

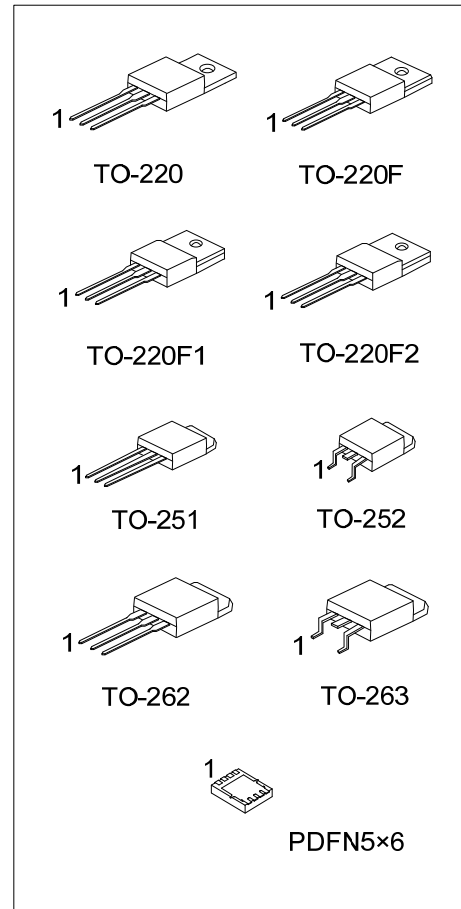
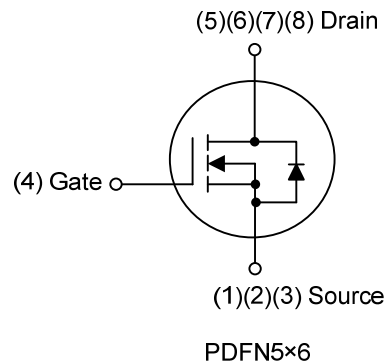
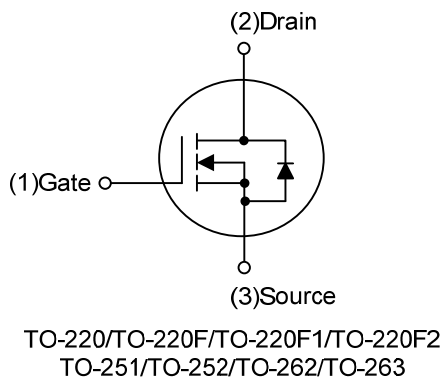
**11NM65****Power MOSFET****11A, 650V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

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	4	5	6	7	8	
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
11NM65L-P5060-R	11NM65G-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

11NM65G-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2 TF3: TO-220F, TM3: TO-251, TN3: TO-252 T2Q: TO-262, TQ2: TO-263, P5060: PDFN5×6 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

TO-220 / TO-220F / TO-220F1 / TO-220F2 TO-251 / TO-252 / TO-262 / TO-263	PDFN5×6
UTC 11NM65 Lot Code ← [] → Date Code 1 L: Lead Free G: Halogen Free	UTC 11NM65 Lot Code ← [] → Date Code

■ **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}	± 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
	PDFN5×6		28	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	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-251/TO-252		110	$^\circ\text{C/W}$
	PDFN5×6		75	$^\circ\text{C/W}$
Junction to Case	TO-220/TO-262 TO-263	θ_{JC}	1.25	$^\circ\text{C/W}$
	TO-220F/TO-220F1 TO-220F2		4.16	$^\circ\text{C/W}$
	TO-251/TO-252		2.08 (Note)	$^\circ\text{C/W}$
	PDFN5×6		4.46 (Note)	$^\circ\text{C/W}$

