



# 7N65A

Power MOSFET

## 7A, 650V N-CHANNEL POWER MOSFET

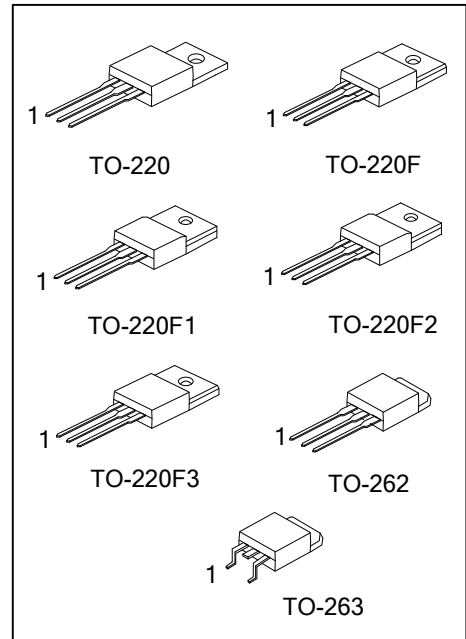
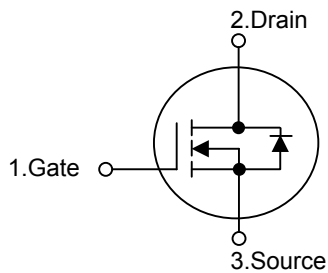
### DESCRIPTION

The UTC **7N65A** is a high voltage N-Channel enhancement mode power field effect transistors designed to have minimize on-state resistance, superior switching performance and withstand high energy pulse in the avalanche and commutation mode. This power MOSFET is well suited for high efficiency switch mode power supply.

### FEATURES

- \*  $R_{DS(ON)} \leq 1.4\Omega$  @  $V_{GS}=10V, I_D=3.5A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

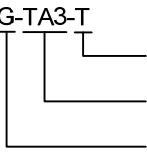
### SYMBOL



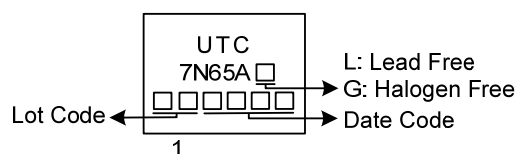
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N65AL-TA3-T	7N65AG-TA3-T	TO-220	G	D	S	Tube
7N65AL-TF3-T	7N65AG-TF3-T	TO-220F	G	D	S	Tube
7N65AL-TF1-T	7N65AG-TF1-T	TO-220F1	G	D	S	Tube
7N65AL-TF2-T	7N65AG-TF2-T	TO-220F2	G	D	S	Tube
7N65AL-TF3T-T	7N65AG-TF3T-T	TO-220F3	G	D	S	Tube
7N65AL-T2Q-T	7N65AG-T2Q-T	TO-262	G	D	S	Tube
7N65AL-TQ2-T	7N65AG-TQ2-T	TO-263	G	D	S	Tube
7N65AL-TQ2-R	7N65AG-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>7N65AG-TA3-T</p>  <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1 TF2: TO-220F2, TF3T: TO-220F3, T2Q: TO-262, TQ2: TO-263 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	7	A
	Pulsed (Note 2)	$I_{DM}$	28	A
Avalanche Energy (Note 3)	Single Pulsed (Note 3)	$E_{AS}$	145	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.3	V/ns
Power Dissipation	TO-220/TO-262 TO-263	$P_D$	65	W
	TO-220F/TO-220F1 TO-220F2/TO-220F3		30	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-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.  $L = 10\text{mH}$ ,  $I_{AS} = 5.4\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 27\ \Omega$ , 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	TO-220/TO-262 TO-263	$\theta_{JA}$	83.3	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2/TO-220F3		62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262 TO-263	$\theta_{JC}$	1.92	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2/TO-220F3		4.16	$^\circ\text{C}/\text{W}$

