



# 7NM70-U2

*Power MOSFET*

## 7A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

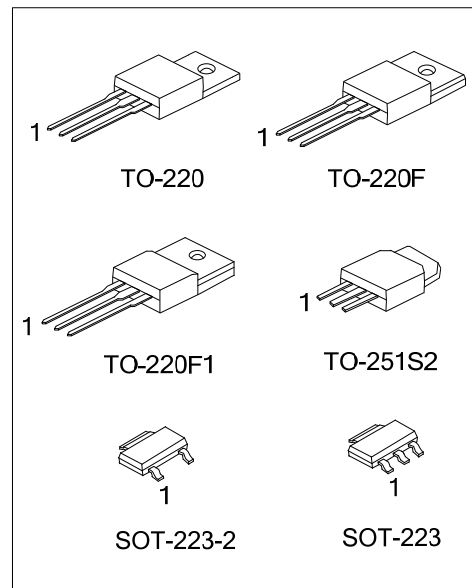
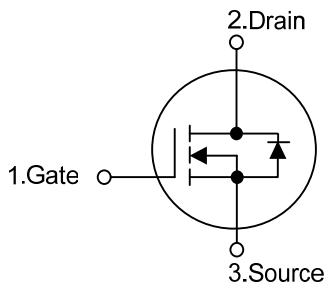
■ DESCRIPTION

The **UTC 7NM70-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

■ FEATURES

- \*  $R_{DS(ON)} \leq 1.35\Omega @ V_{GS}=10V, I_D=3.5A$
- \* Fast Switching Capability
- \* Avalanche Energy Tested
- \* Improved dv/dt Capability, High Ruggedness

■ SYMBOL



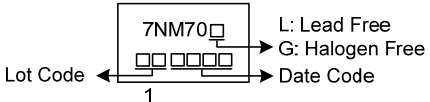
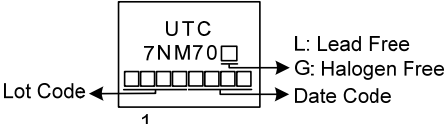
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7NM70L-AA2-R	7NM70G-AA2-R	SOT-223-2	G	D	S	Tape Reel
7NM70L-AA3-R	7NM70G-AA3-R	SOT-223	G	D	S	Tape Reel
7NM70L-TA3-T	7NM70G-TA3-T	TO-220	G	D	S	Tube
7NM70L-TF3-T	7NM70G-TF3-T	TO-220F	G	D	S	Tube
7NM70L-TF1-T	7NM70G-TF1-T	TO-220F1	G	D	S	Tube
7NM70L-TMS2-T	7NM70G-TMS2-T	TO-251S2	G	D	S	Tube

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

<p>7NM70G-AA2-R</p>	<p>(1) R: Tape Reel, T: Tube                  (2) AA2: SOT-223-2, AA3: SOT-223, TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TMS2: TO-251S2                  (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

SOT-223-2 / SOT-223	TO-220 / TO-251S2
 <p>7NM70</p> <p>Lot Code ← → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p>	 <p>UTC 7NM70</p> <p>Lot Code ← → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p>


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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	700	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	7	A
	Pulsed (Note 2)	$I_{DM}$	14	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	112	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.4	V/ns
Power Dissipation	SOT-223-2/SOT-223	$P_D$	14	W
	TO-220		78	W
	TO-220F/TO-220F1		28	W
	TO-251S2		56	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.  $L=100\text{mH}$ ,  $I_{AS}=1.5\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD}\leq 7.0\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223-2/SOT-223	$\theta_{JA}$	150	$^\circ\text{C}/\text{W}$
	TO-220/TO-220F		62.5	$^\circ\text{C}/\text{W}$
	TO-220F1			
	TO-251S2		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223-2/SOT-223	$\theta_{JC}$	8.93	$^\circ\text{C}/\text{W}$
	TO-220		1.6	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		4.46	$^\circ\text{C}/\text{W}$
	TO-251S2		2.32 (Note)	$^\circ\text{C}/\text{W}$