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

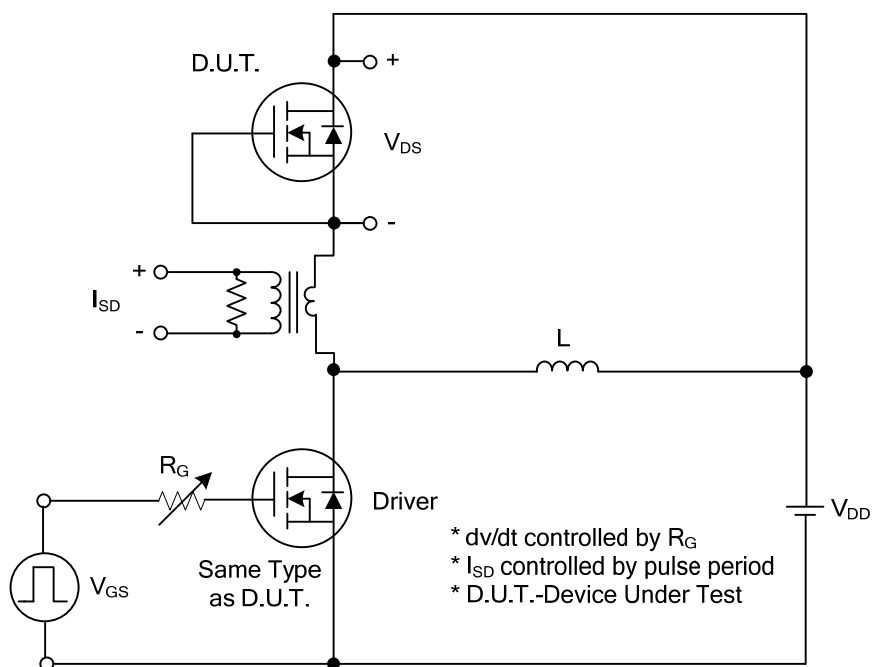
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	650			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±30V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =5.5A		0.43	0.52	Ω
DYNAMIC PARAMETERS						
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
SWITCHING PARAMETERS						
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 =25Ω (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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
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/μs		4.6		μC

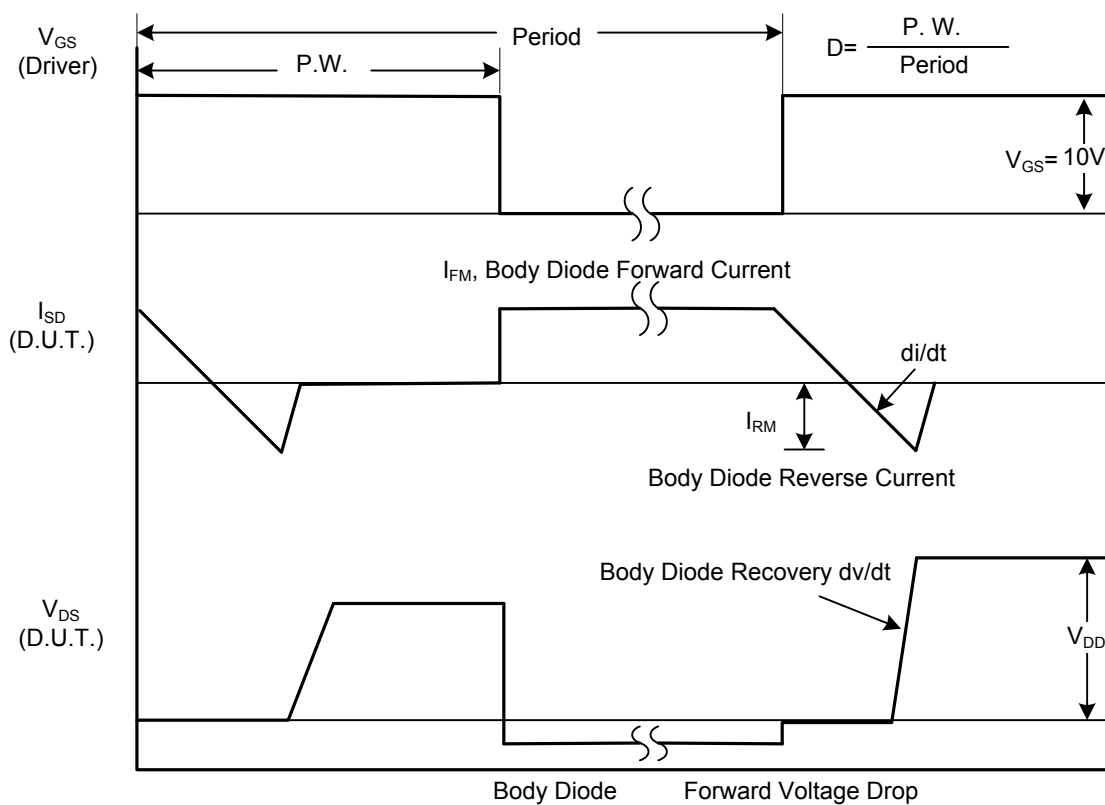
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

