



15NM60-U2

Power MOSFET

15A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

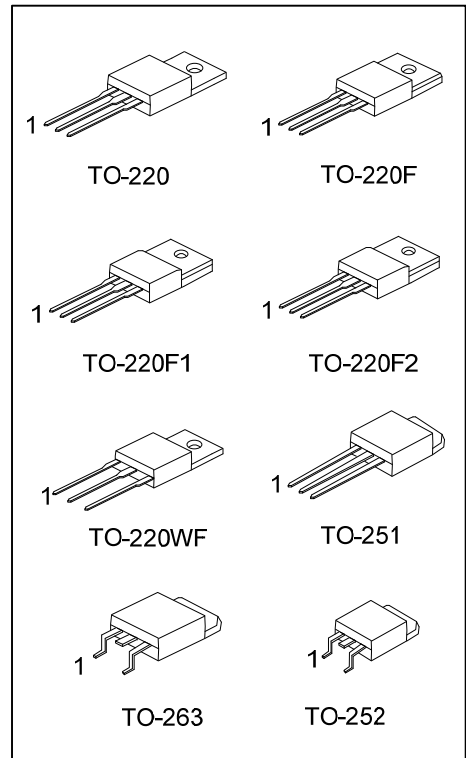
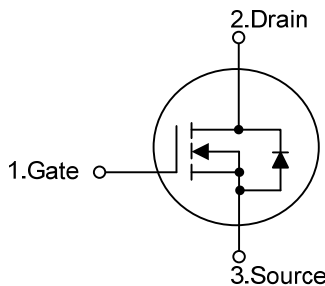
■ DESCRIPTION

The **UTC 15NM60-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 high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

■ FEATURES

- * $R_{DS(ON)} \leq 0.38 \Omega @ V_{GS}=10V, I_D=7.5A$
- * Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested

■ SYMBOL



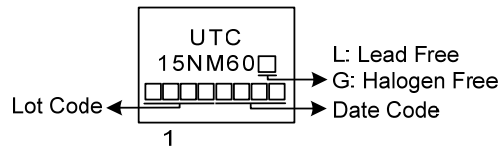
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
15NM60L-TA3-T	15NM60G-TA3-T	TO-220	G	D	S	Tube
15NM60L-TF3-T	15NM60G-TF3-T	TO-220F	G	D	S	Tube
15NM60L-TF1-T	15NM60G-TF1-T	TO-220F1	G	D	S	Tube
15NM60L-TF2-T	15NM60G-TF2-T	TO-220F2	G	D	S	Tube
15NM60L-TW1-T	15NM60G-TW1-T	TO-220WF	G	D	S	Tube
15NM60L-TM3-T	15NM60G-TM3-T	TO-251	G	D	S	Tube
15NM60L-TN3-R	15NM60G-TN3-R	TO-252	G	D	S	Tape Reel
15NM60L-TQ2-T	15NM60G-TQ2-T	TO-263	G	D	S	Tube
15NM60L-TQ2-R	15NM60G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>15NM60G-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, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TW1: TO-220WF, TM3: TO-251, TN3: TO-252, TQ2: TO-263</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		V_{DSS}	600	V	
Gate-Source Voltage		V_{GSS}	± 30	V	
Continuous Drain Current	Continuous	I_D	$T_C=25^\circ\text{C}$	15	A
			$T_C=100^\circ\text{C}$	9.7	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	45	A	
Avalanche energy	Single Pulsed (Note 3)	E_{AS}	490	mJ	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	7.5	V/nS	
Power Dissipation	TO-220/TO-263	P_D	96	W	
	TO-220F/TO-220F1		30	W	
	TO-220F2/TO-220WF				
	TO-251/TO-252		61	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. $L=102\text{mH}$, $I_{AS}=3.1\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J = 25^\circ\text{C}$.

4. $I_{SD} \leq 15\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J = 25^\circ\text{C}$.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-220WF/TO-263			
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	θ_{JC}	1.3	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		4.16	$^\circ\text{C}/\text{W}$
	TO-220F2/TO-220WF			
	TO-251/TO-252		2.04 (Note)	$^\circ\text{C}/\text{W}$

Note: The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.