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

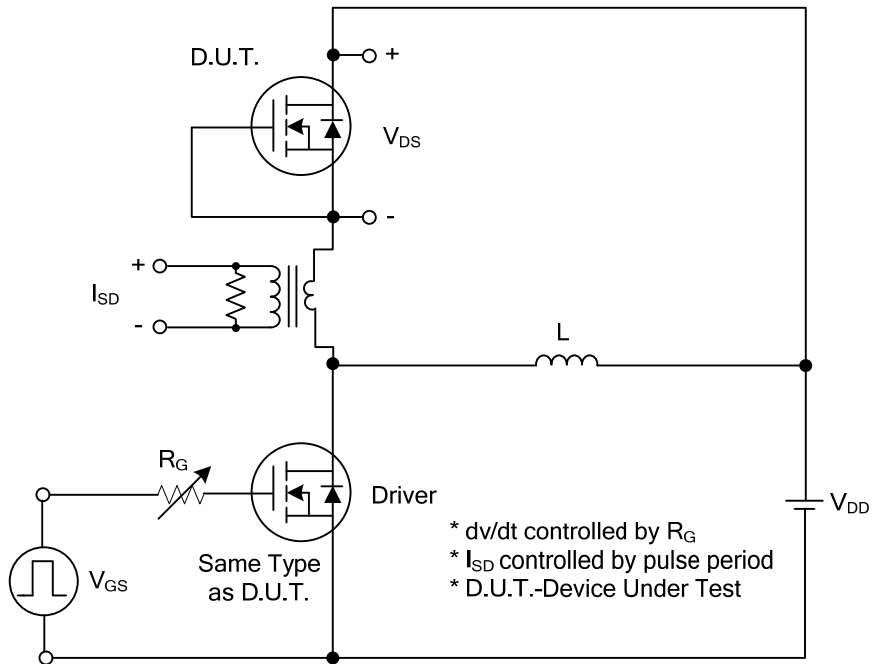
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

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	700			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =700V, V <sub>GS</sub> =0V			10	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub> V <sub>GS</sub> =30V, V <sub>DS</sub> =0V			100	nA
	Reverse		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100
<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
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A			1.35	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0 MHz		350		pF
Output Capacitance	C <sub>OSS</sub>			203		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			18		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =560V, V <sub>GS</sub> =10V, I <sub>D</sub> =7A, I <sub>G</sub> =1mA (Note 1, 2)		17.5		nC
Gate to Source Charge	Q <sub>GS</sub>			7		nC
Gate to Drain Charge	Q <sub>GD</sub>			4.3		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =7A, R <sub>G</sub> =25Ω (Note 1, 2)		4.8		ns
Rise Time	t <sub>R</sub>			18.3		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			42.4		ns
Fall-Time	t <sub>F</sub>			28		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				7	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				14	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =7A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =7A, V <sub>GS</sub> =0V, di/dt=100A/μs		330		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>				3.3	

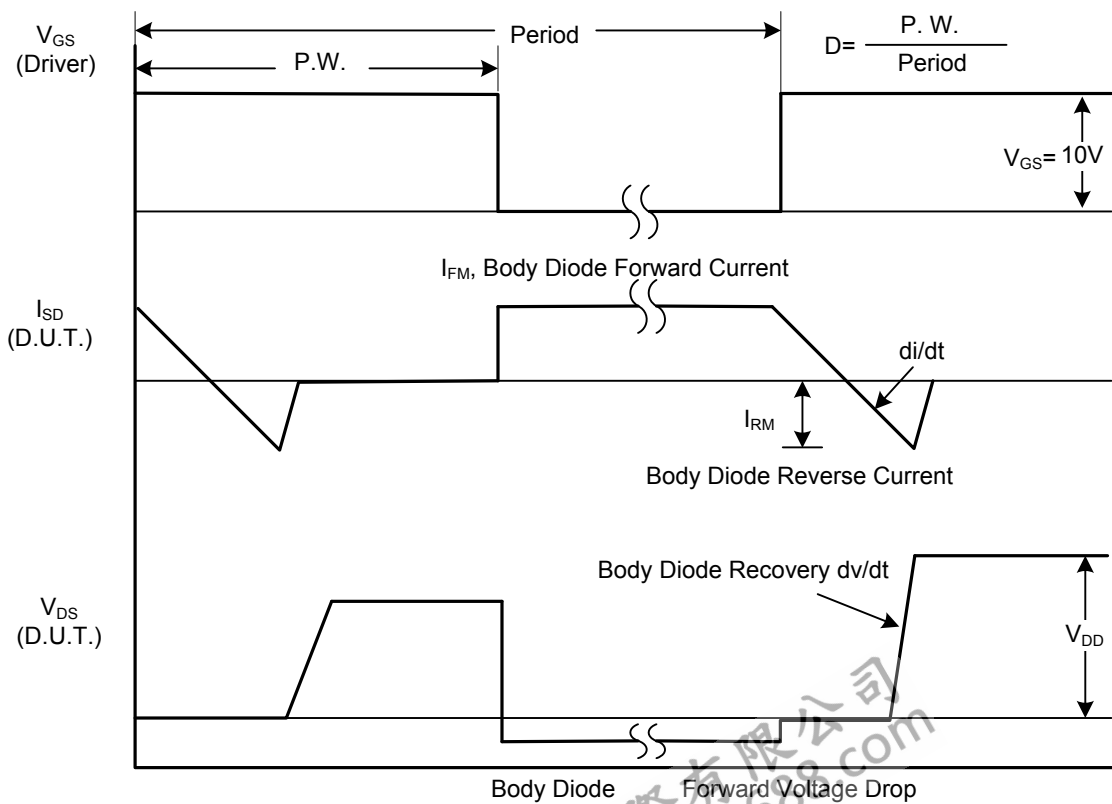
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

