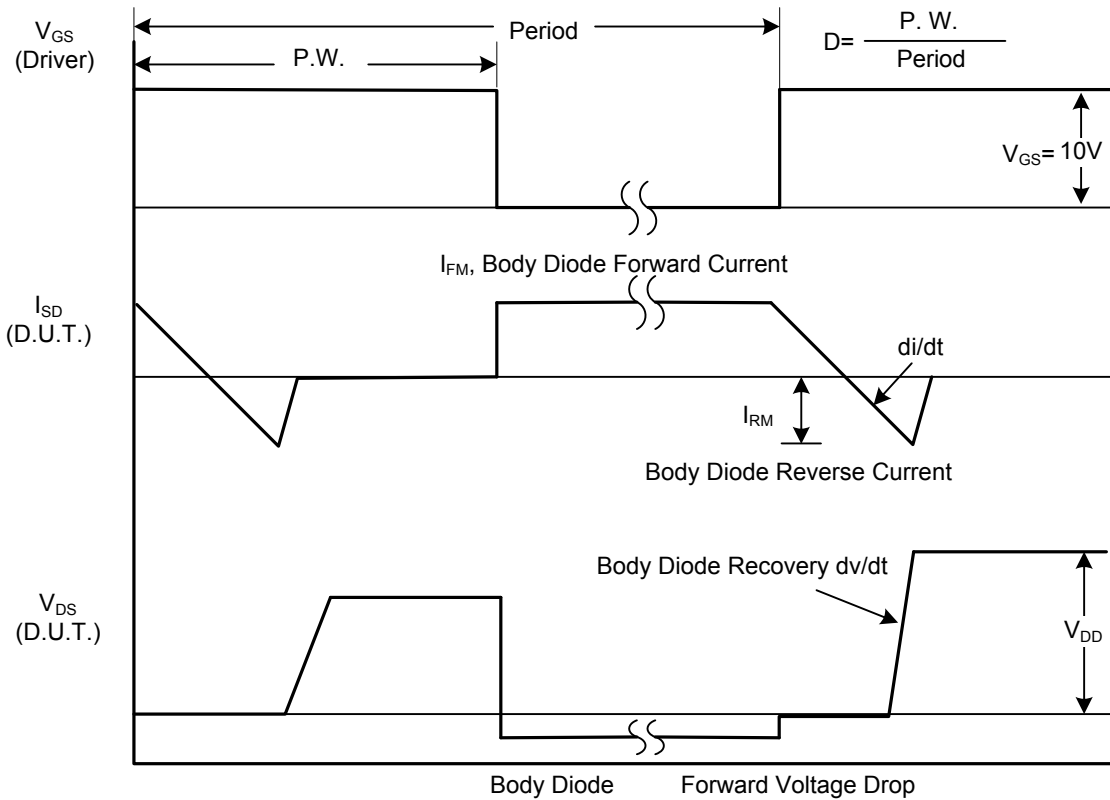
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	500			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V				μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>			+100	nA
	Reverse					
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A			0.28	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		2450		pF
Output Capacitance	C <sub>OSS</sub>			275		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			16.5		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A I <sub>G</sub> = 1mA (Note1, 2)		53		nC
Gate to Source Charge	Q <sub>GS</sub>			11		nC
Gate to Drain Charge	Q <sub>GD</sub>			13		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A, R <sub>G</sub> =25Ω (Note1, 2)		32		ns
Rise Time	t <sub>R</sub>			30		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			162		ns
Fall-Time	t <sub>F</sub>			70		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				20	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				80	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V, V <sub>R</sub> =400V dI <sub>F</sub> /dt=100A/μs (Note 1)		412		ns
Reverse Recovery Charge	Q <sub>rr</sub>				6.5	

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.  
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

