



# 11NM65

**Power MOSFET**

## 11A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

### DESCRIPTION

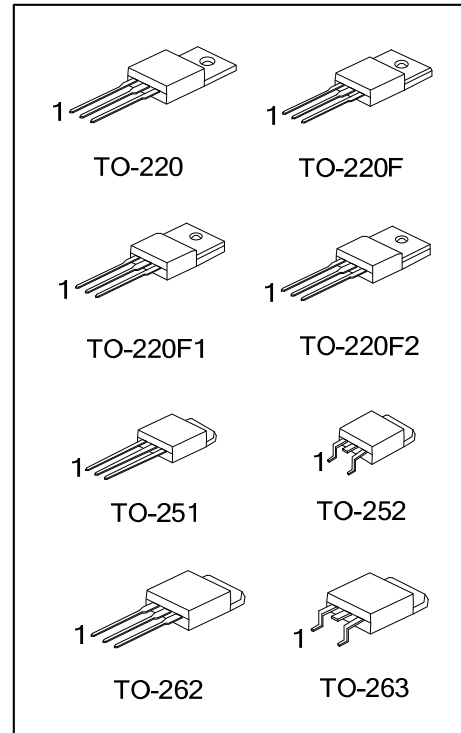
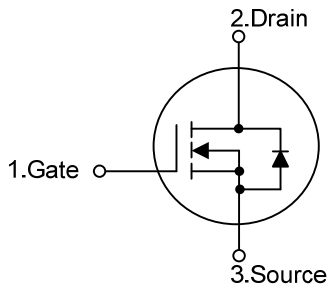
The UTC **11NM65** is a Super Junction MOSFET Structure. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **11NM65** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

### FEATURES

- \*  $R_{DS(ON)} \leq 0.52\Omega @ V_{GS}=10V, I_D=5.5A$
- \* By using Super Junction Structure
- \* Fast Switching
- \* With 100% Avalanche Tested

### SYMBOL



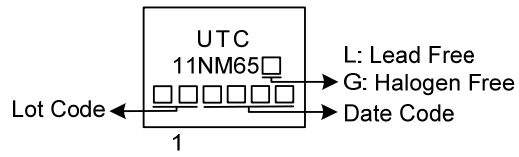
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11NM65L-TA3-T	11NM65G-TA3-T	TO-220	G	D	S	Tube
11NM65L-TF1-T	11NM65G-TF1-T	TO-220F1	G	D	S	Tube
11NM65L-TF2-T	11NM65G-TF2-T	TO-220F2	G	D	S	Tube
11NM65L-TF3-T	11NM65G-TF3-T	TO-220F	G	D	S	Tube
11NM65L-TM3-T	11NM65G-TM3-T	TO-251	G	D	S	Tube
11NM65L-TN3-R	11NM65G-TN3-R	TO-252	G	D	S	Tape Reel
11NM65L-T2Q-T	11NM65G-T2Q-T	TO-262	G	D	S	Tube
11NM65L-TQ2-T	11NM65G-TQ2-T	TO-263	G	D	S	Tube
11NM65L-TQ2-R	11NM65G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>11NM65G-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2</p> <p>TF3: TO-220F, TM3: TO-251, TN3: TO-252</p> <p>T2Q: TO-262, TQ2: TO-263</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	11	A
	Pulsed (Note 2)	$I_{DM}$	44	A
Avalanche Current (Note 2)		$I_{AR}$	2.3	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	415	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.0	V/ns
Power Dissipation	TO-220/TO-262 TO-263	$P_D$	100	W
	TO-220F/TO-220F1 TO-220F2		30	W
	TO-251/TO-252		60	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.  $L = 157\text{mH}$ ,  $I_{AS} = 2.3\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 11\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-262/ TO-263	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262 TO-263	$\theta_{JC}$	1.25	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2		4.16	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.08	$^\circ\text{C}/\text{W}$