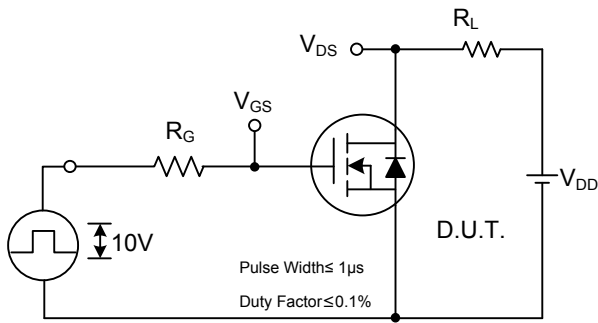


Peak Diode Recovery dv/dt Test Circuit

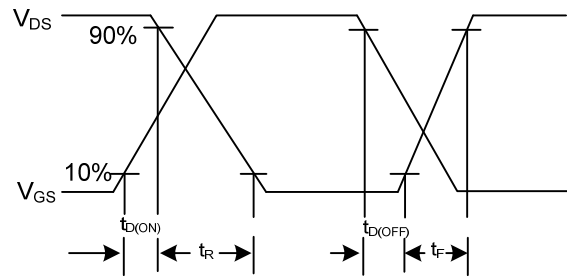


Peak Diode Recovery dv/dt Waveforms

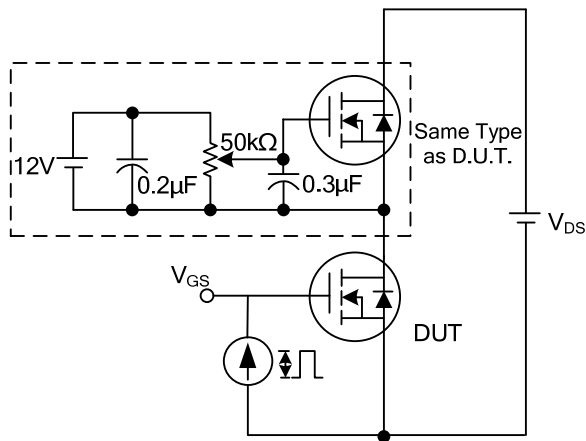
## TEST CIRCUITS AND WAVEFORMS (Cont.)



