



## 11NM65-F

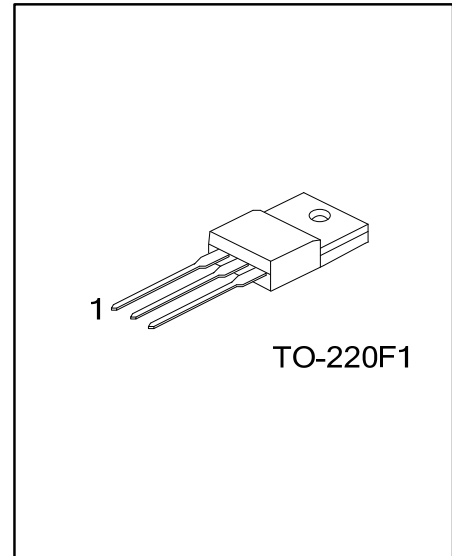
Power MOSFET

### 11A, 650V N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC **11NM65-F** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

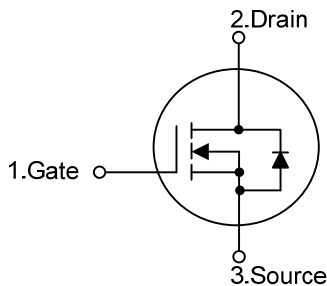
The UTC **11NM65-F** is generally applied in high efficiency switch mode power supplies.



#### FEATURES

- \*  $R_{DS(ON)} \leq 0.5\Omega$  @  $V_{GS}=10V, I_D=5.5A$
- \* Fast Switching
- \* With 100% Avalanche Tested

#### SYMBOL



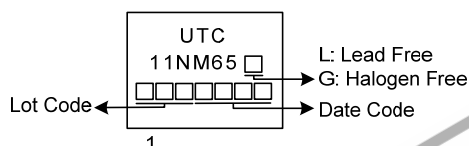
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11NM65L-TF1-T	11NM65G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>11NM65G-TF1-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube (2) TF1: TO220F1 (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>	11	A
	Pulsed (Note 2)	I <sub>DM</sub>	22	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	630	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	10.4	V/ns
Power Dissipation		P <sub>D</sub>	31	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature Range		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=140mH, I<sub>AS</sub>=3.0A, V<sub>DD</sub>= 50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

4. I<sub>SD</sub>≤11A, 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>	4	°C/W

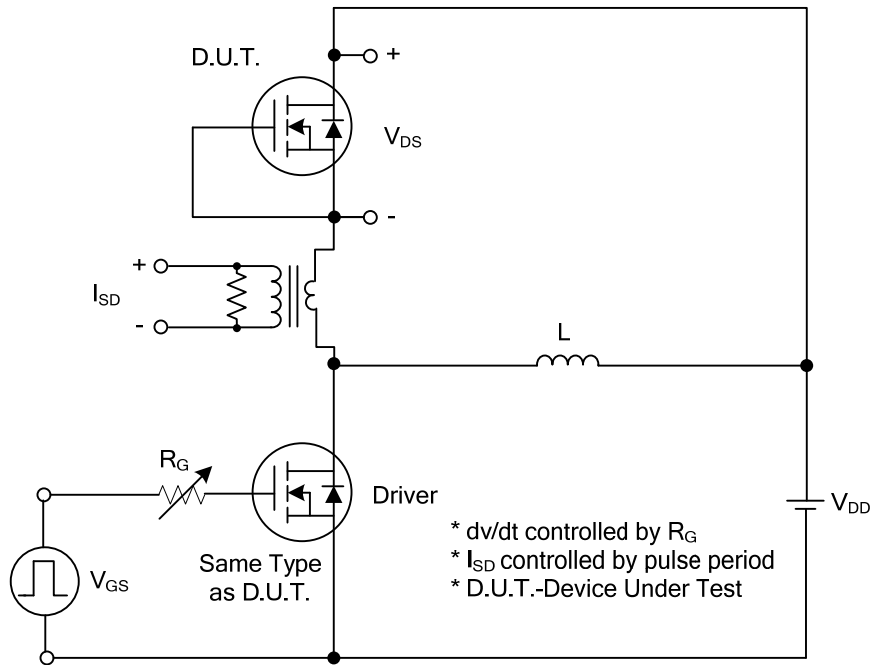
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

