



5NM65

Power MOSFET

5.0A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

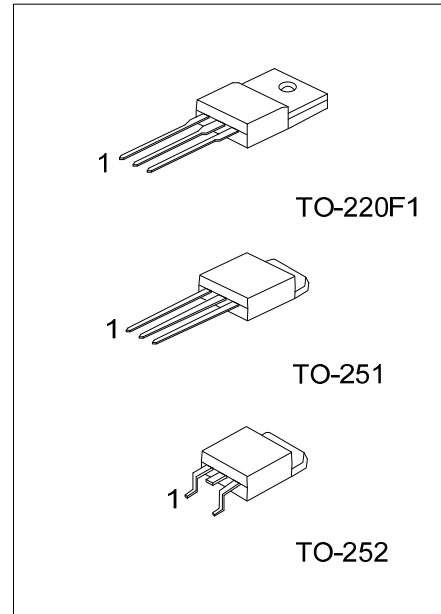
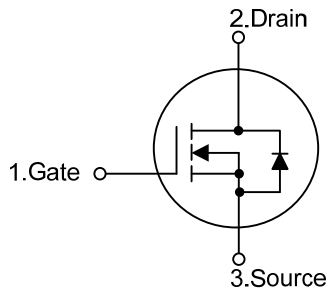
■ DESCRIPTION

The **UTC 5NM65** 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

- * $R_{DS(on)} \leq 1.2 \Omega @ V_{GS}=10V, I_D=2.5A$
- * Improved dv/dt capability
- * Fast switching
- * 100% avalanche tested

■ SYMBOL



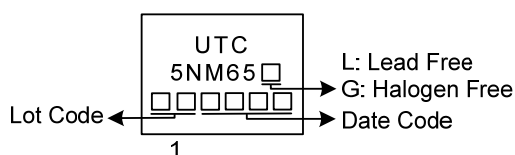
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5NM65L-TF1-T	5NM65G-TF1-T	TO-220F1	G	D	S	Tube
5NM65L-TM3-T	5NM65G-TM3-T	TO-251	G	D	S	Tube
5NM65L-TN3-R	5NM65G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>5NM65G-TF1-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TM3: TO-251, TN3: TO-252 (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}	650	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	5	A
	Pulsed (Note 2)	I_{DM}	20	A
Avalanche Current (Note 2)		I_{AR}	1.1	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	87	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.7	V/ns
Power Dissipation	TO-220F1	P_D	36	W
	TO-251/TO-252		54	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. $L = 144\text{mH}$, $I_{AS} = 1.1\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 5.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

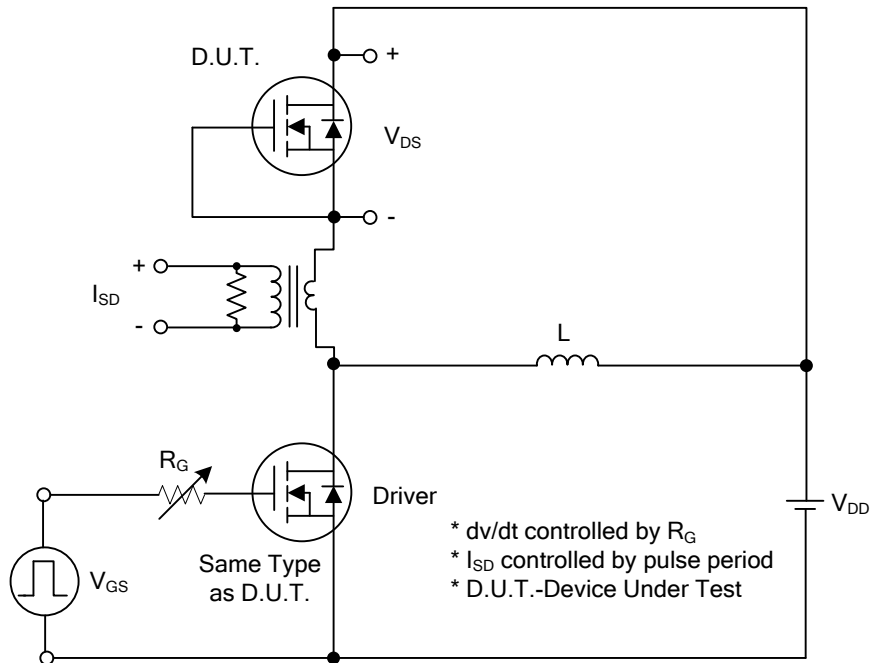
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F1	θ_{JC}	3.47	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.31	$^\circ\text{C}/\text{W}$