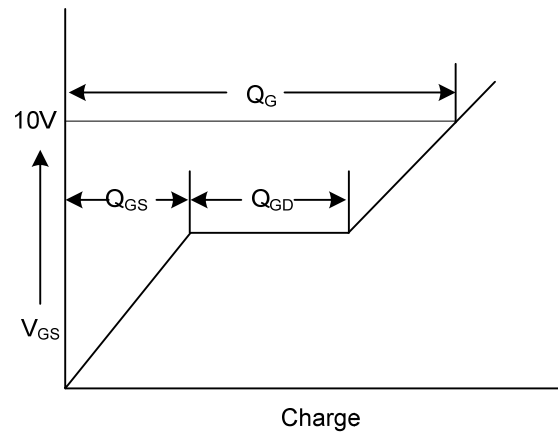
**Switching Test Circuit**



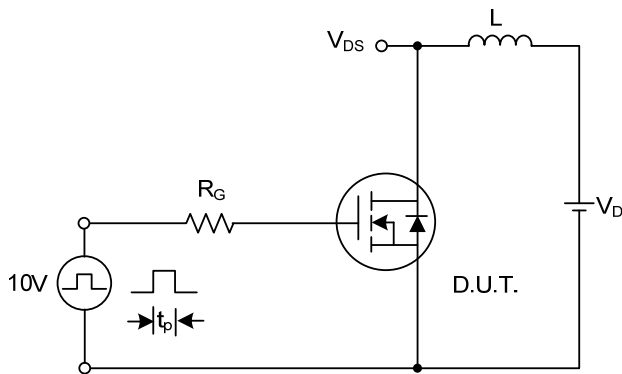
**Switching Waveforms**



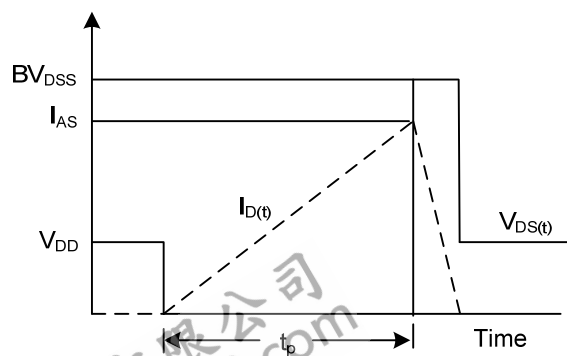
**Gate Charge Test Circuit**



**Gate Charge Waveform**

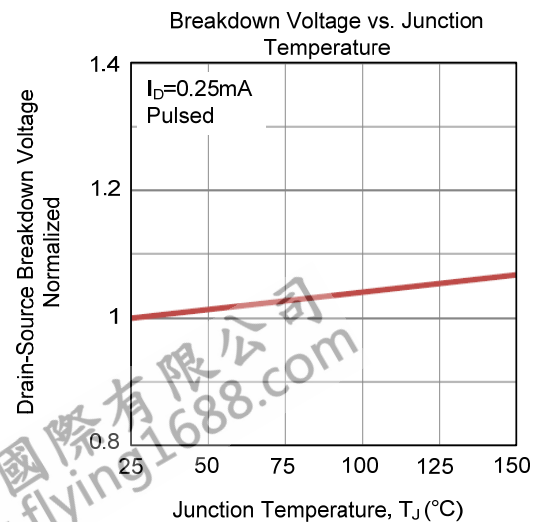