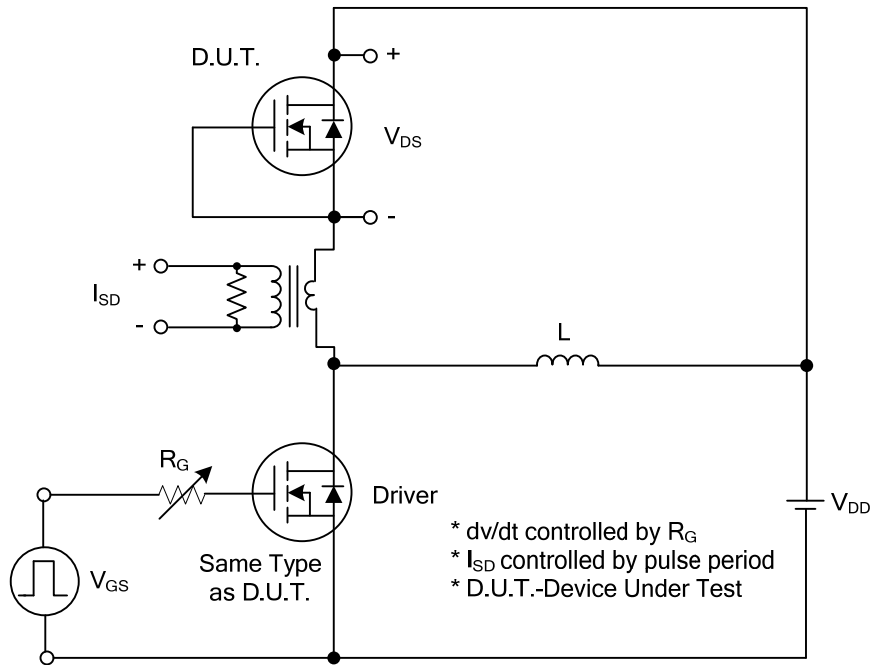
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			10	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 30V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5		4.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.5A$		0.43	0.52	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$		770		pF
Output Capacitance	$C_{OSS}$			580		pF
Reverse Transfer Capacitance	$C_{RSS}$			52		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=520V, V_{GS}=10V,$ $I_D=11A, I_G=1mA$ (Note 1, 2)		27		nC
Gate-Source Charge	$Q_{GS}$			5		nC
Gate-Drain Charge	$Q_{GD}$			8		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V,$ $I_D=11A, R_G=25\Omega$ (Note 1, 2)		11		ns
Turn-ON Rise Time	$t_R$			23		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			82		ns
Turn-OFF Fall Time	$t_F$			47		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				11	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				44	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=11A, V_{GS}=0V$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=11A, V_{GS}=0V$		360		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt=100A/\mu s$		4.6		$\mu C$

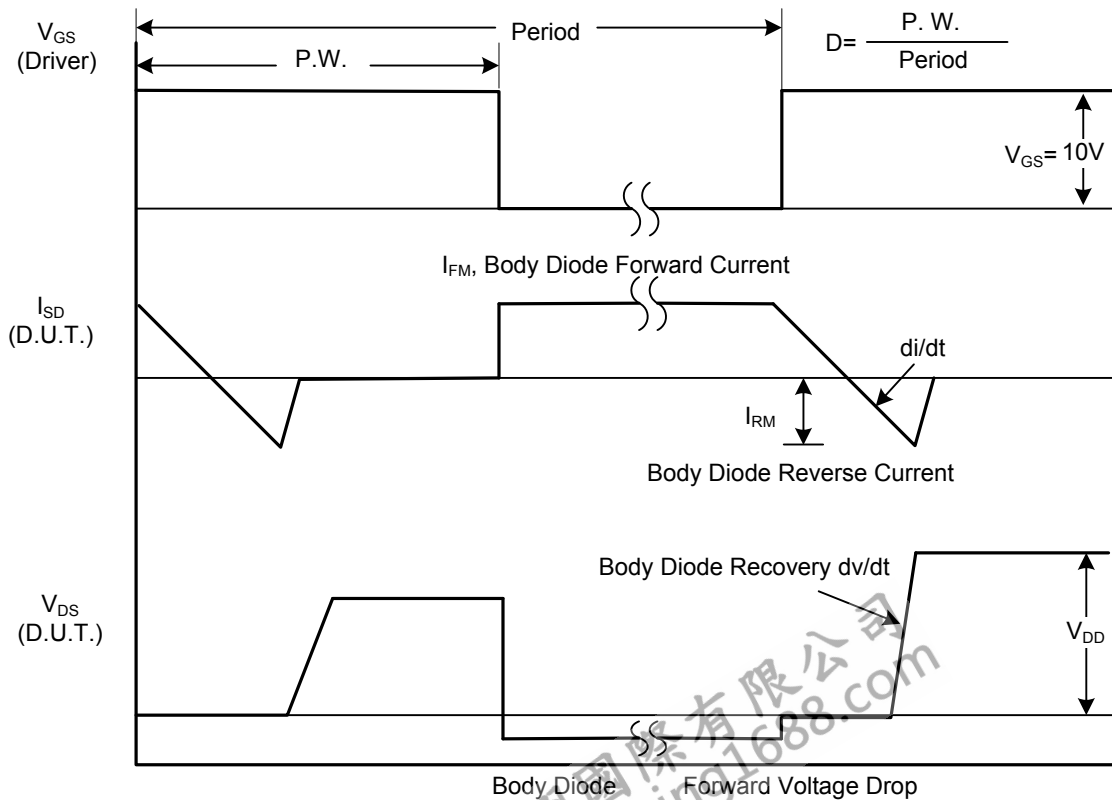
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

