



## 20N65K-MT

Power MOSFET

### 20A, 650V N-CHANNEL POWER MOSFET

#### DESCRIPTION

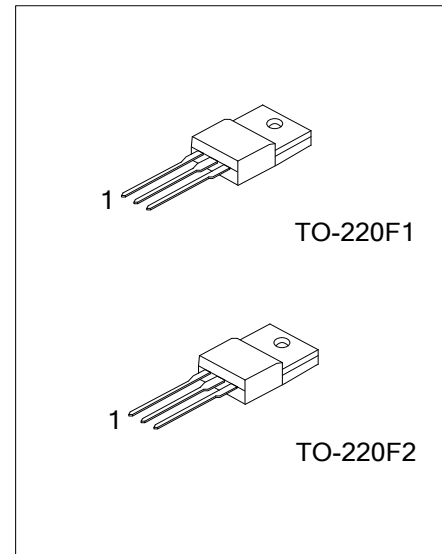
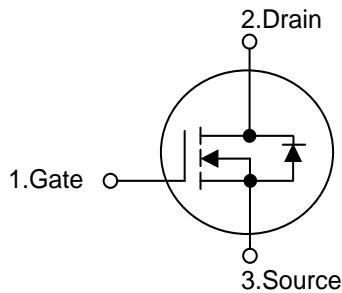
The UTC **20N65K-MT** is an N-channel Power MOSFET using UTC's advanced technology to provide customers a minimum on-state resistance and superior switching performance, etc.

The UTC **20N65K-MT** is generally applied in high efficient AC to DC converters, PWM motor controls and bridge circuits, etc.

#### FEATURES

- \*  $R_{DS(ON)} \leq 0.55 \Omega @ V_{GS}=10V, I_D=10A$
- \* High Switching Speed
- \* Improved dv/dt capability

#### SYMBOL



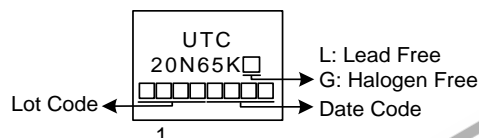
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20N65KL-TF1-T	20N65KG-TF1-T	TO-220F1	G	D	S	Tube
20N65KL-TF2-T	20N65KG-TF2-T	TO-220F2	G	D	S	Tube

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

<p>20N65KG-TF1-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TF1: TO-220F1, TF2: TO-220F2 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	650	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Drain Current	Continuous	I <sub>D</sub>	20	A
	Pulsed (Note 2)	I <sub>DM</sub>	40	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	562	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.46	V/ns
Power Dissipation		P <sub>D</sub>	55	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +150	°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 = 10mH, I<sub>AS</sub> = 10.5A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25 Ω Starting T<sub>J</sub> = 25°C

4. I<sub>SD</sub> ≤ 20A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

### ■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ <sub>JA</sub>	62.5	°C/W
Junction to Case	θ <sub>JC</sub>	2.27	°C/W