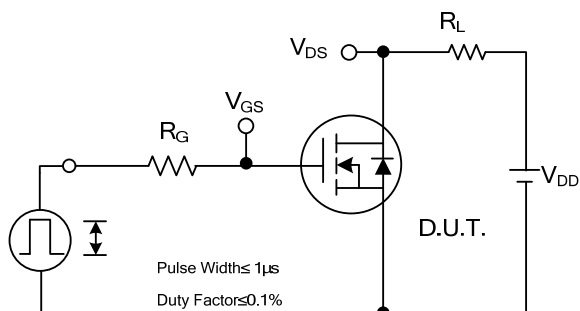


Peak Diode Recovery dv/dt Test Circuit

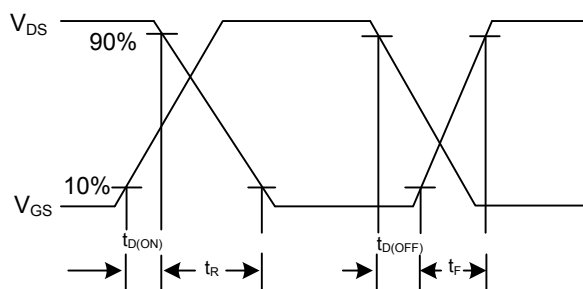


Peak Diode Recovery dv/dt Waveforms

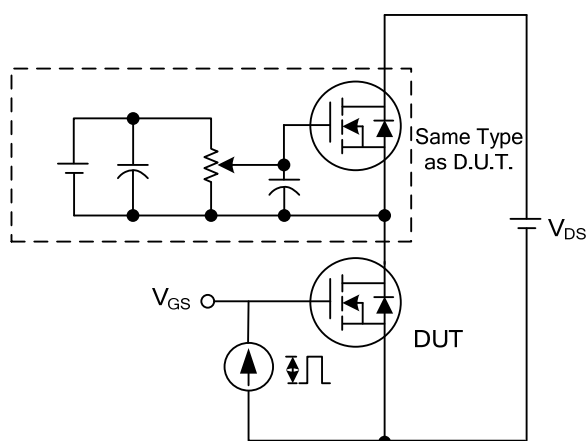
■ TEST CIRCUITS AND WAVEFORMS



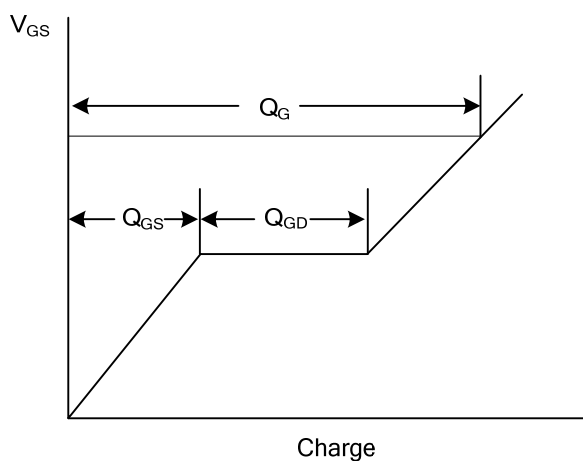
Switching Test Circuit



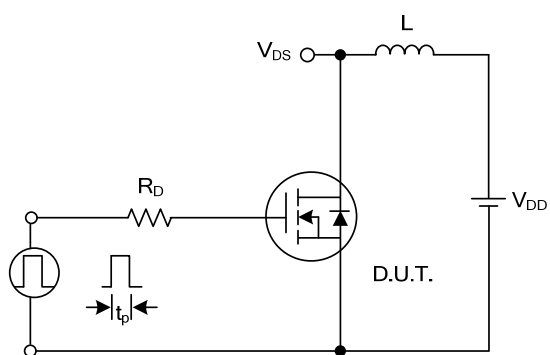