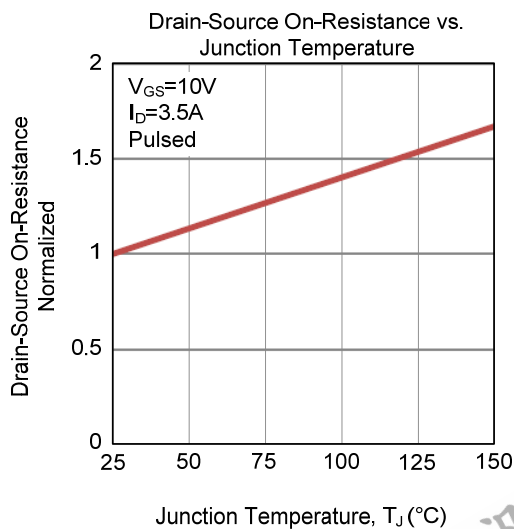
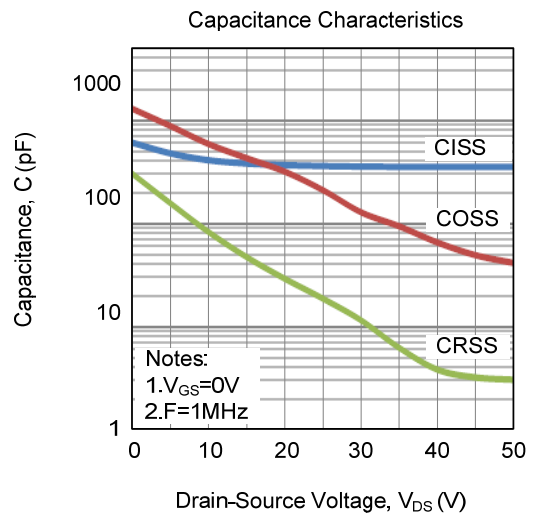
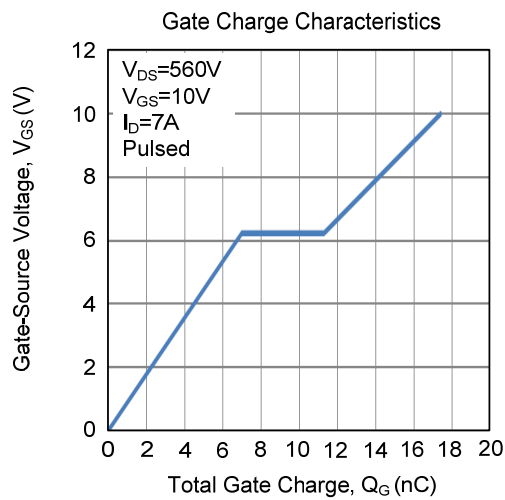
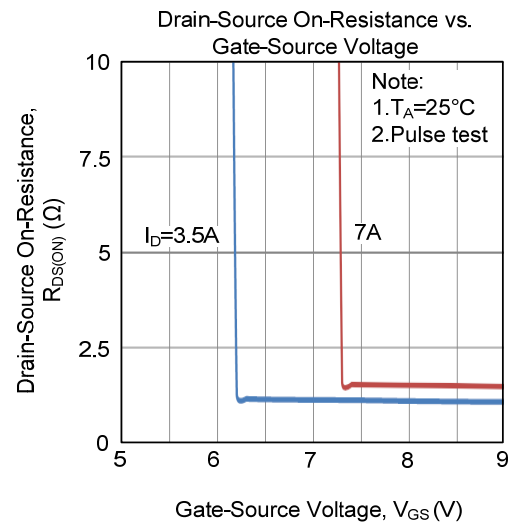
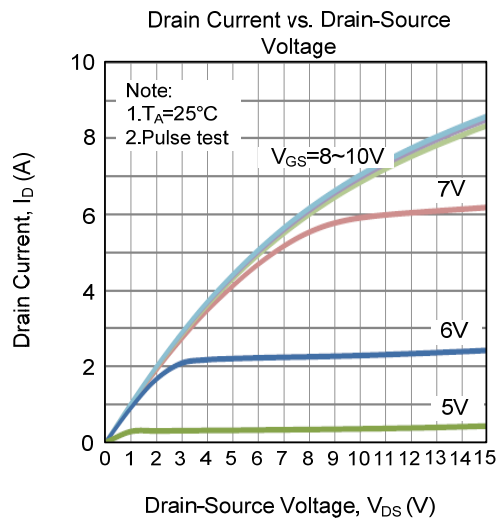