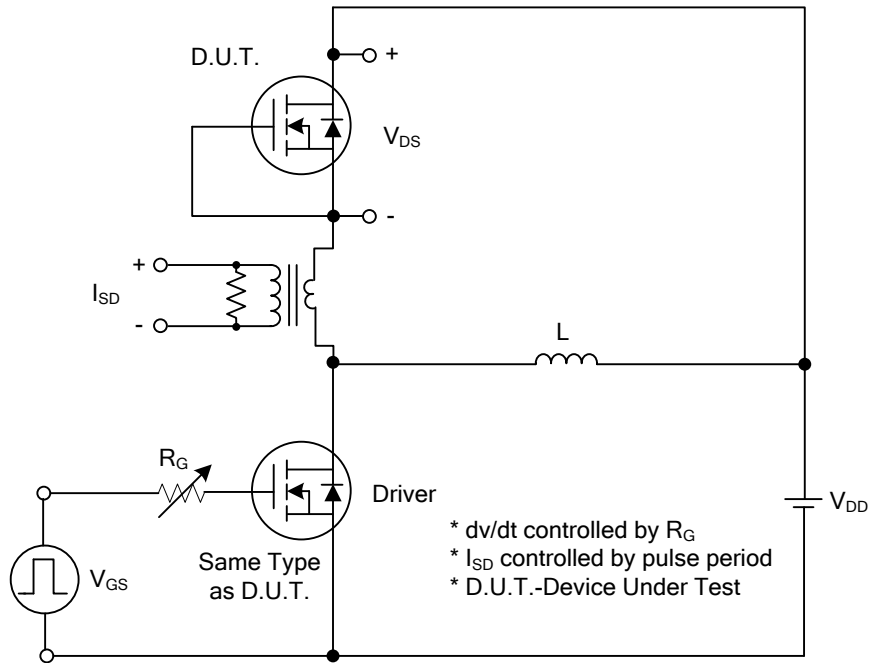
### ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> = 250μA	650			V	
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V			10	μA	
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA	
	Reverse				-100	nA	
<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		0.515	0.55	Ω	
<b>DYNAMIC CHARACTERISTICS</b>							
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		2512		pF	
Output Capacitance	C <sub>OSS</sub>				231		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>				14		pF
<b>SWITCHING CHARACTERISTICS</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 (Note 1, 2)		54		nC	
Gate-source Charge	Q <sub>GS</sub>				10		nC
Gate-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 (Note 1, 2)		28		ns	
Rise Time	t <sub>R</sub>				35		ns
Turn-off Delay Time	t <sub>D(OFF)</sub>				140		ns
Fall-Time	t <sub>F</sub>				76		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>				40	A	
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A			1.4	V	
Reverse Recovery Time (Note 1)	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A		506		ns	
Reverse Recovery Charge	Q <sub>rr</sub>	di <sub>F</sub> /dt=100A/μs (Note1)		9		μC	

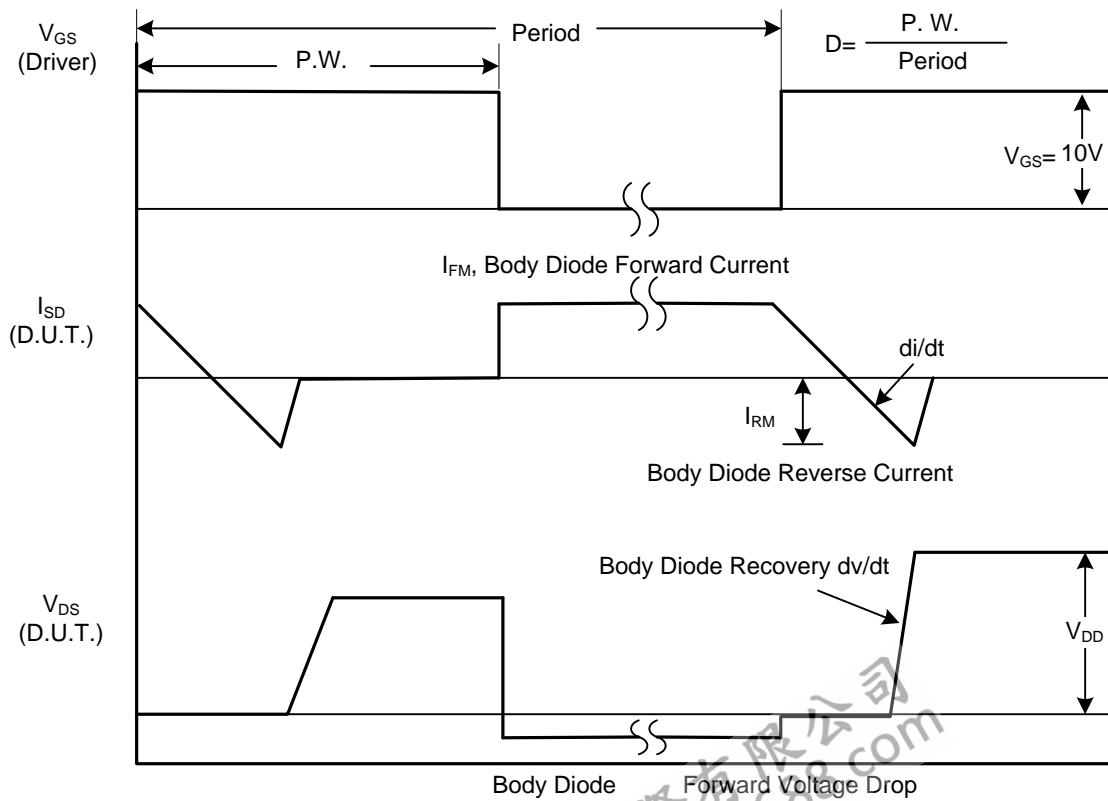
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