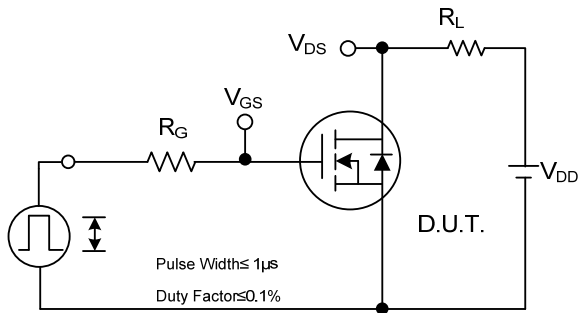
■ ELECTRICAL CHARACTERISTICS (T_J =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	V _{DS} =0V, V _{GS} =+30V			+100	nA
	Reverse		V _{DS} =0V, V _{GS} =-30V			-100
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 =7.5A			0.38	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1.0MHz		920		pF
Output Capacitance	C _{OSS}			100		pF
Reverse Transfer Capacitance	C _{RSS}			6		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =480V, V _{GS} =10V, I _D =15A (Note 1, 2)		35		nC
Gate to Source Charge	Q _{GS}			9		nC
Gate to Drain Charge	Q _{GD}			15		nC
Turn-on Delay Time (Note 1)	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =15A, R _G =25Ω (Note 1, 2)		15		ns
Rise Time	t _R			26		ns
Turn-off Delay Time	t _{D(OFF)}			100		ns
Fall-Time	t _F			40		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Pulsed Current	I _S				15	A
Drain-Source Diode Forward Voltage (Note 1)	I _{SM}				45	A
Maximum Body-Diode Continuous Current	V _{SD}	I _S =15A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)	t _{rr}	I _S =15A, V _{GS} =0V, dI _F /dt=100A/μs		385		ns
Reverse Recovery Charge	Q _{rr}				5.8	