## ■ TEST CIRCUITS AND WAVEFORMS

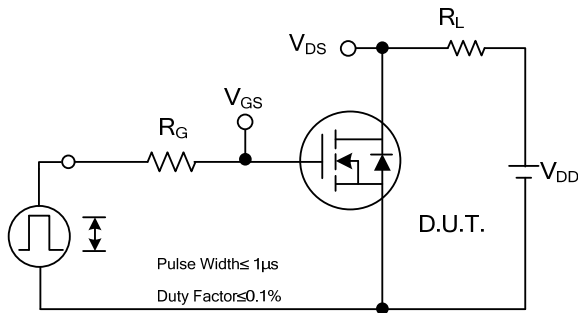


**Peak Diode Recovery dv/dt Test Circuit**

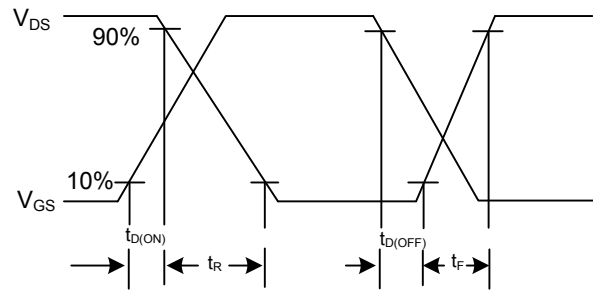


**Peak Diode Recovery dv/dt Waveforms**

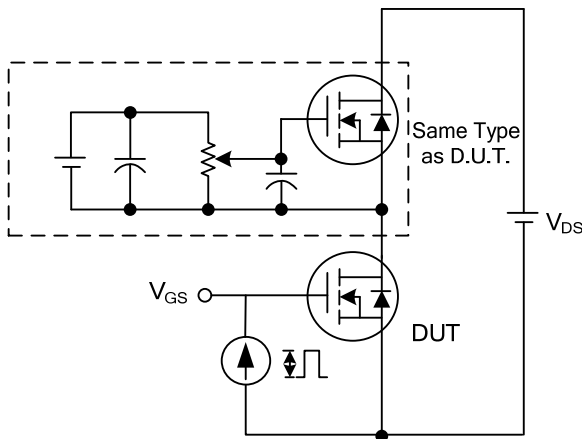
## TEST CIRCUITS AND WAVEFORMS



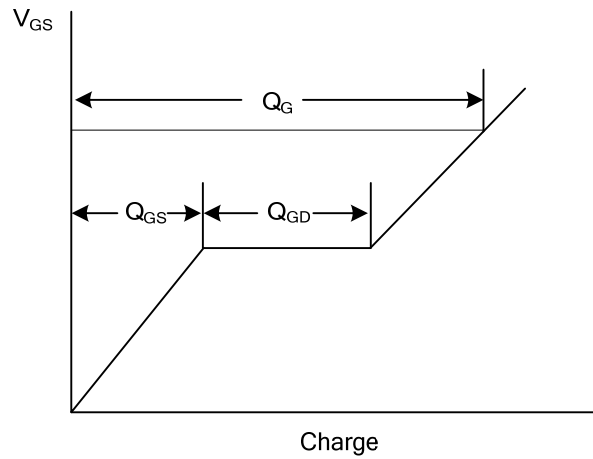
Switching Test Circuit



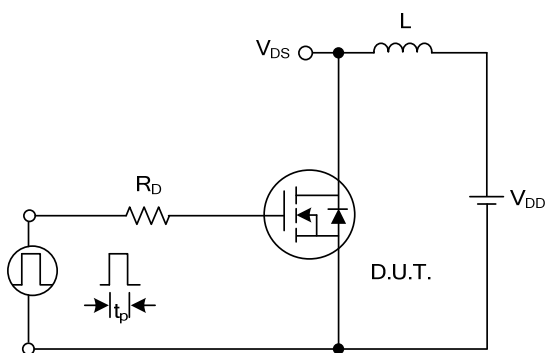