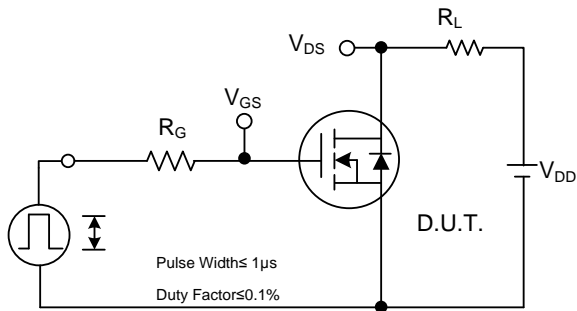


Peak Diode Recovery dv/dt Test Circuit

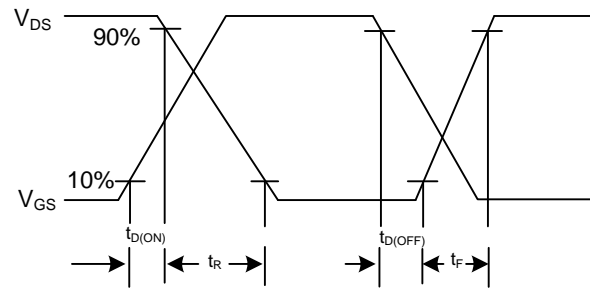


Peak Diode Recovery dv/dt Waveforms

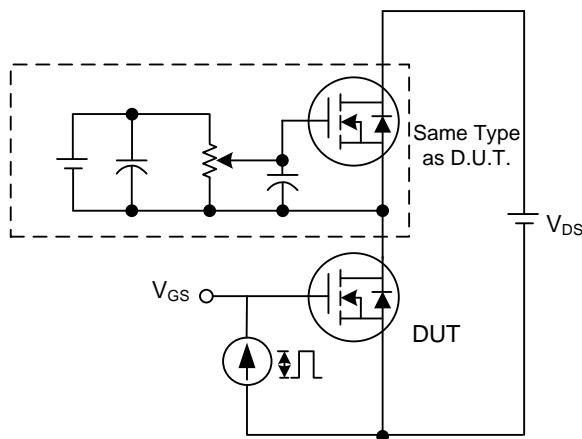
## TEST CIRCUITS AND WAVEFORMS



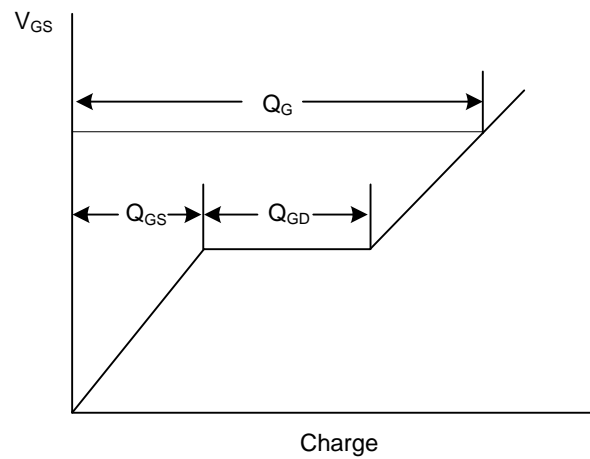
Switching Test Circuit



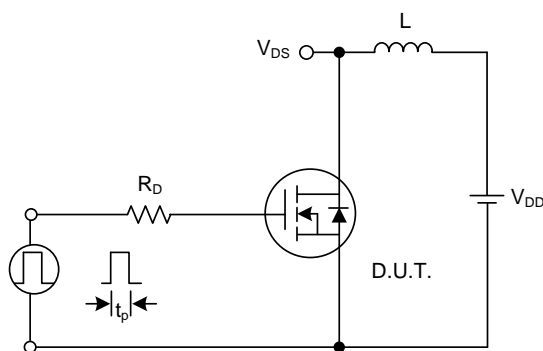