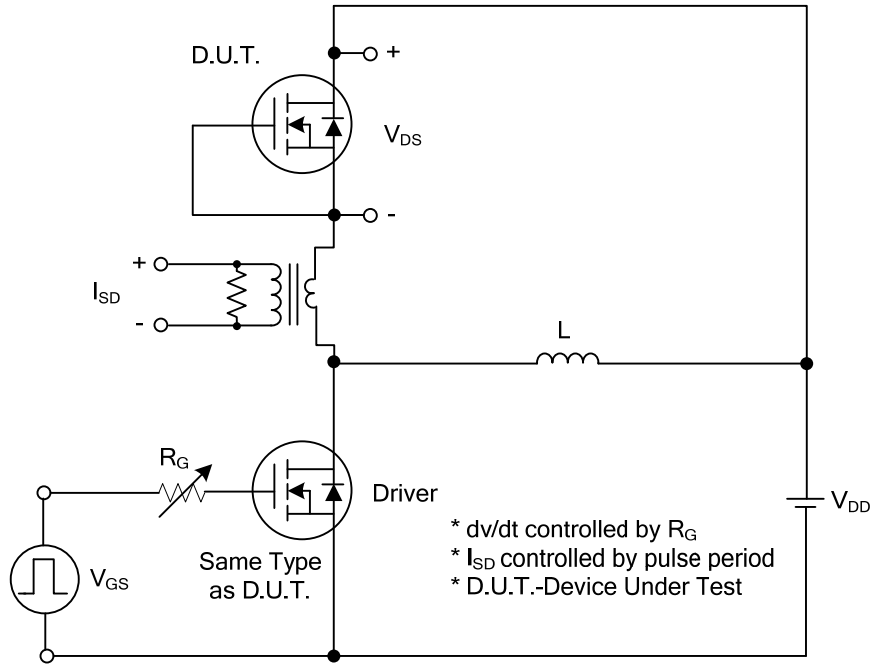
■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	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> =3.5A		1.05	1.4	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz		1630		pF
Output Capacitance	C <sub>OSS</sub>			117		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			12.5		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =7.0A I <sub>G</sub> =1mA (Note 1, 2)		50		nC
Gate-Source Charge	Q <sub>GS</sub>			8		nC
Gate-Drain Charge	Q <sub>GD</sub>			8		nC
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =7.0A R <sub>G</sub> =25Ω (Note 1, 2)		19		ns
Turn-On Rise Time	t <sub>R</sub>			16.5		ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			130		ns
Turn-Off Fall Time	t <sub>F</sub>			43.8		ns
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				7	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				28	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =7A			1.4	V
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =7A, dI <sub>F</sub> /dt=100A/μs (Note1)		280		ns
Reverse Recovery Charge	Q <sub>rr</sub>			3		μC

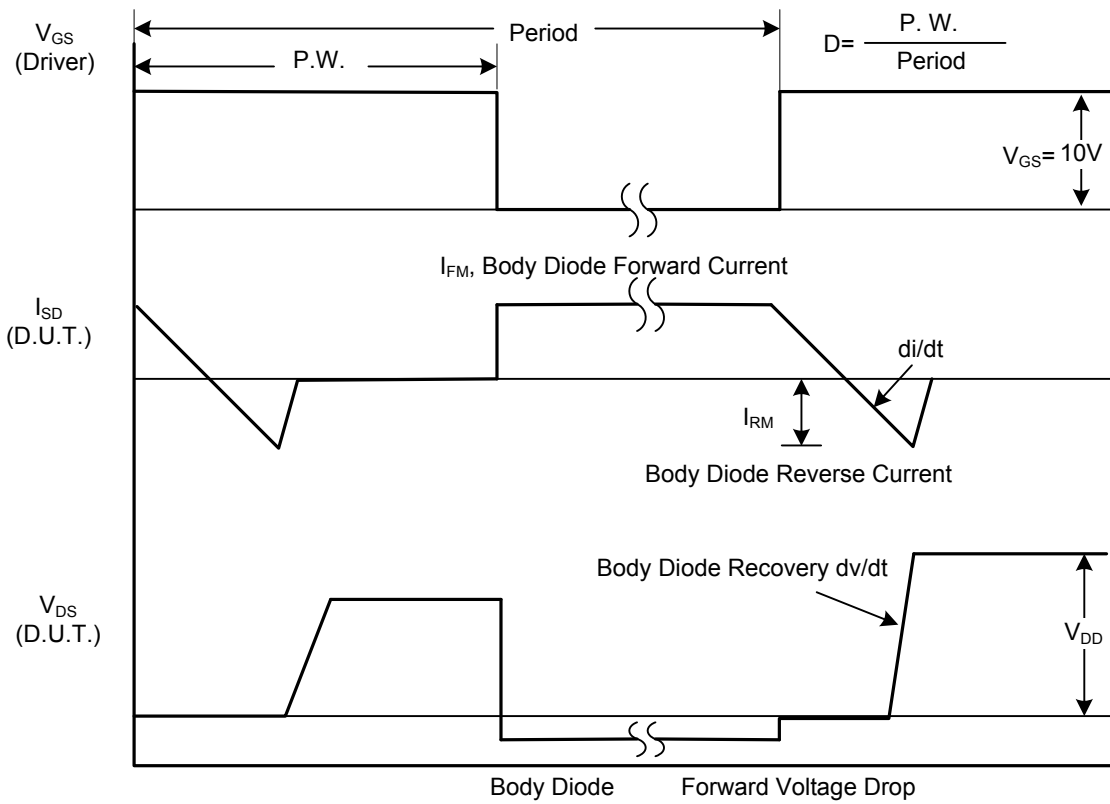
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