Switching Waveforms



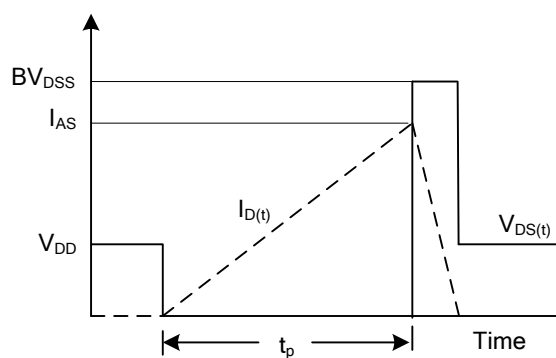
Gate Charge Test Circuit



Gate Charge Waveform

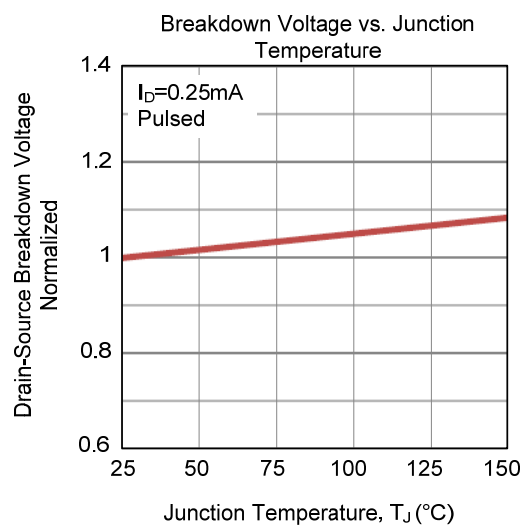
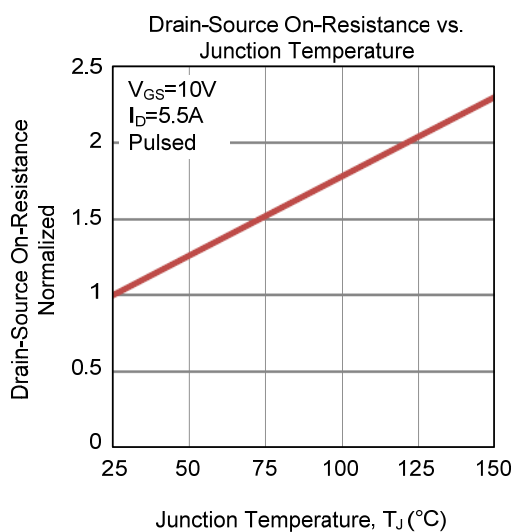
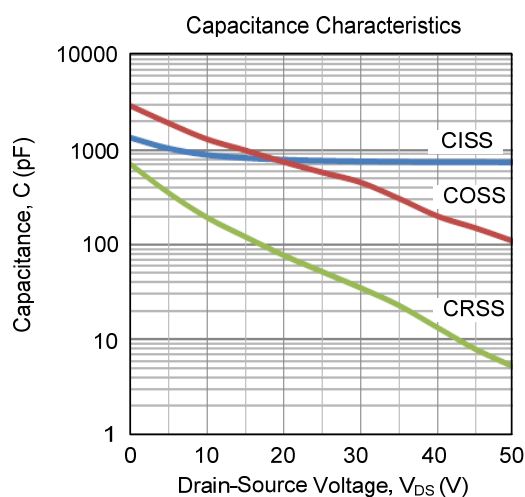
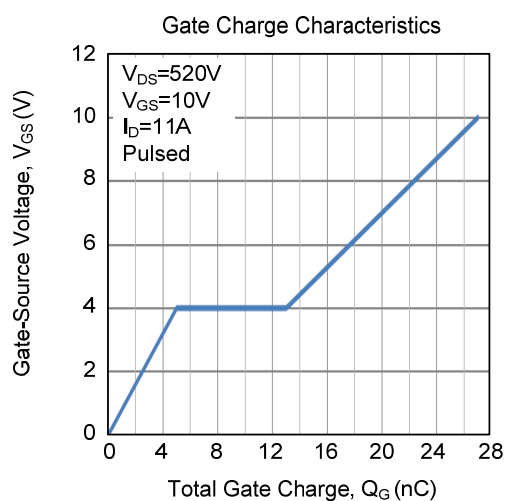
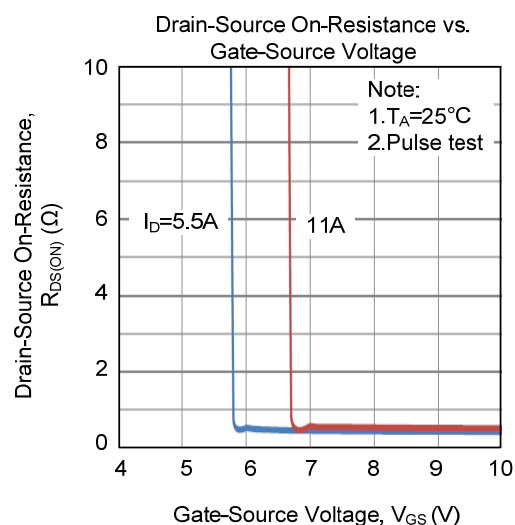
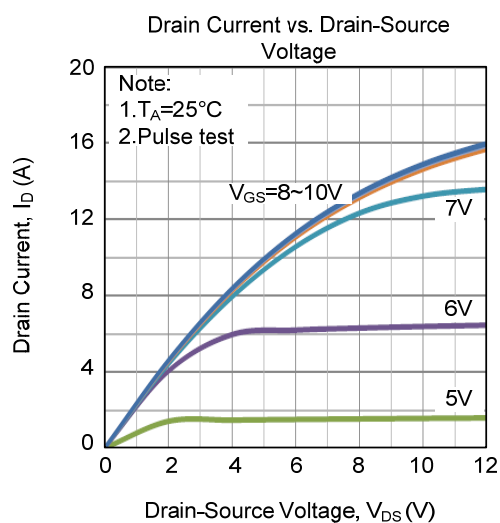