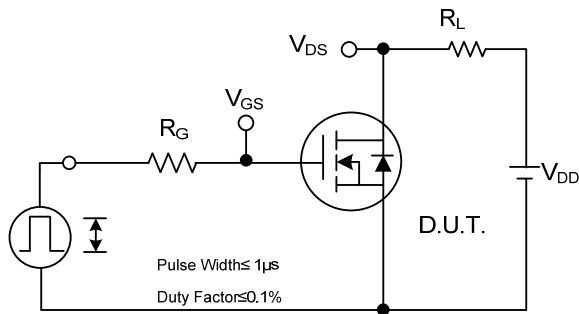


Peak Diode Recovery  $dv/dt$  Test Circuit

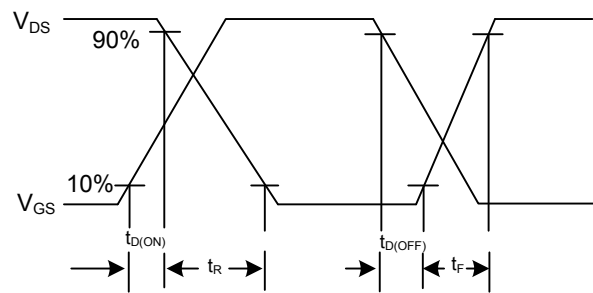


Peak Diode Recovery  $dv/dt$  Waveforms

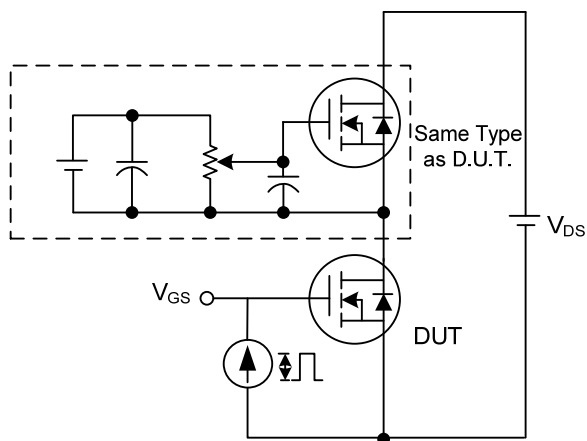
## TEST CIRCUITS AND WAVEFORMS



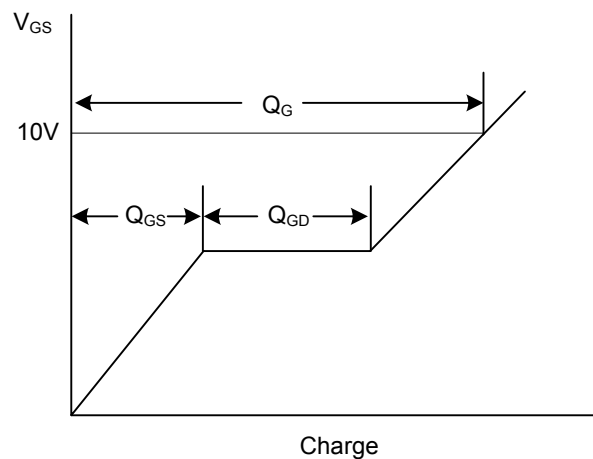
Switching Test Circuit



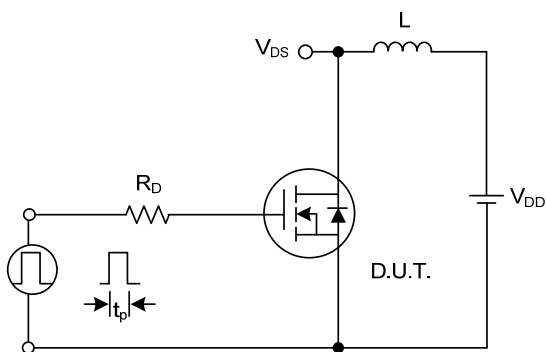