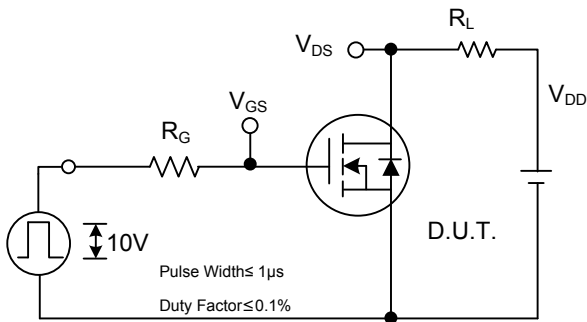


Peak Diode Recovery  $dv/dt$  Test Circuit

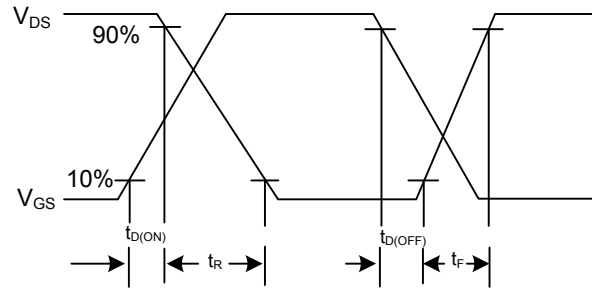


Peak Diode Recovery  $dv/dt$  Waveforms

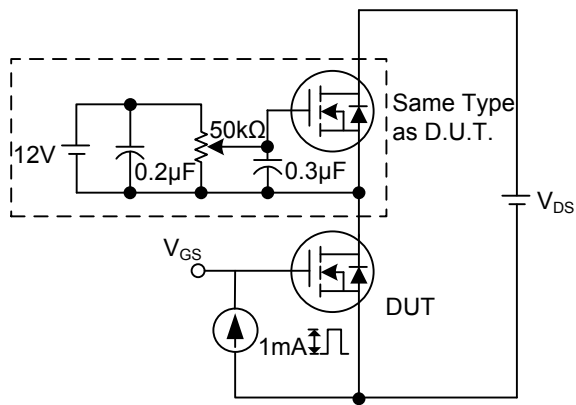
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