Unclamped Inductive Switching Test Circuit

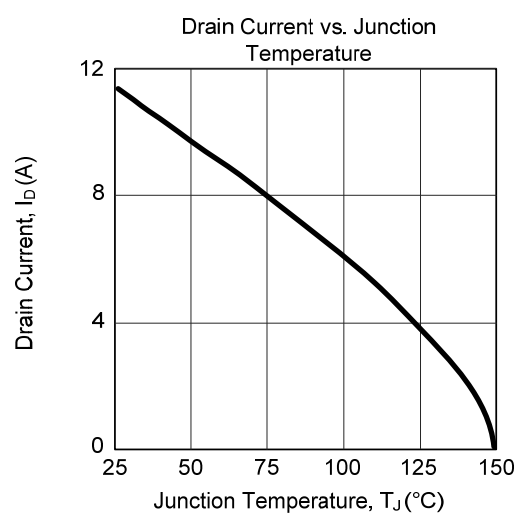
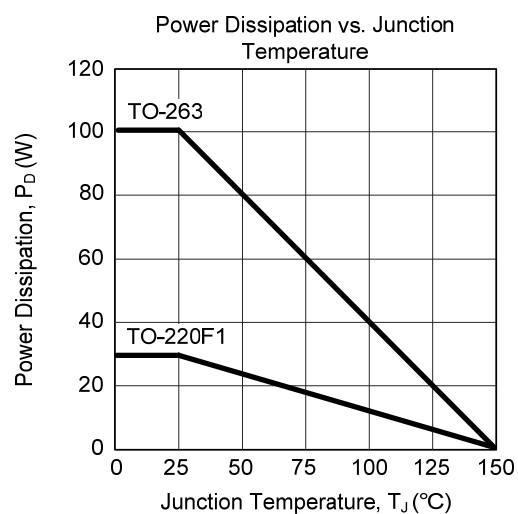
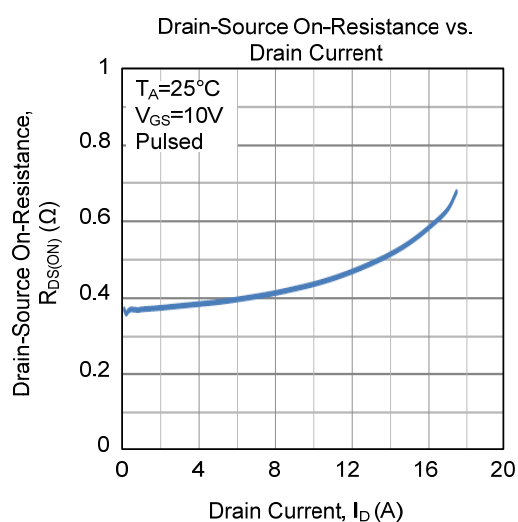
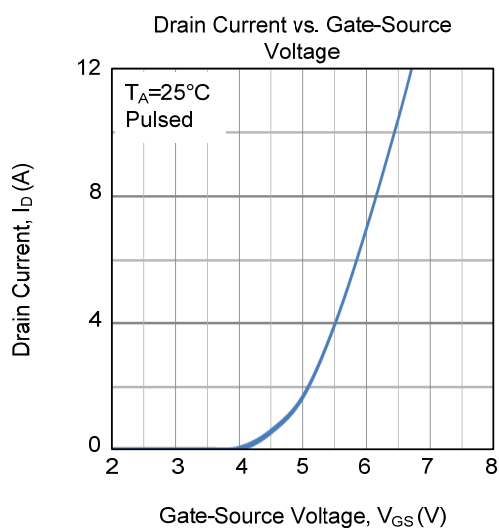
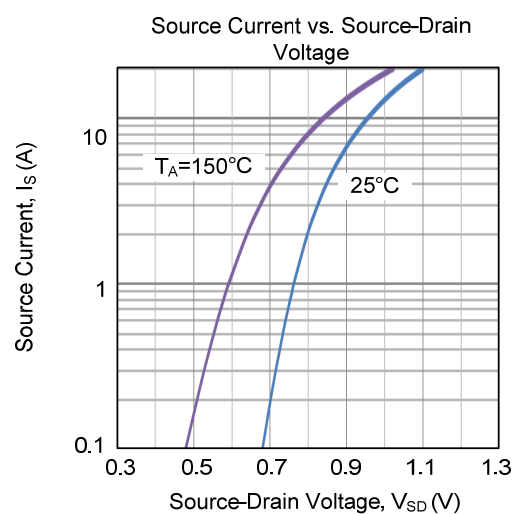
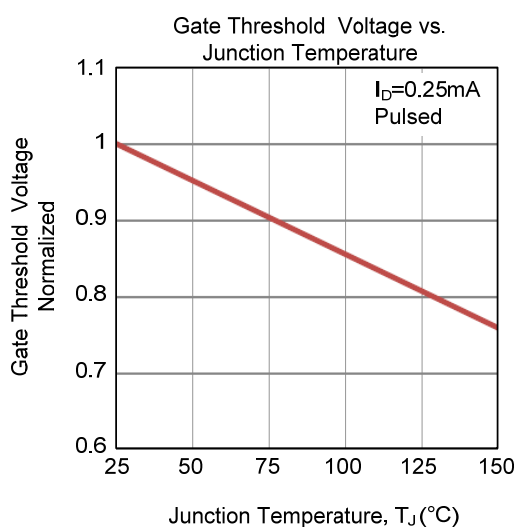