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

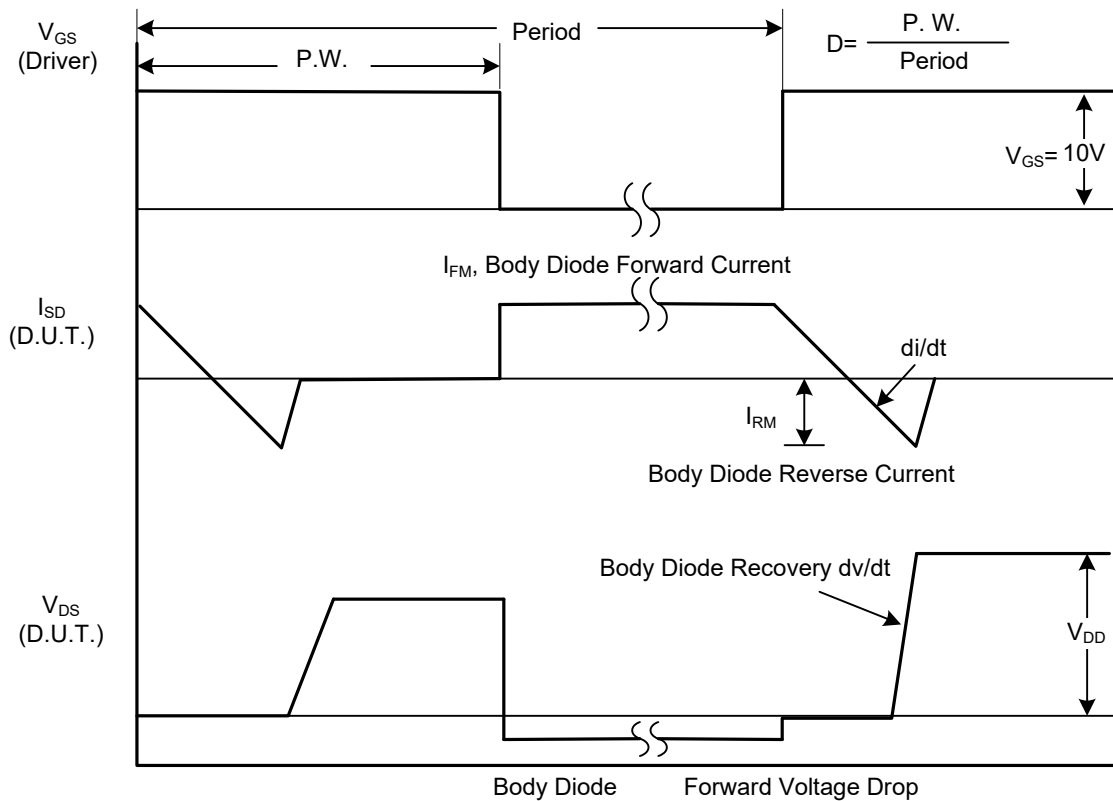
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	650			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}			+100	nA
	Reverse				-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =2.5A			1.2	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		345		pF
Output Capacitance	C _{OSS}			240		pF
Reverse Transfer Capacitance	C _{RSS}			30		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =520V, V _{GS} =10V, I _D =5.0A, (Note 1, 2)		18.8		nC
Gate to Source Charge	Q _{GS}			5.8		nC
Gate to Drain Charge	Q _{GD}			6.4		nC
Turn-on Delay Time (Note 1)	t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =5.0A, R _G =25Ω (Note 1, 2)		7		ns
Rise Time	t _R			18		ns
Turn-off Delay Time	t _{D(OFF)}			43		ns
Fall-Time	t _F			32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				5	A
Maximum Body-Diode Pulsed Current	I _{SM}				20	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =5.0A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)	t _{rr}	I _S =5.0A, V _{GS} =0V, dI _F /dt =100A/μs		265		nS
Reverse Recovery Charge	Q _{rr}				2.35	