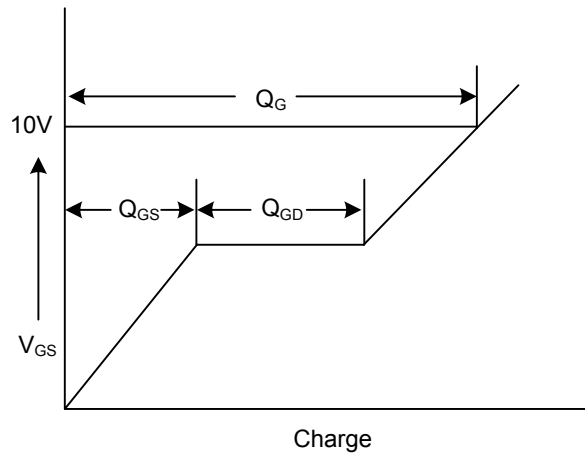
**Switching Test Circuit**



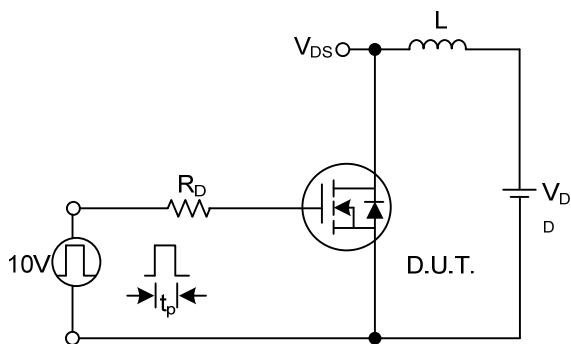
**Switching Waveforms**



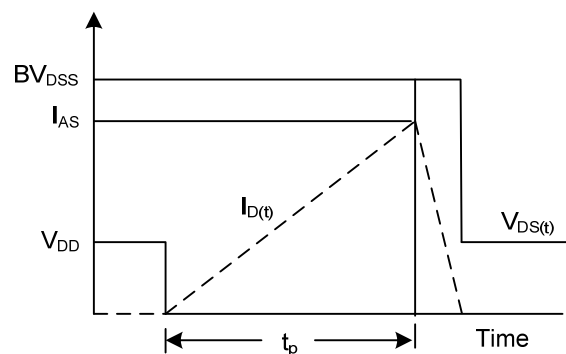
**Gate Charge Test Circuit**



**Gate Charge Waveform**

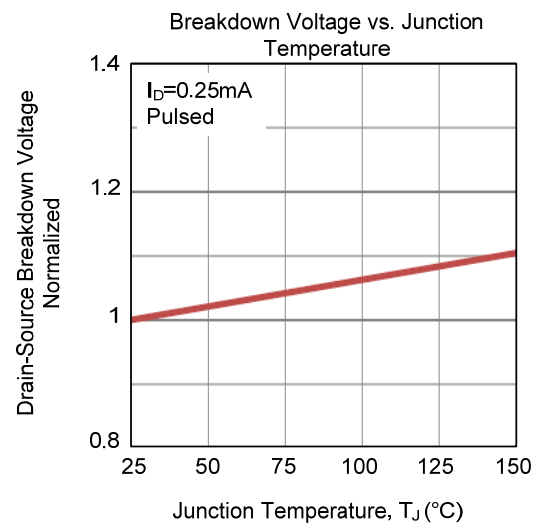