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	I <sub>GSS</sub>	Forward			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	2.5		4.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =5.5A			0.5	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		660		pF
Output Capacitance	C <sub>OSS</sub>			460		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			10		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =300V, V <sub>GS</sub> =10V, I <sub>D</sub> =10A, I <sub>G</sub> =10mA (Note 1, 2)		30		nC
Gate to Source Charge	Q <sub>GS</sub>			11		nC
Gate to Drain Charge	Q <sub>GD</sub>			9		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =300V, V <sub>GS</sub> =10V, I <sub>D</sub> =10A R <sub>G</sub> =25Ω (Note 1, 2)		20		ns
Rise Time	t <sub>R</sub>			26		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			180		ns
Fall-Time	t <sub>F</sub>			62		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				11	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				22	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> = 11A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> = 11A, V <sub>GS</sub> =0V;		240		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	di <sub>F</sub> /dt=100A/μs		2.3		μC

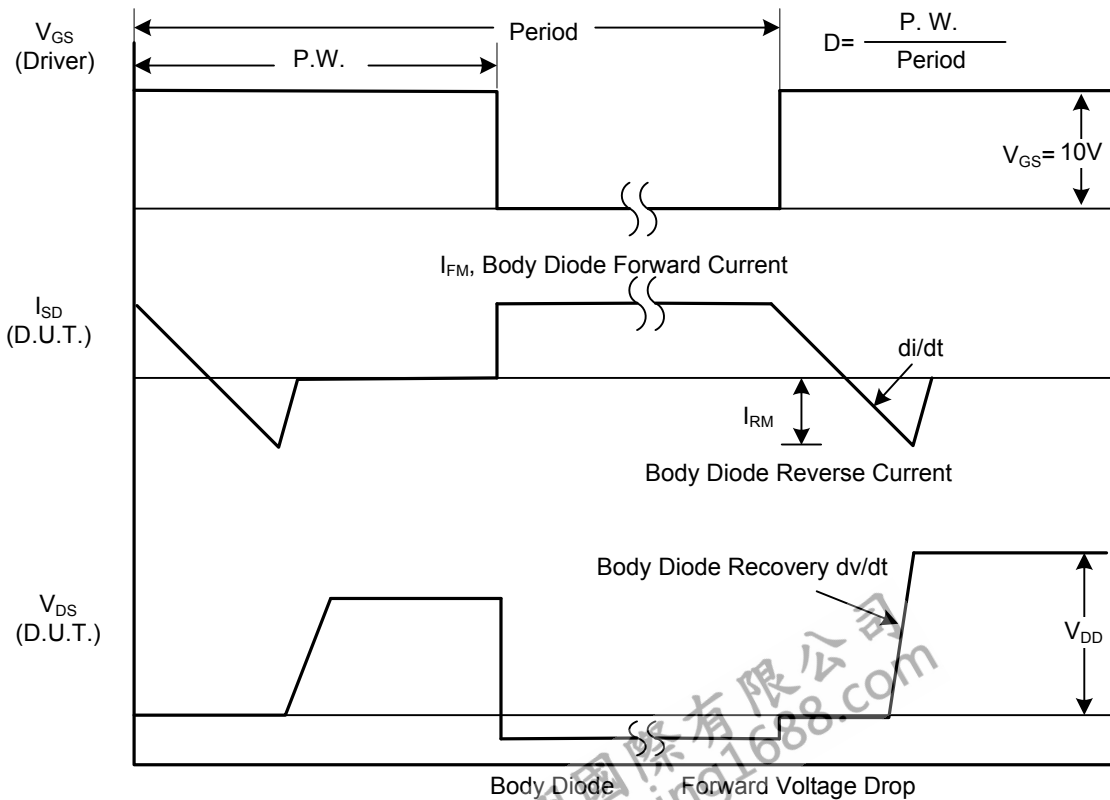
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