Switching Waveforms



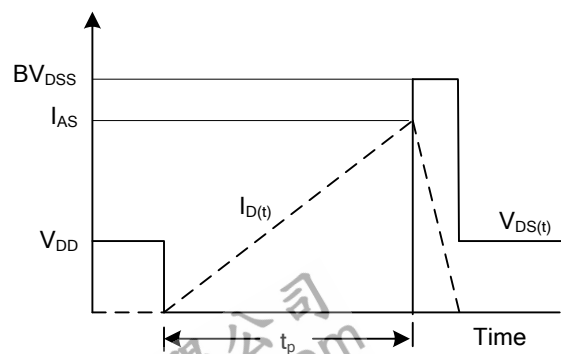
Gate Charge Test Circuit



Gate Charge Waveform

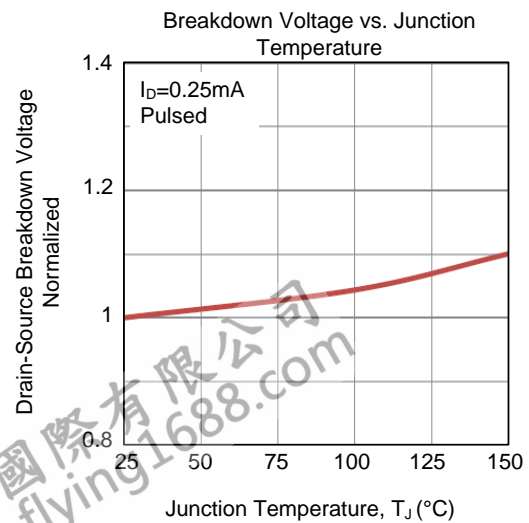
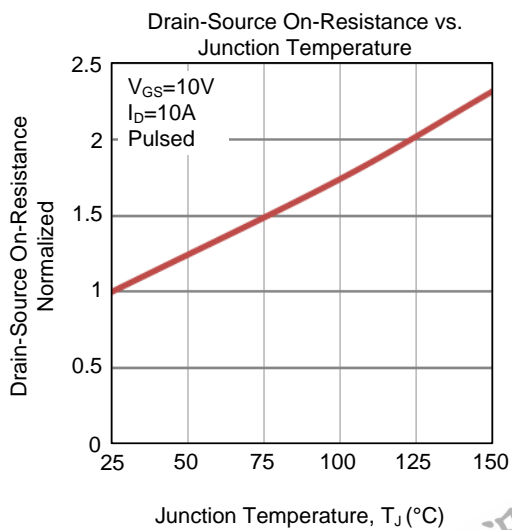
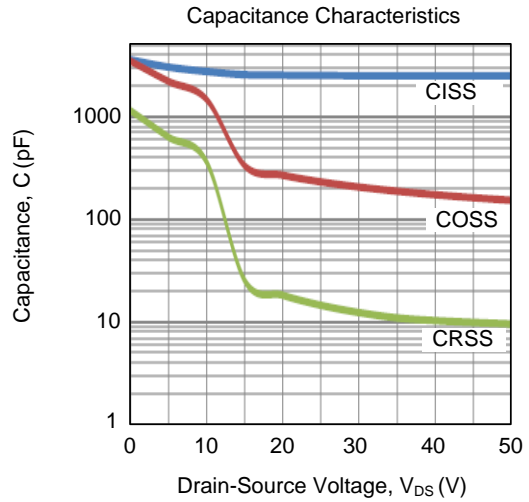
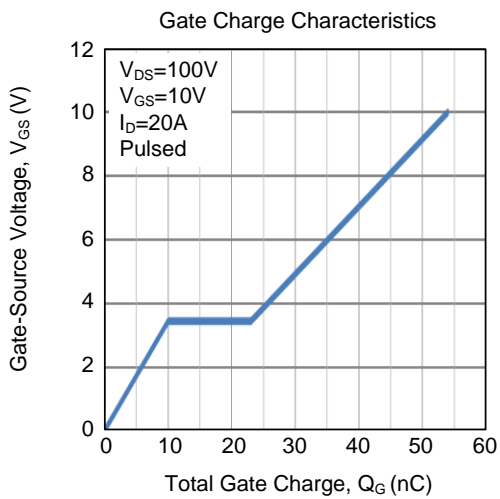
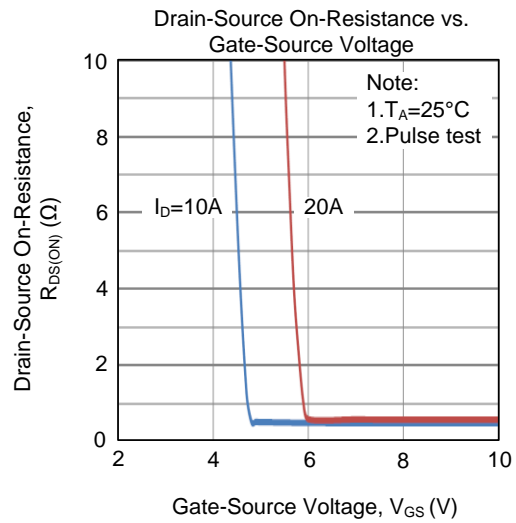
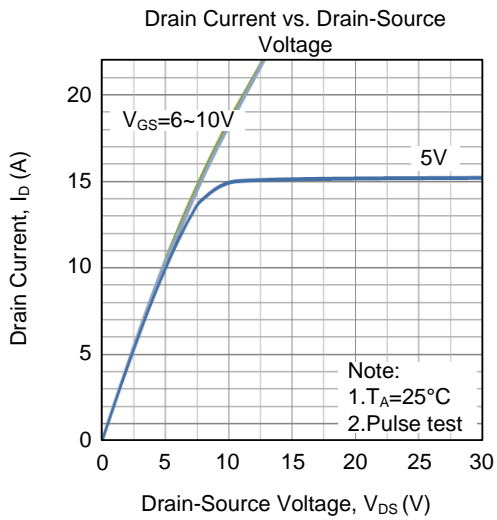