Switching Waveforms



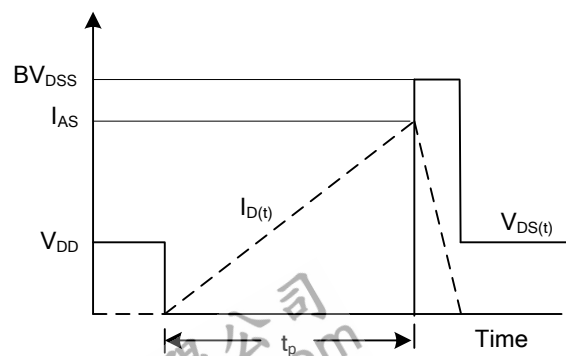
Gate Charge Test Circuit



Gate Charge Waveform

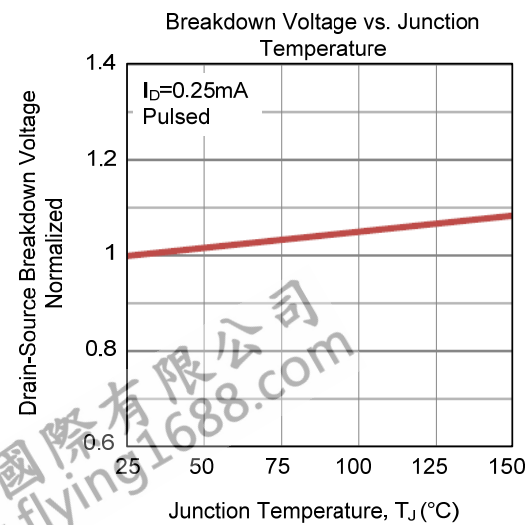
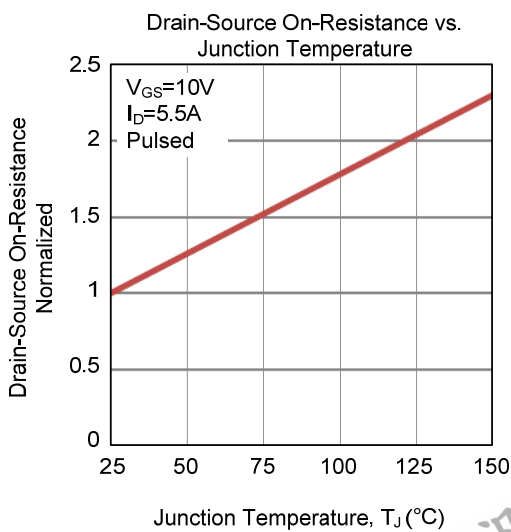
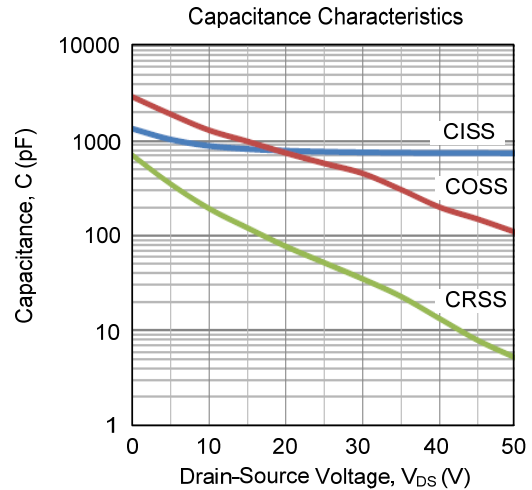
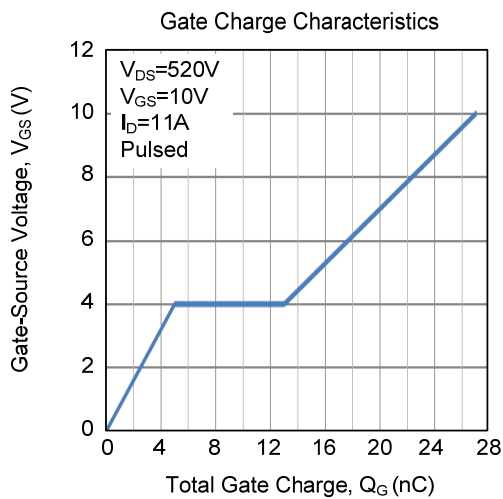
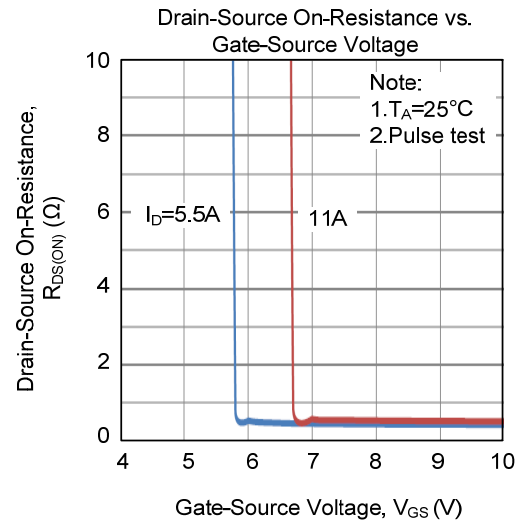
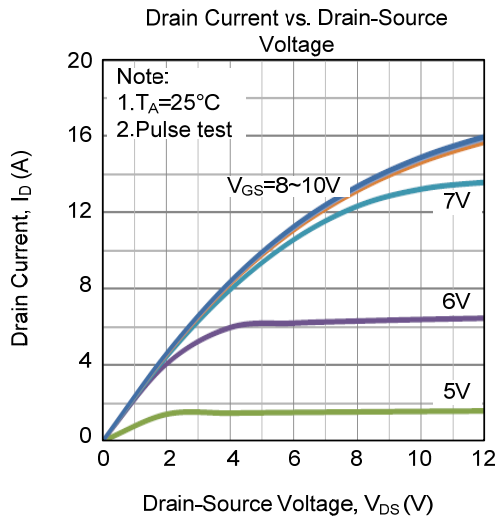