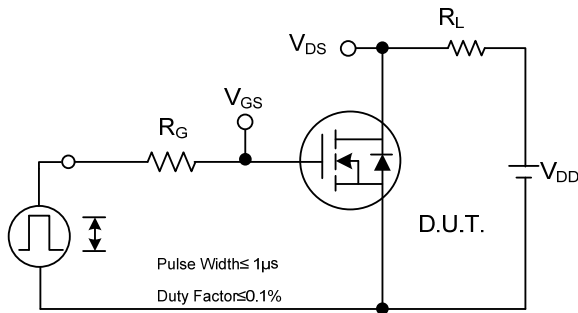


**Peak Diode Recovery dv/dt Test Circuit**

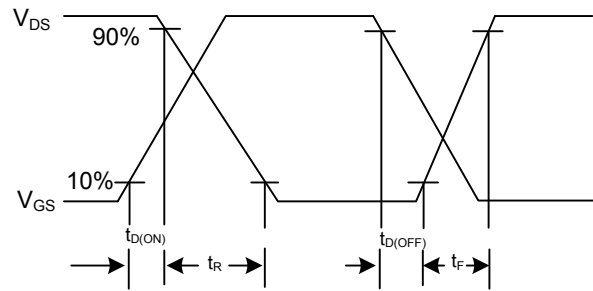


**Peak Diode Recovery dv/dt Waveforms**

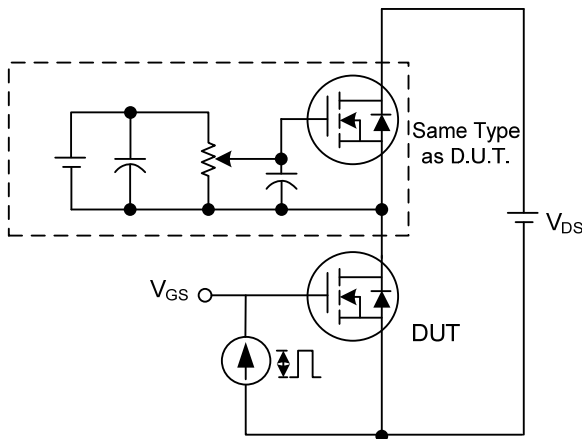
## TEST CIRCUITS AND WAVEFORMS



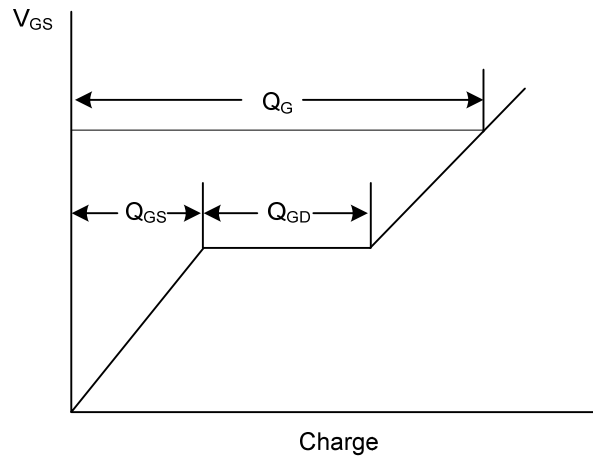
Switching Test Circuit



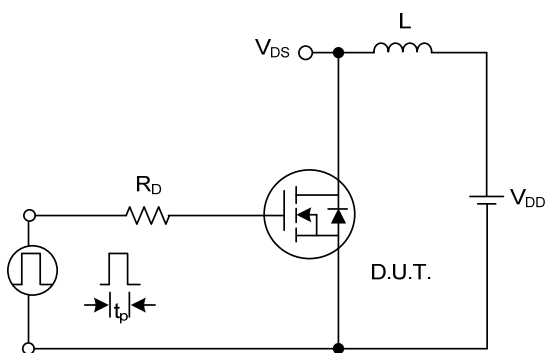