Unclamped Inductive Switching Test Circuit

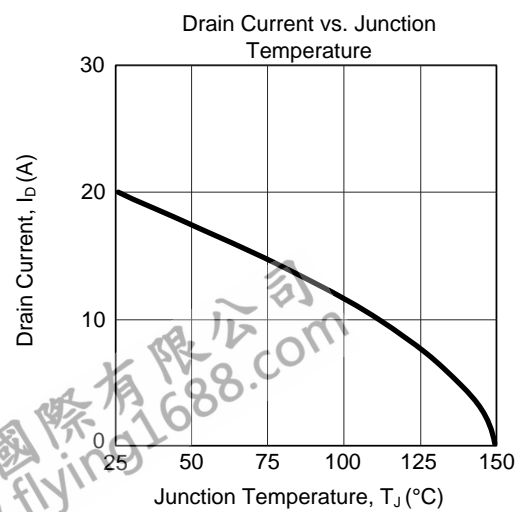
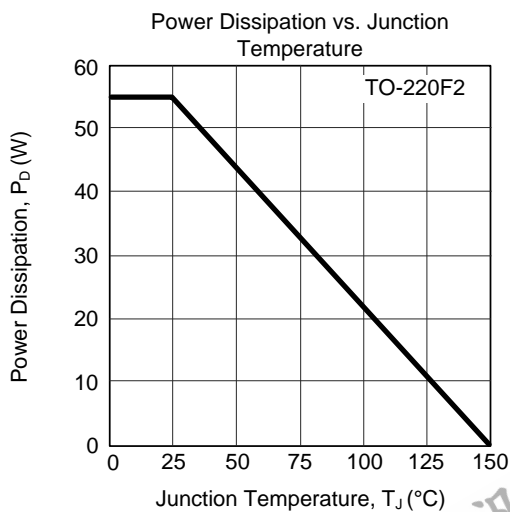
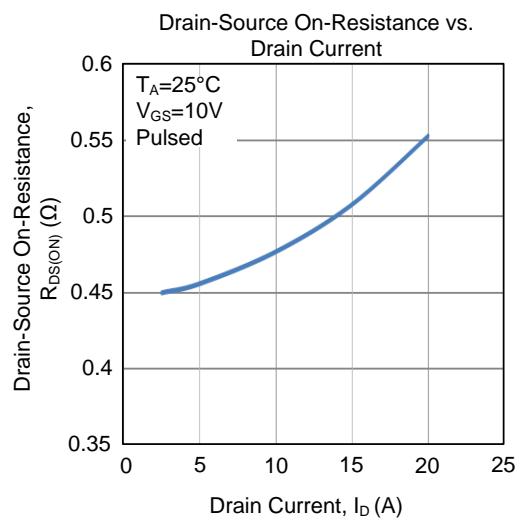
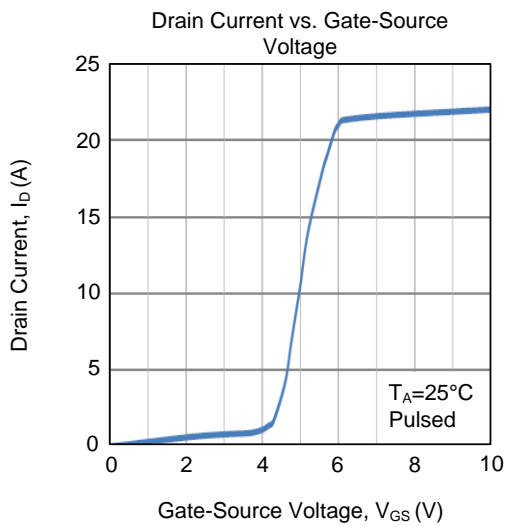
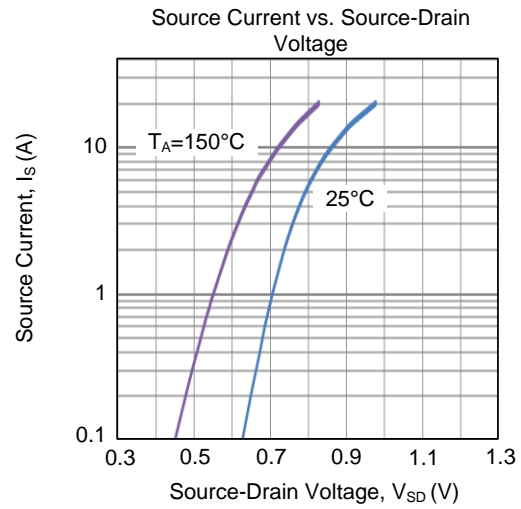