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

2. Essentially independent of operating temperature

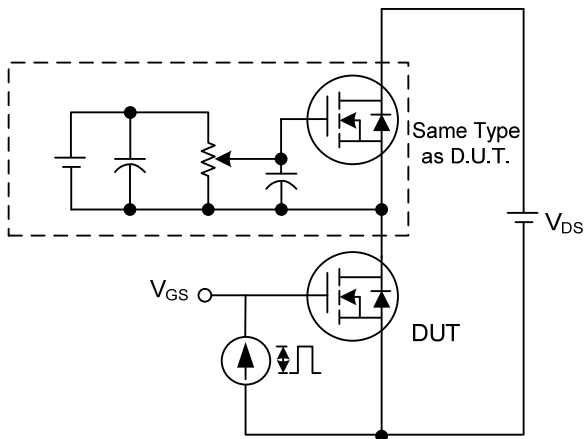
TEST CIRCUITS AND WAVEFORMS



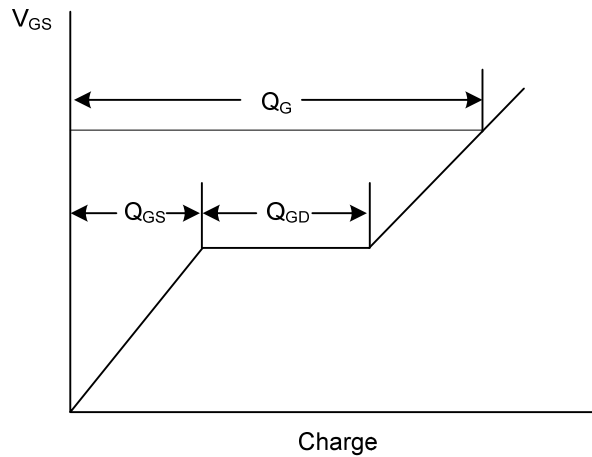
Switching Test Circuit



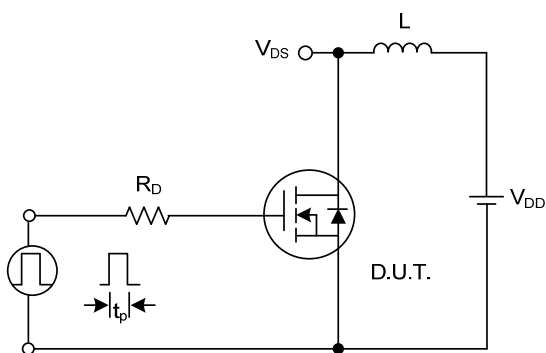
Switching Waveforms



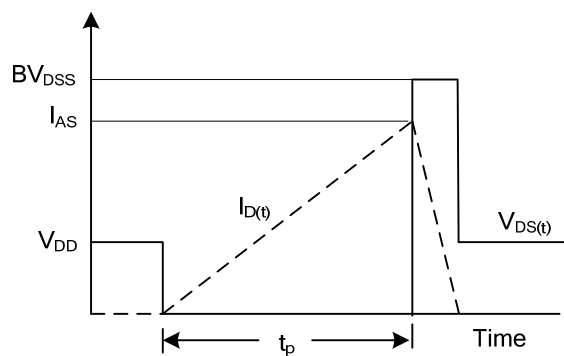
Gate Charge Test Circuit



Gate Charge Waveform

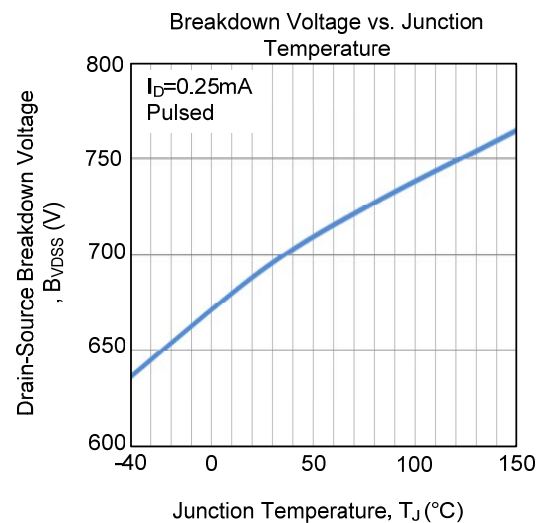
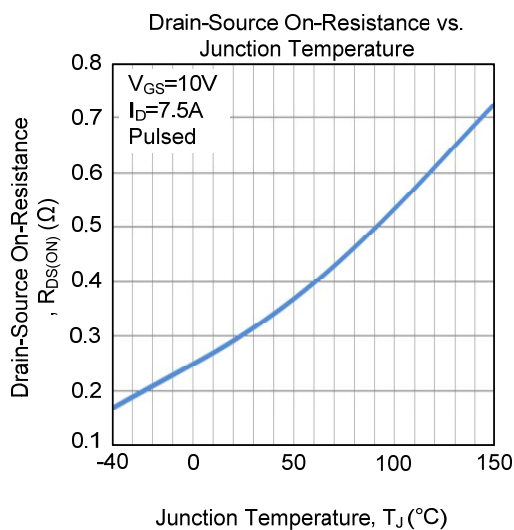
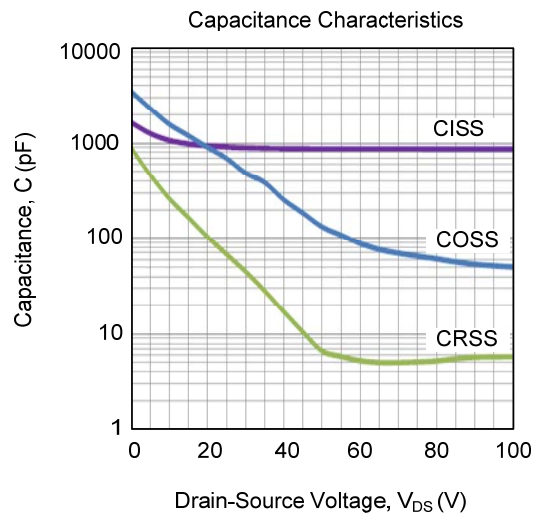
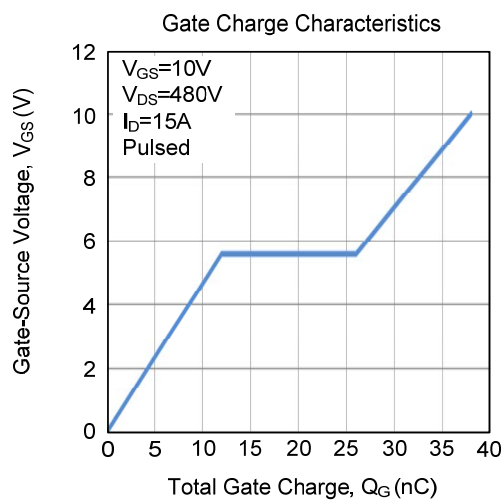
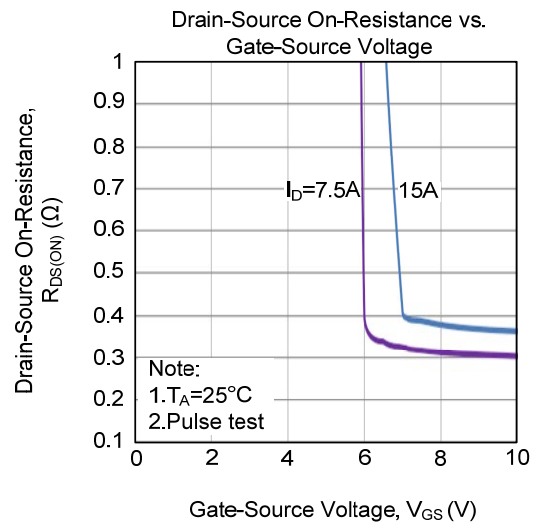
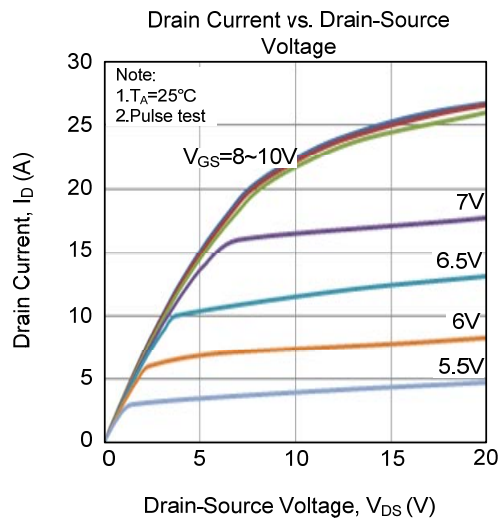