Switching Waveforms



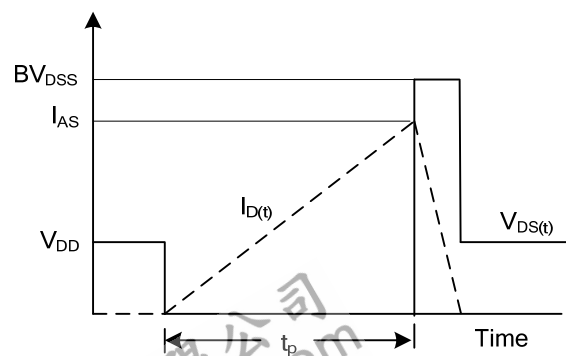
Gate Charge Test Circuit



Gate Charge Waveform

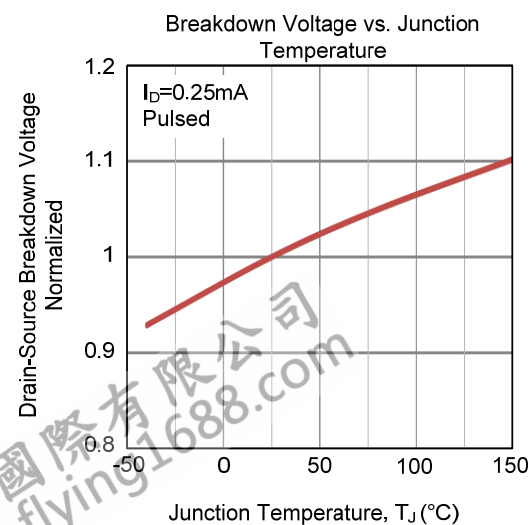
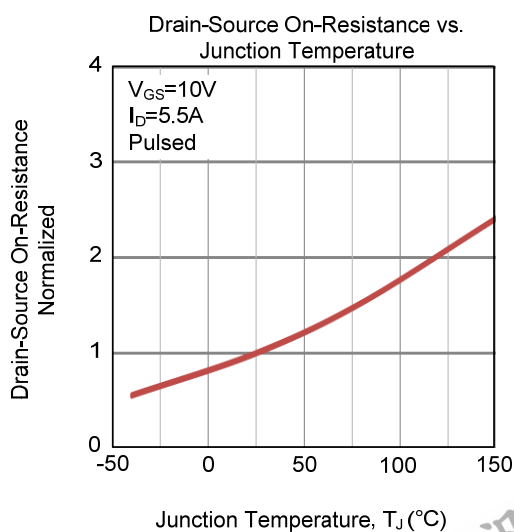
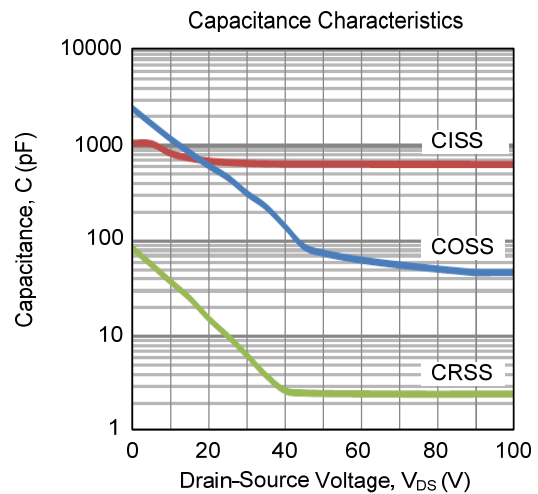
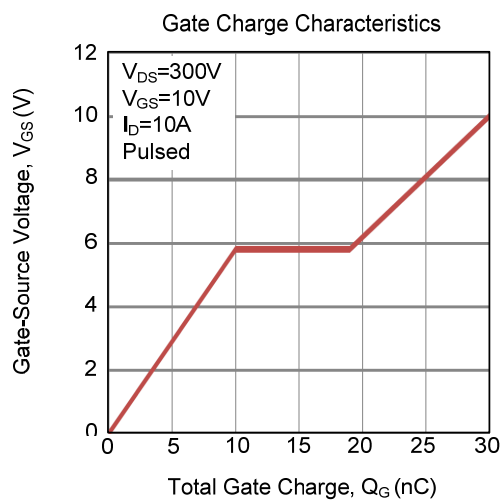
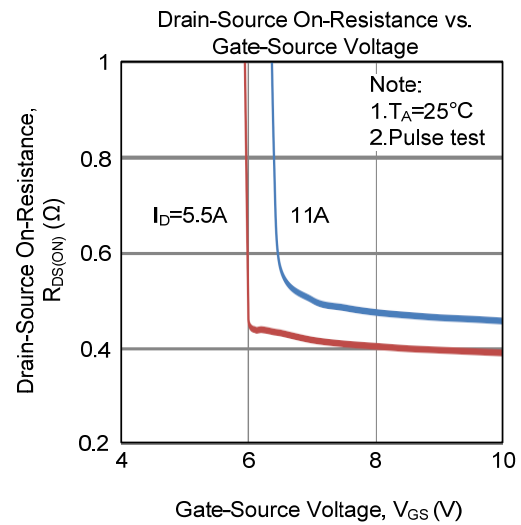
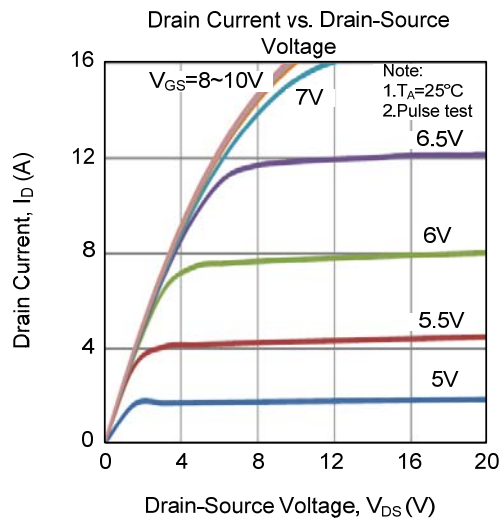