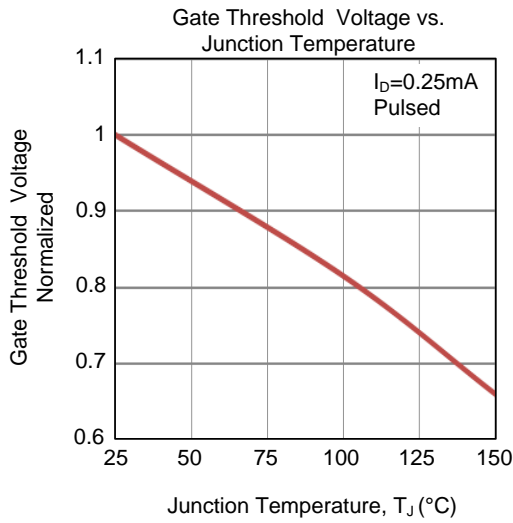


Unclamped Inductive Switching Waveforms

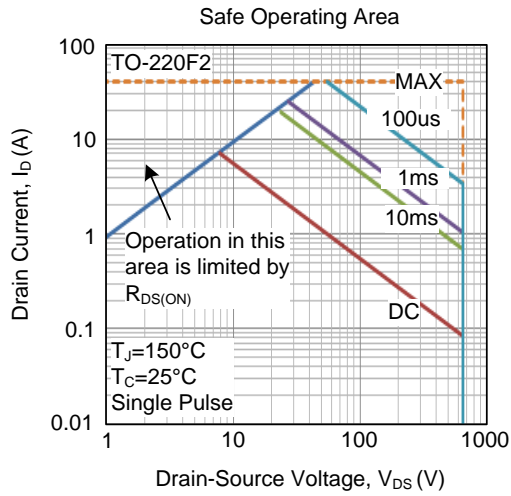
## TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS (Cont.)



## ■ TYPICAL CHARACTERISTICS (Cont.)



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