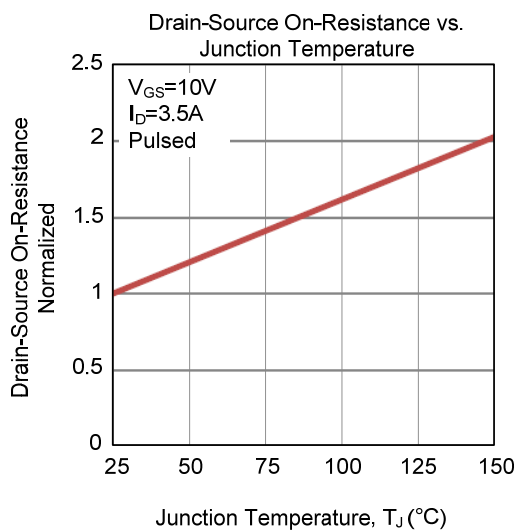
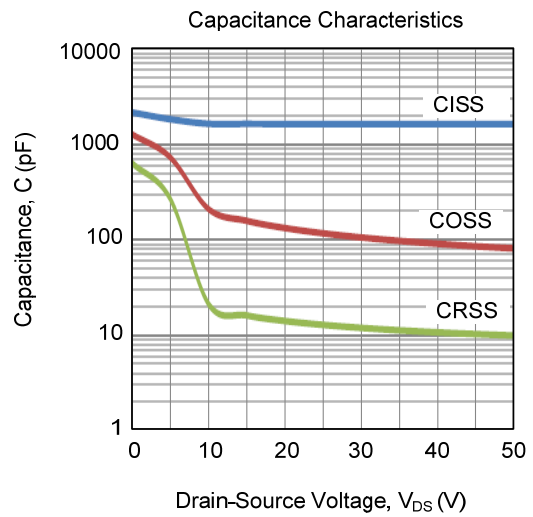
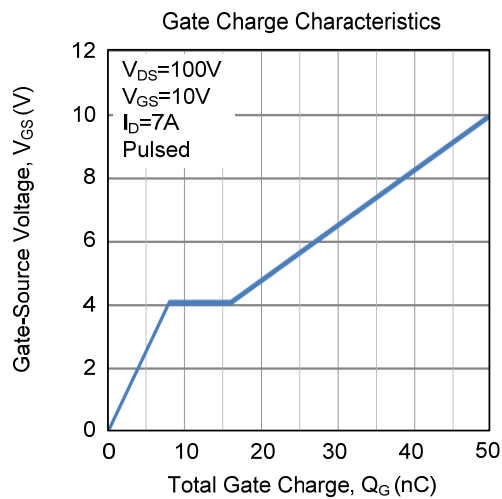
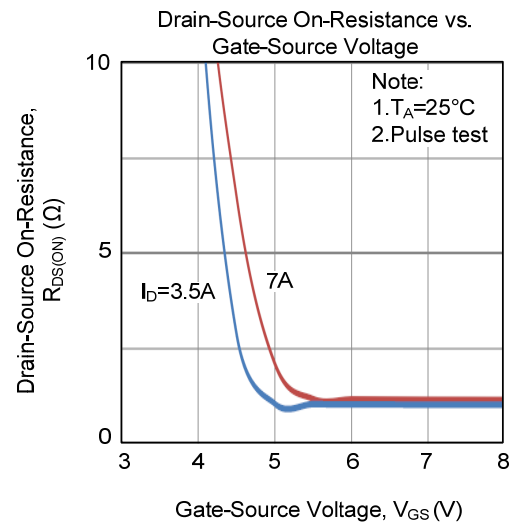
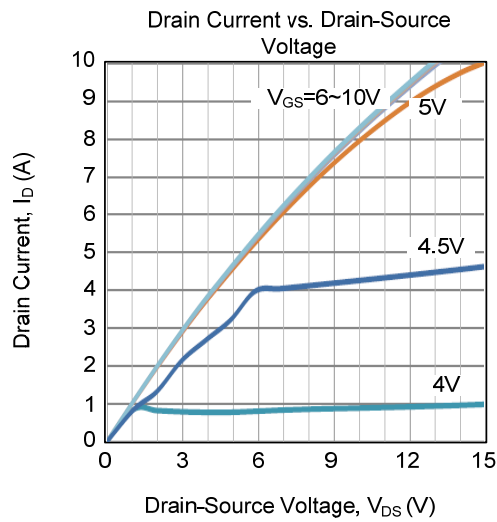