Unclamped Inductive Switching Test Circuit

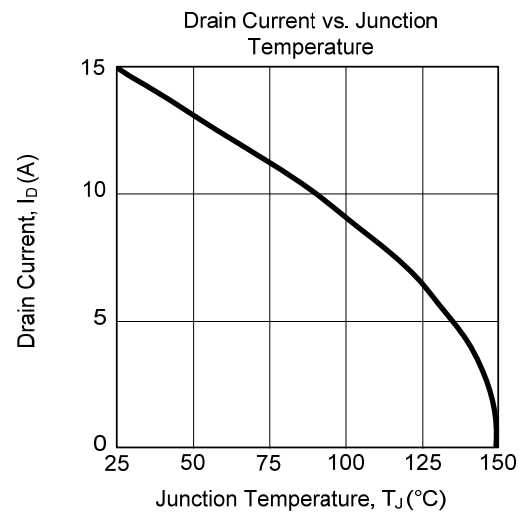
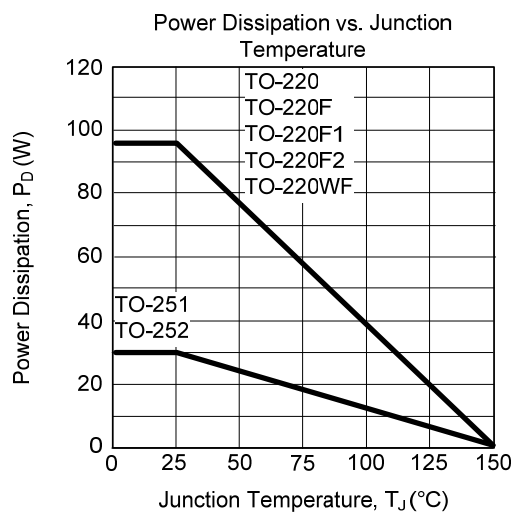
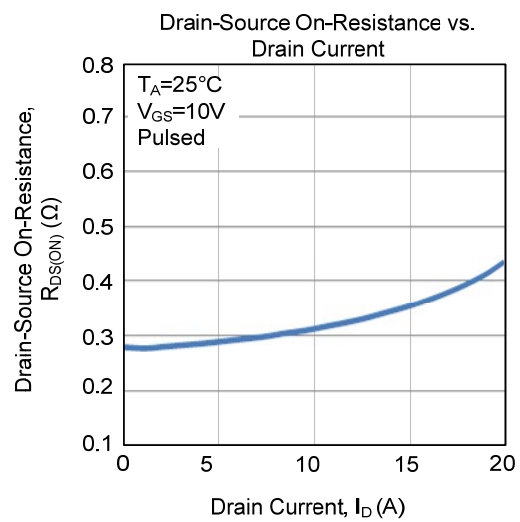
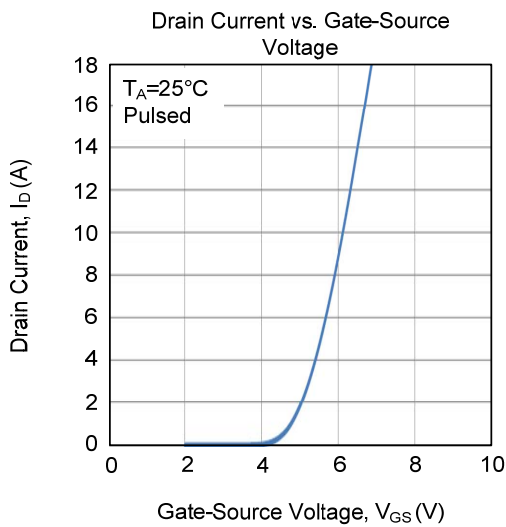
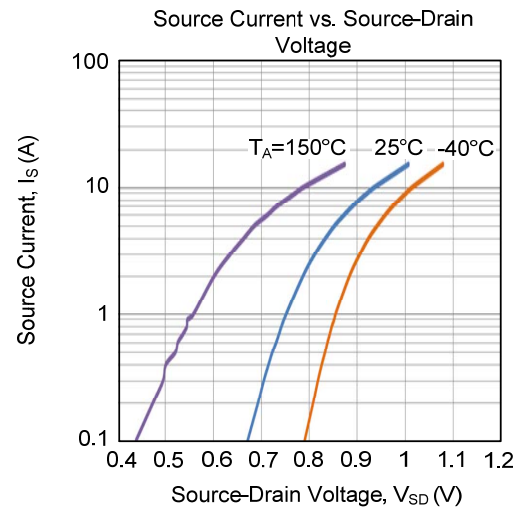
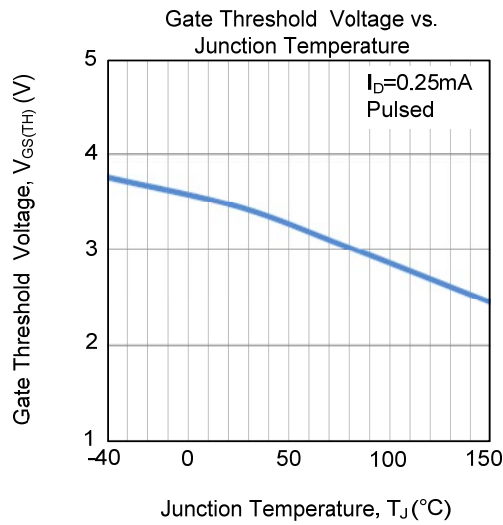