Unclamped Inductive Switching Test Circuit

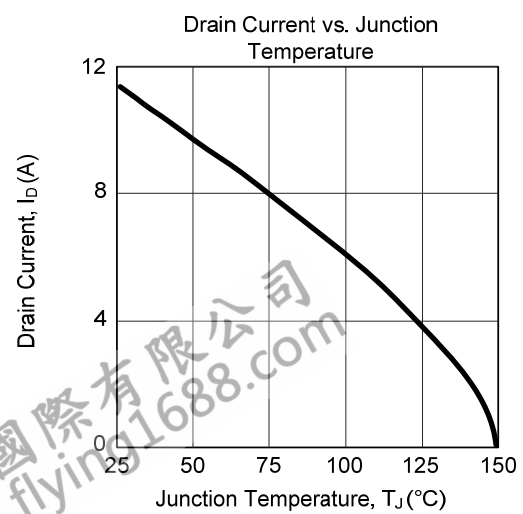
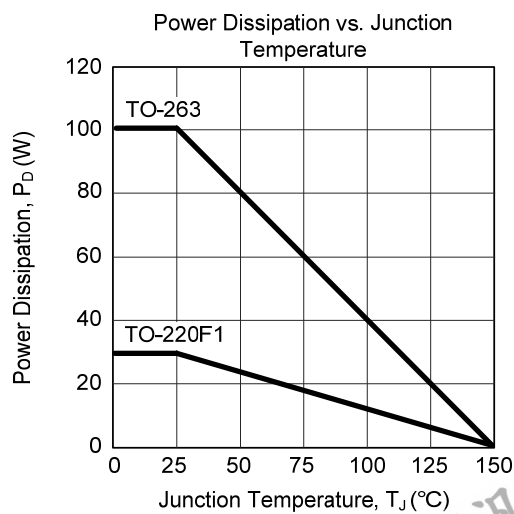
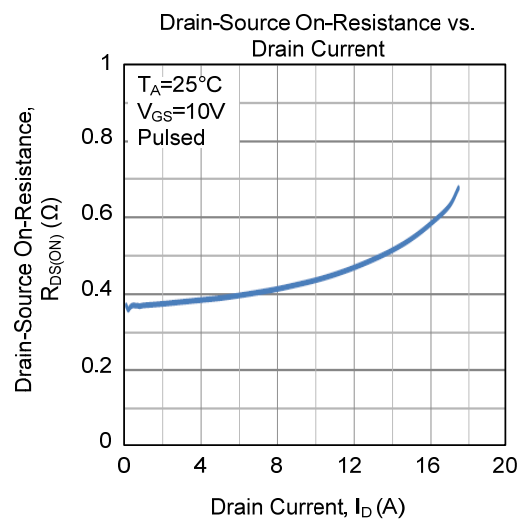
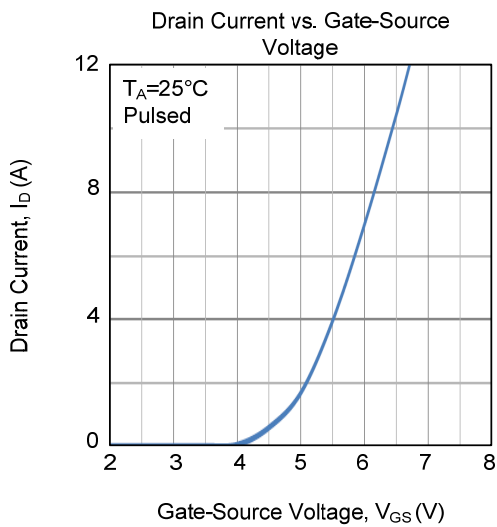
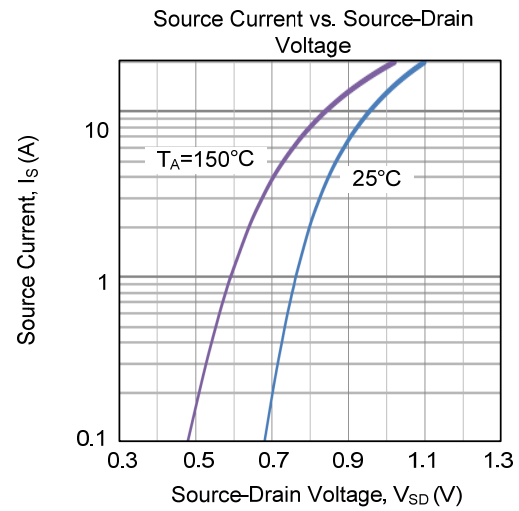
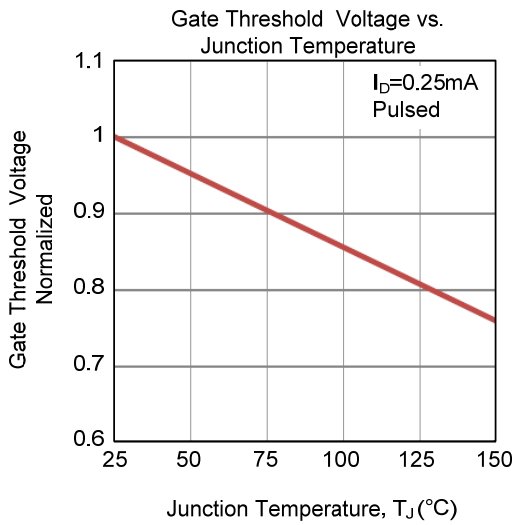