Switching Waveforms



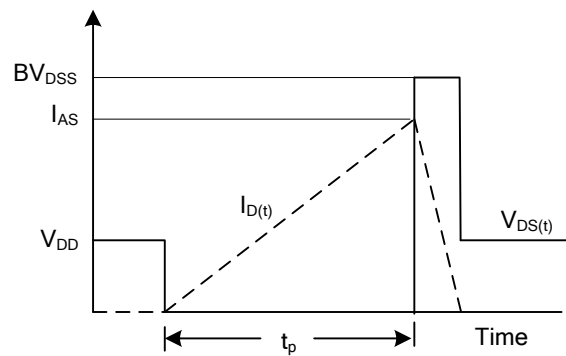
Gate Charge Test Circuit



Gate Charge Waveform

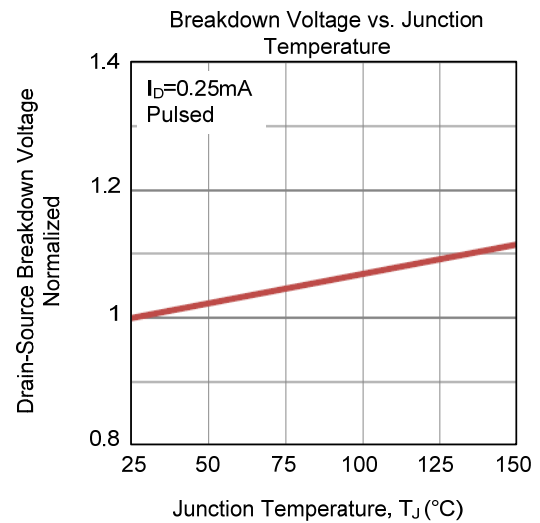
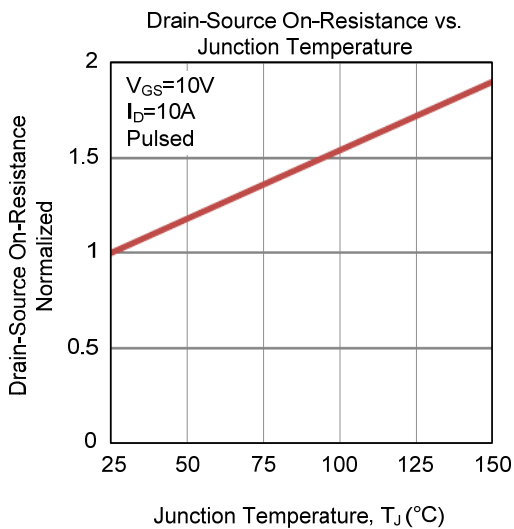
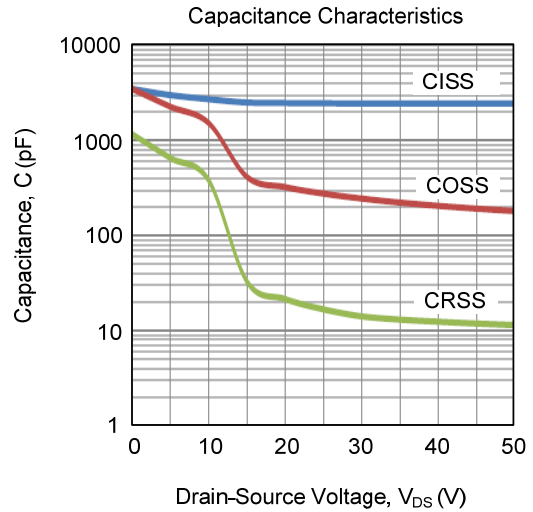
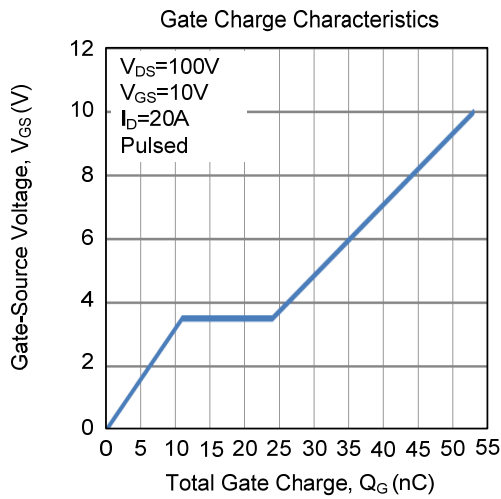
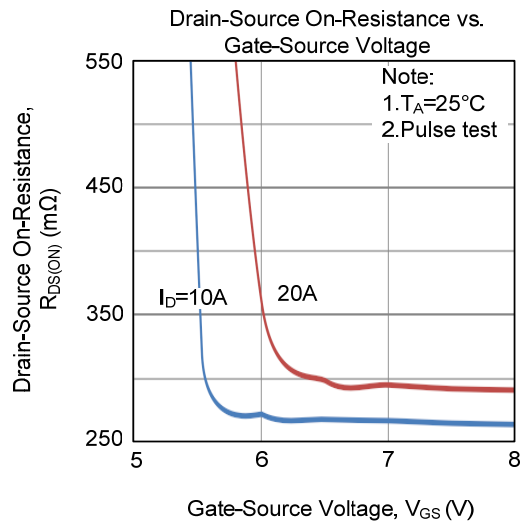
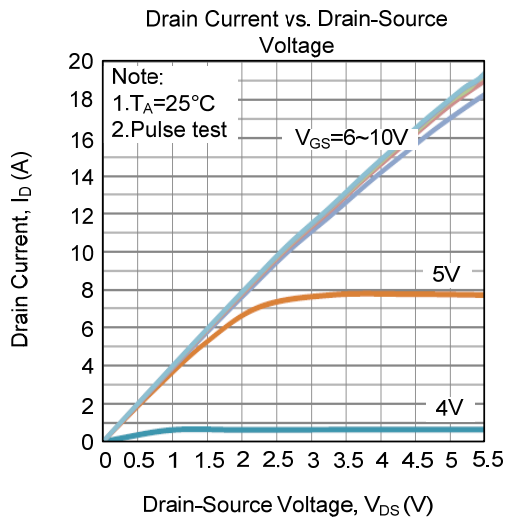