Unclamped Inductive Switching Waveforms

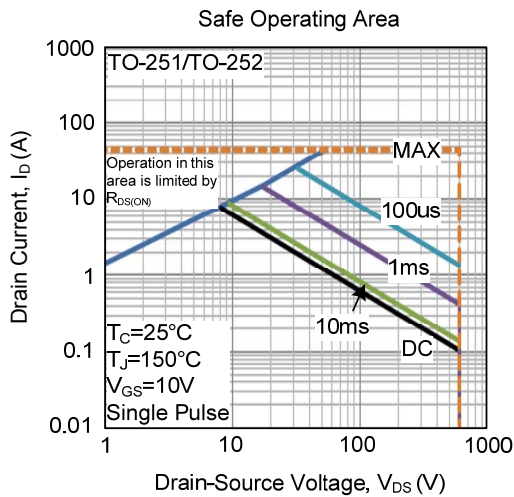
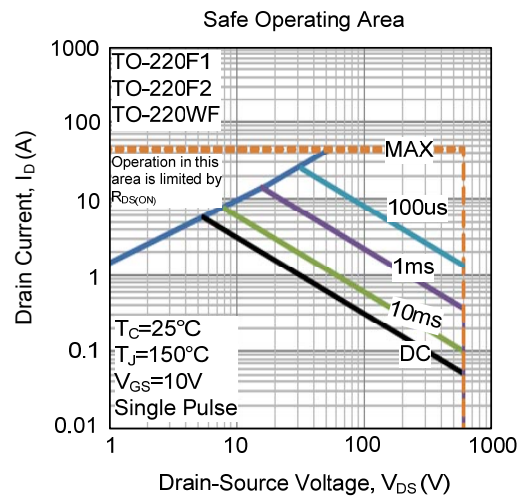
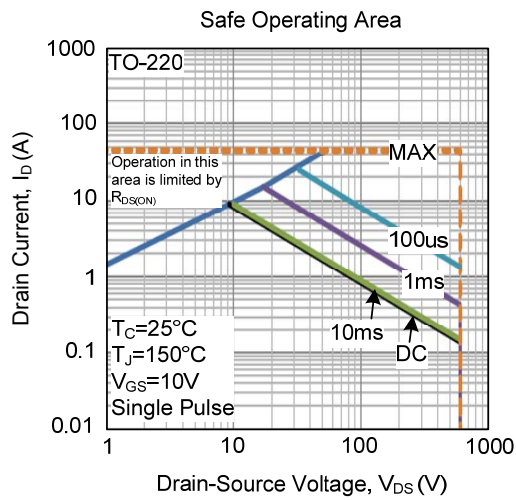
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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