Unclamped Inductive Switching Waveforms

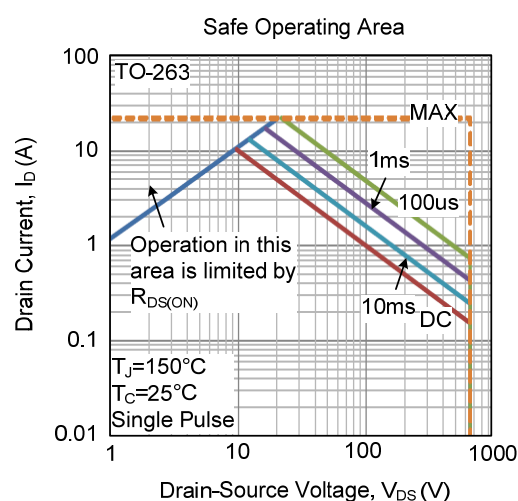
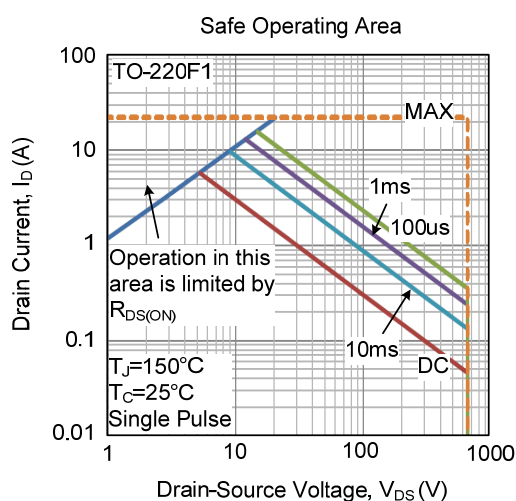
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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