Unclamped Inductive Switching Test Circuit

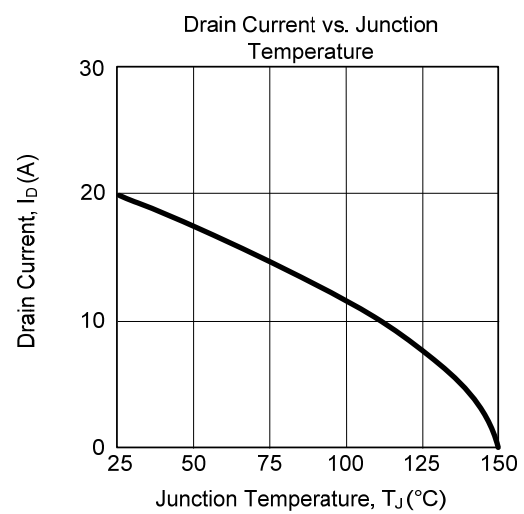
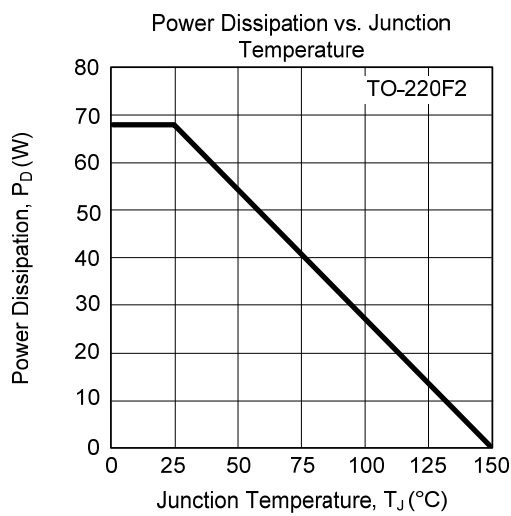
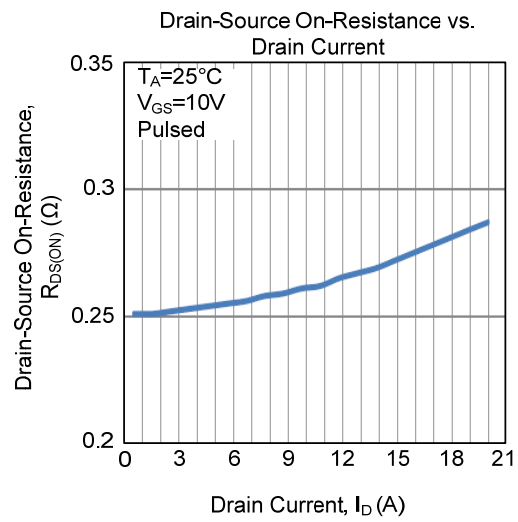
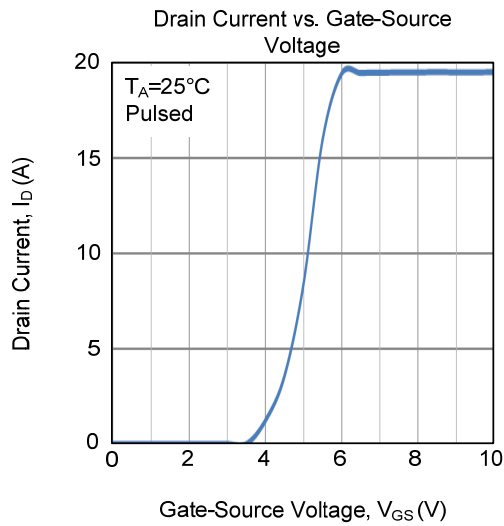
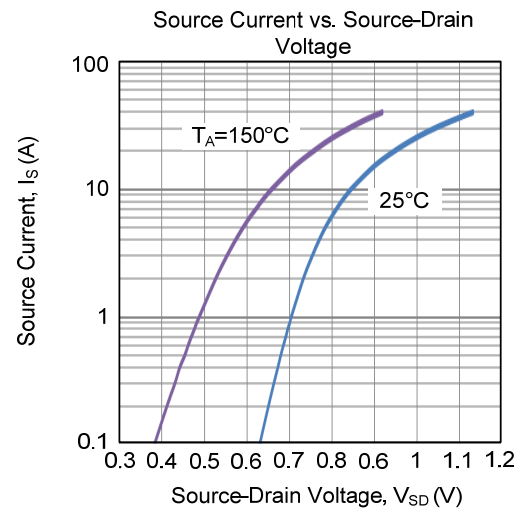