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

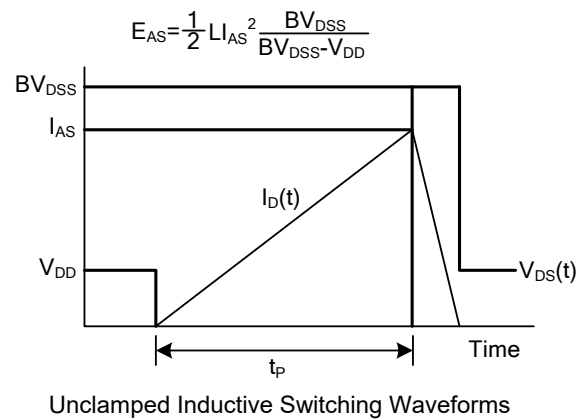
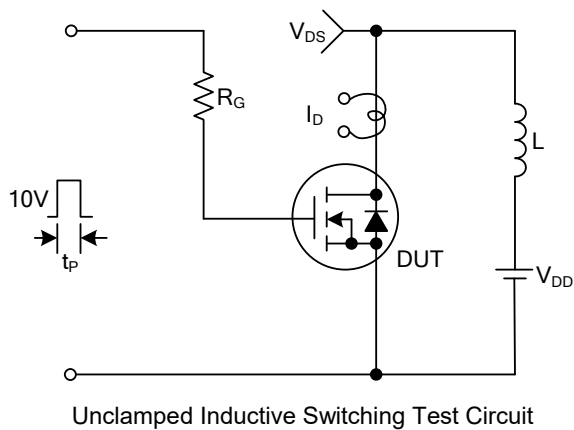
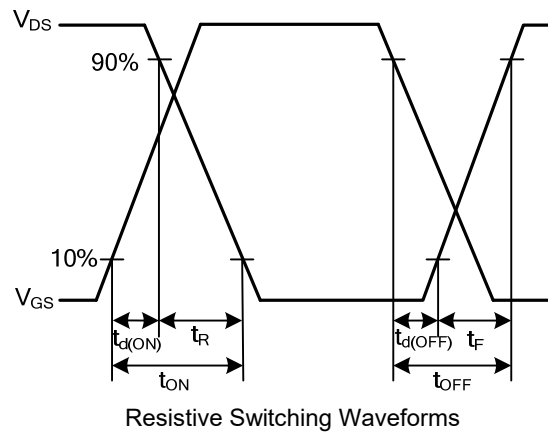
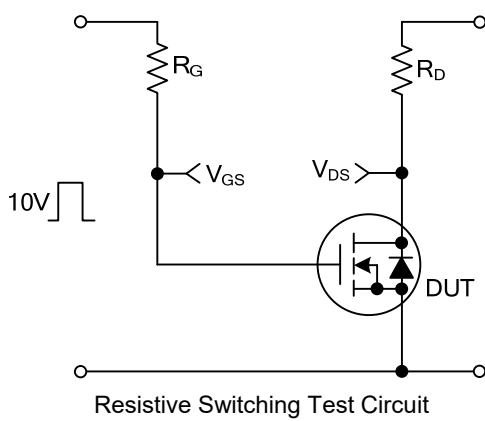
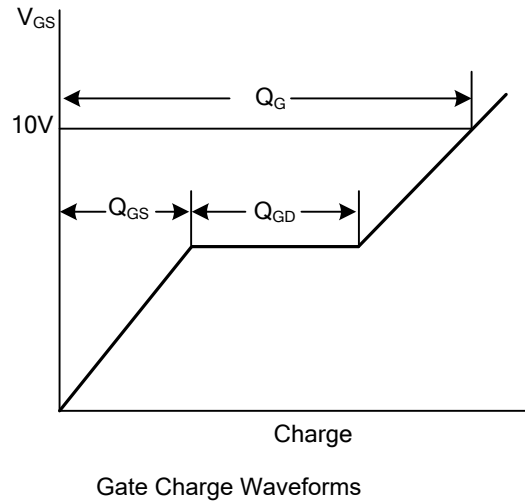
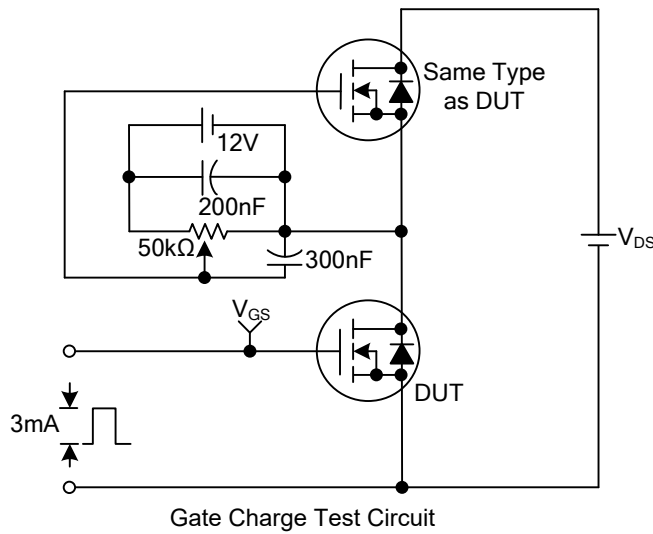