Unclamped Inductive Switching Test Circuit

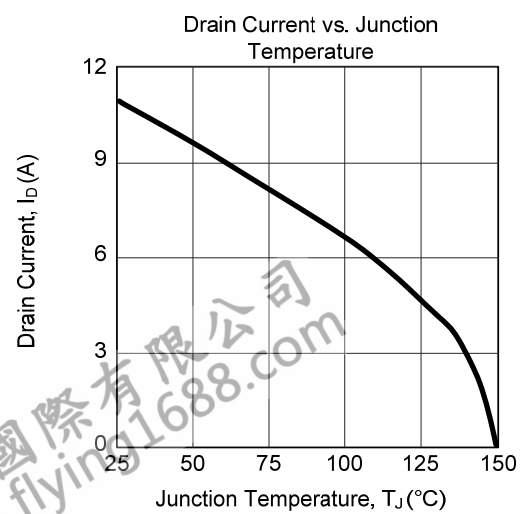
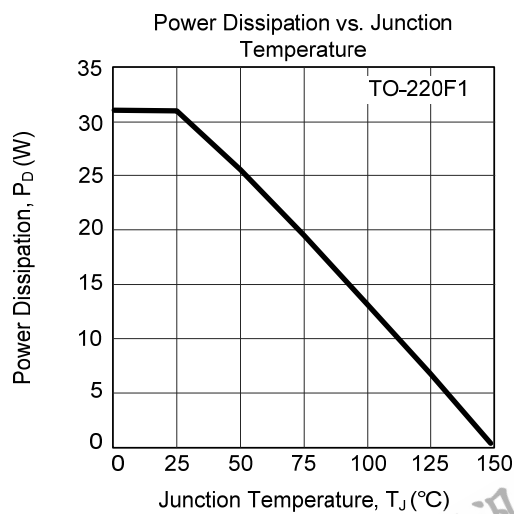
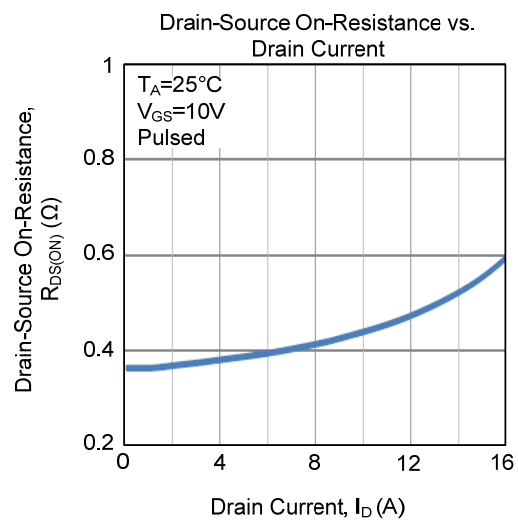
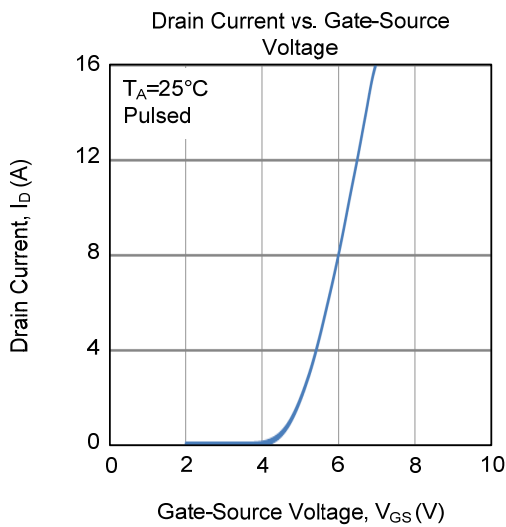
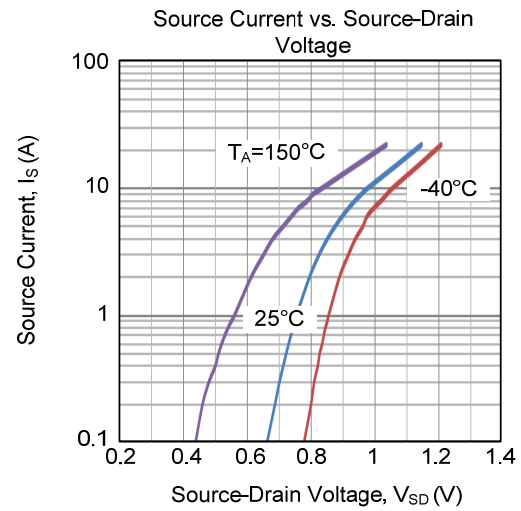