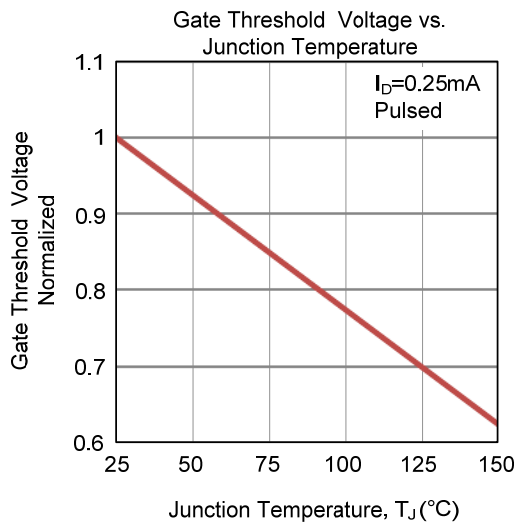


Unclamped Inductive Switching Waveforms

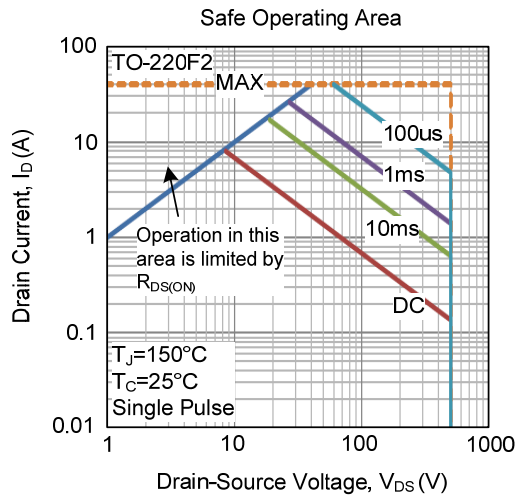
## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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