**Unclamped Inductive Switching Test Circuit**

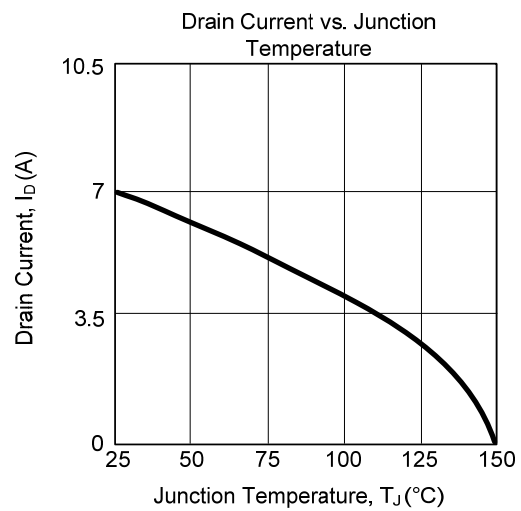
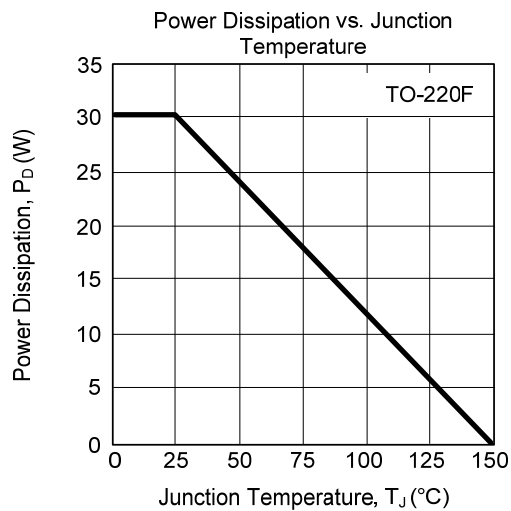
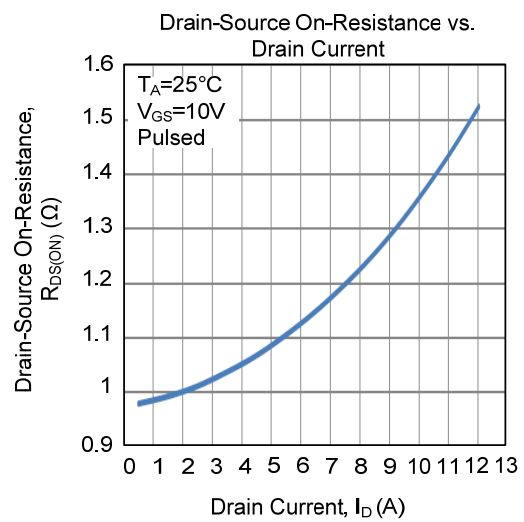
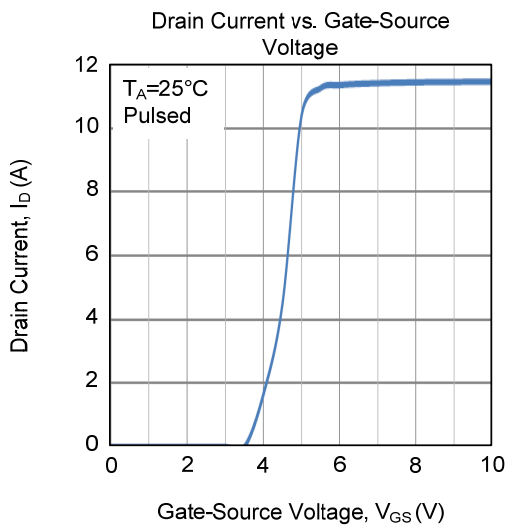
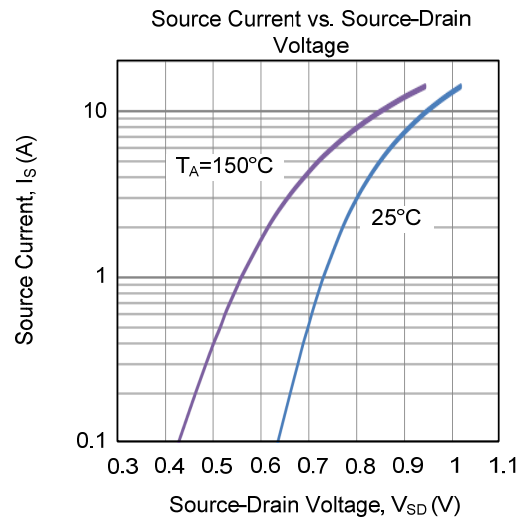
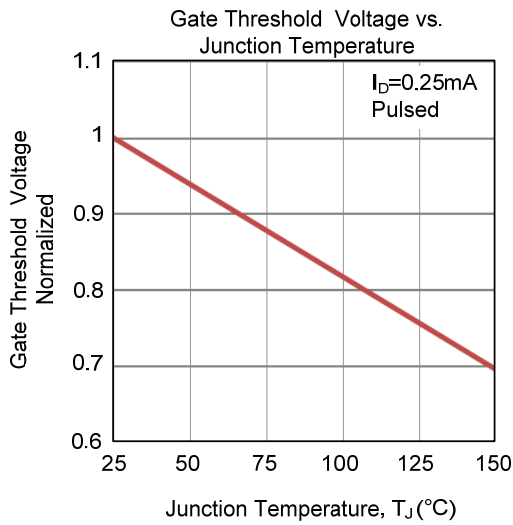


**Unclamped Inductive Switching Waveforms**

### TYPICAL CHARACTERISTICS

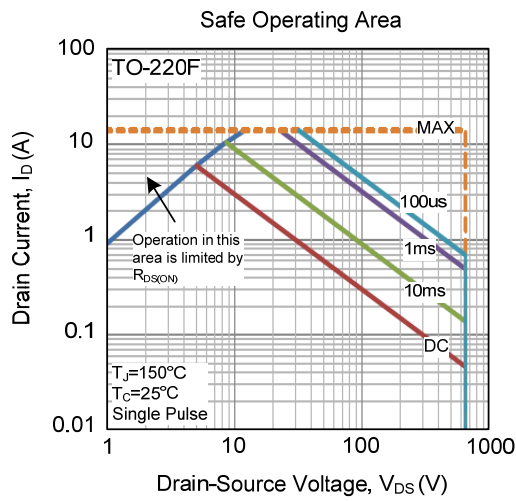


■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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