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

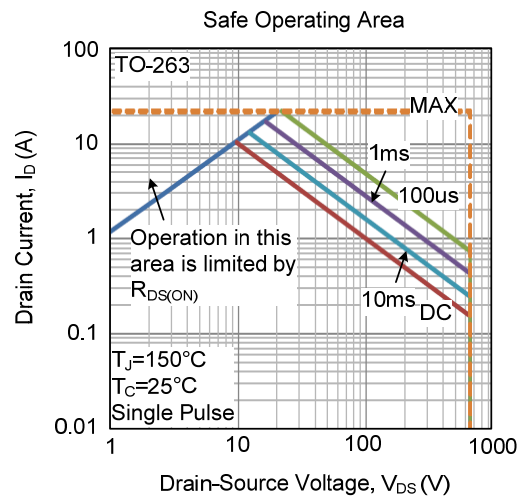
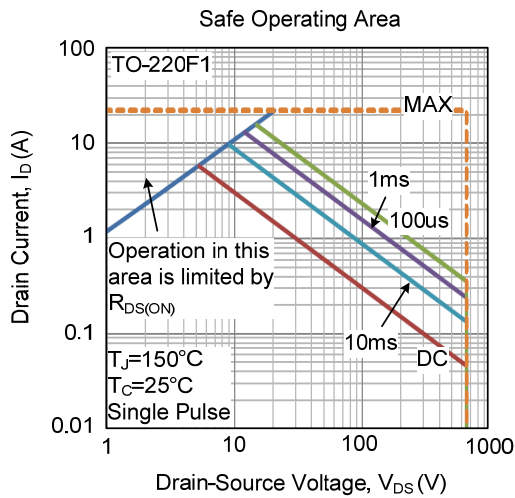


### TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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