**Unclamped Inductive Switching Test Circuit**

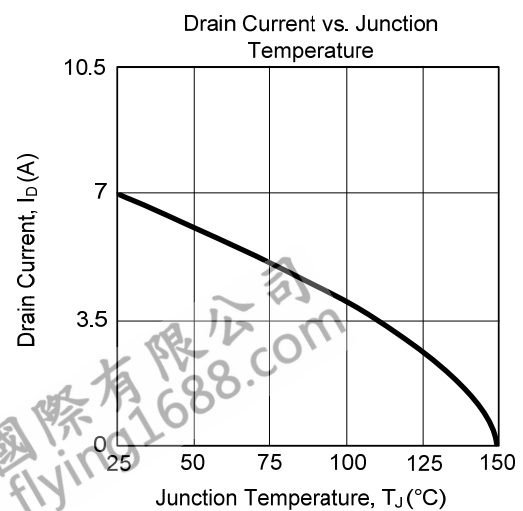
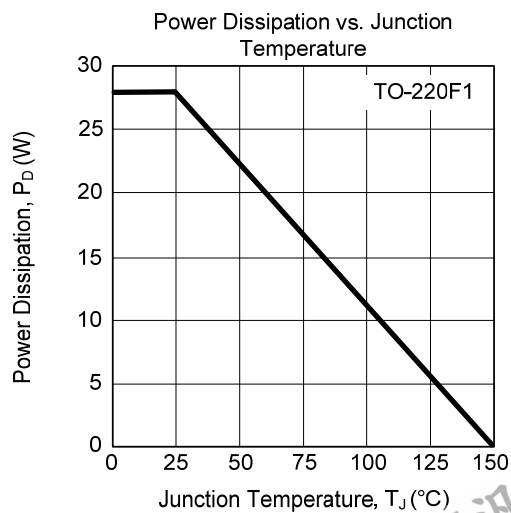
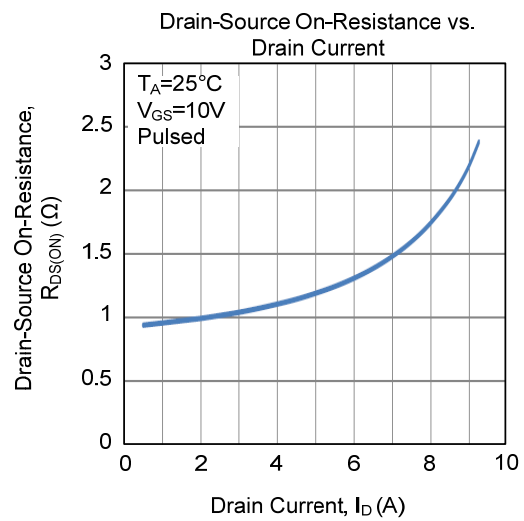
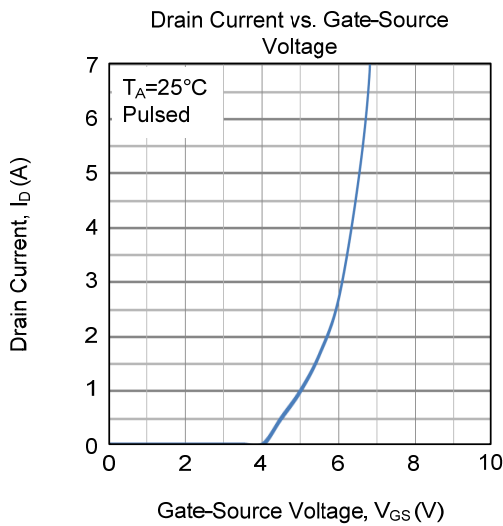
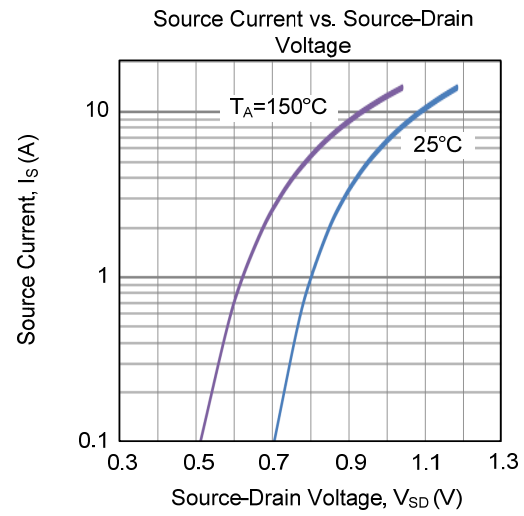
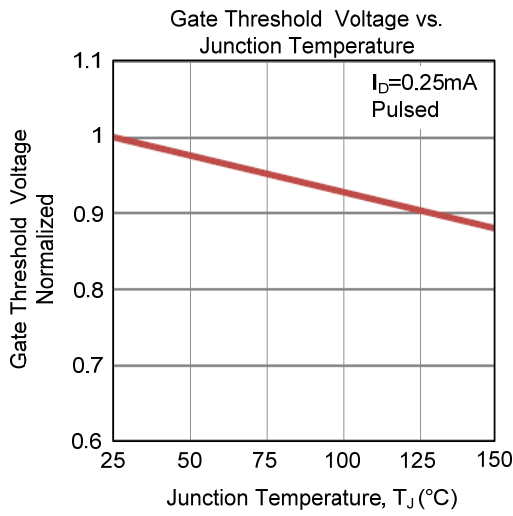


**Unclamped Inductive Switching Waveforms**

## TYPICAL CHARACTERISTICS

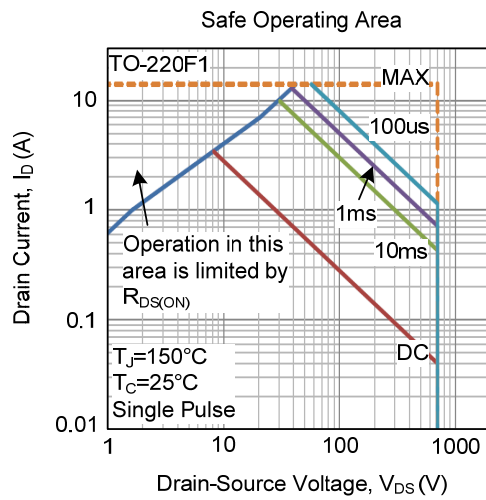


## TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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