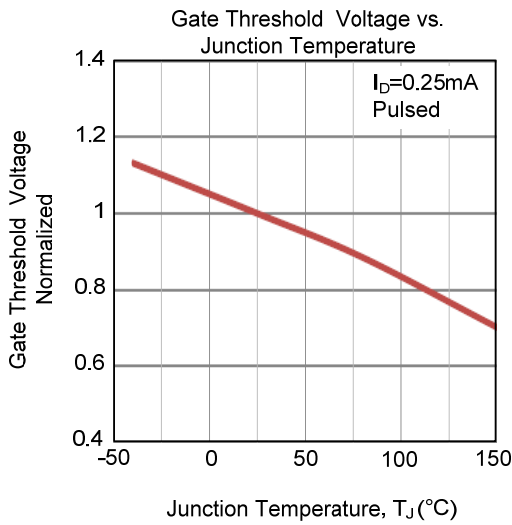


Unclamped Inductive Switching Waveforms

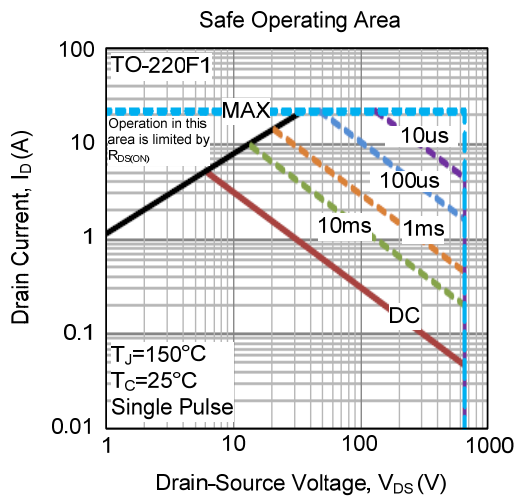
## TYPICAL CHARACTERISTICS



### ■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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