Peak Diode Recovery dv/dt Test Circuit

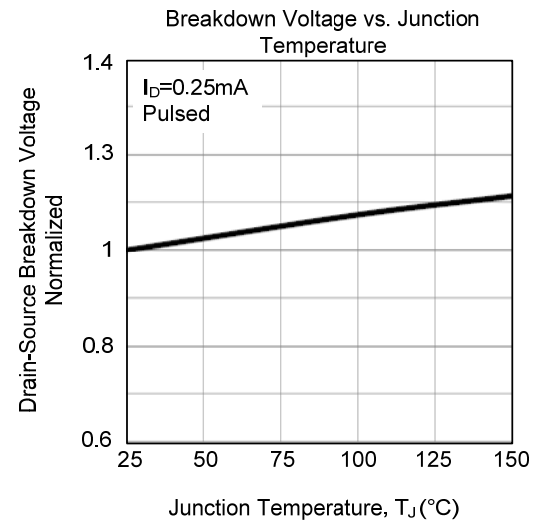
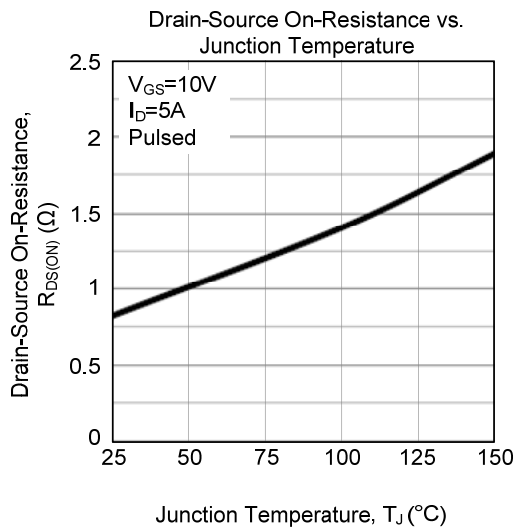
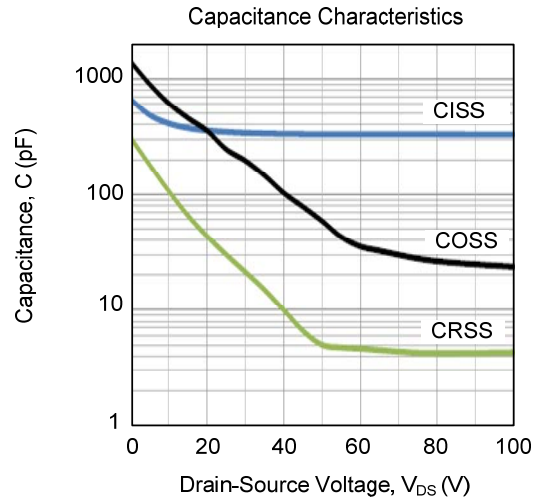
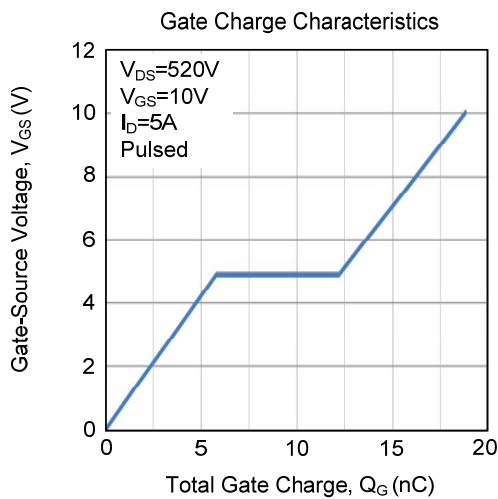
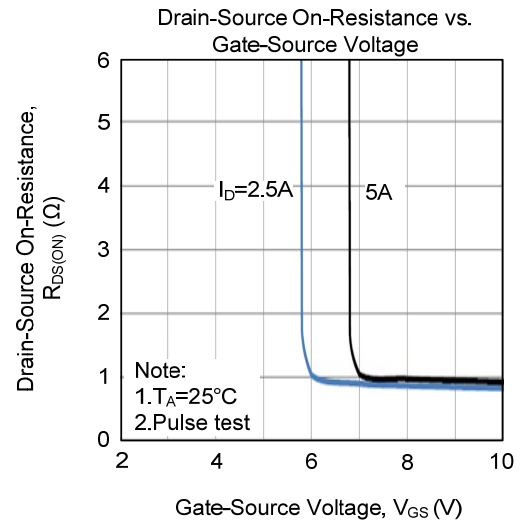
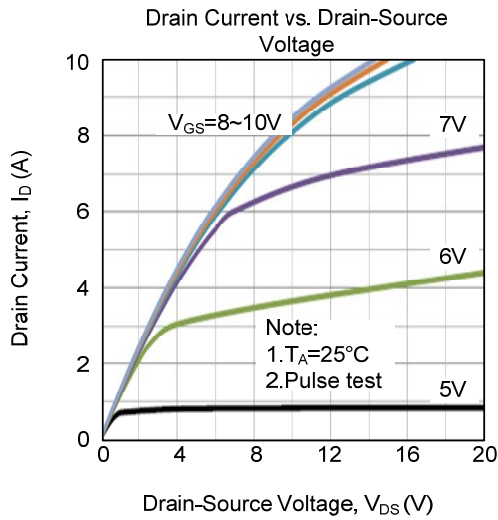


Peak Diode Recovery dv/dt Waveforms

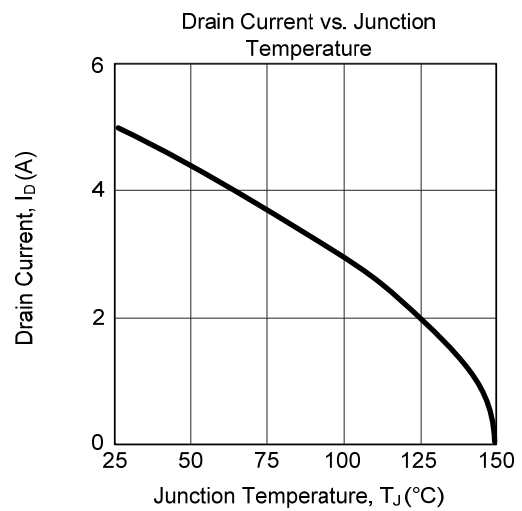
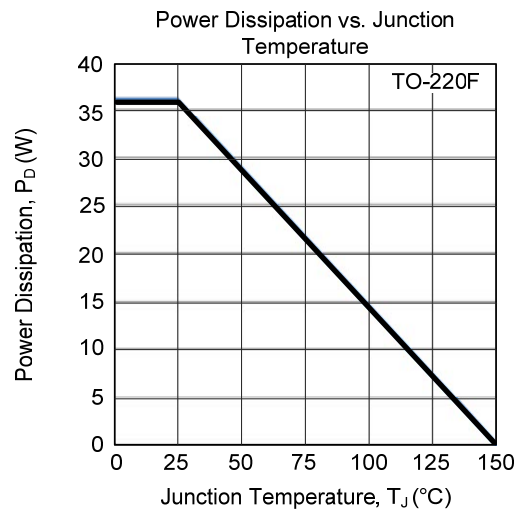
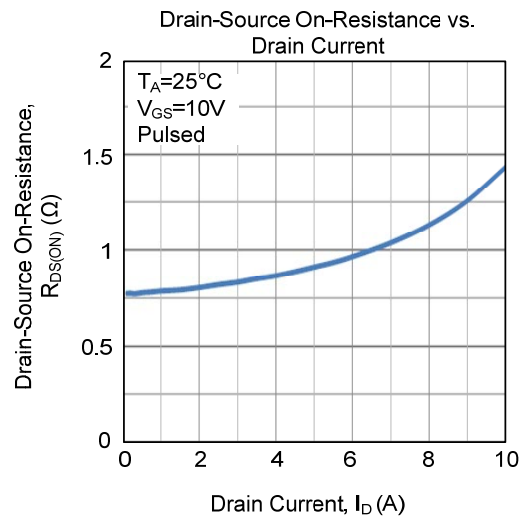
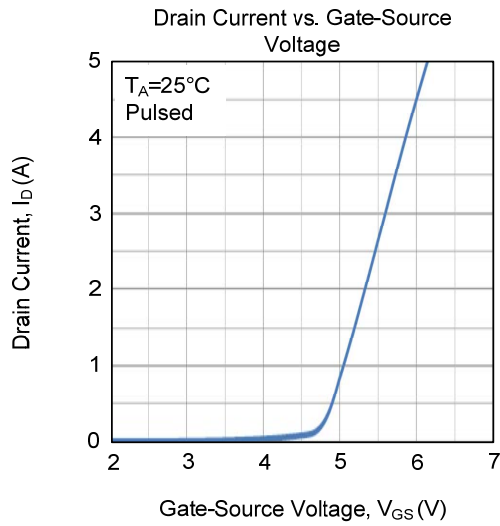
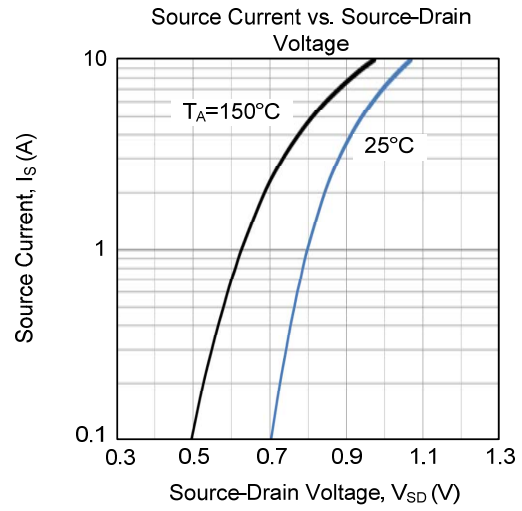
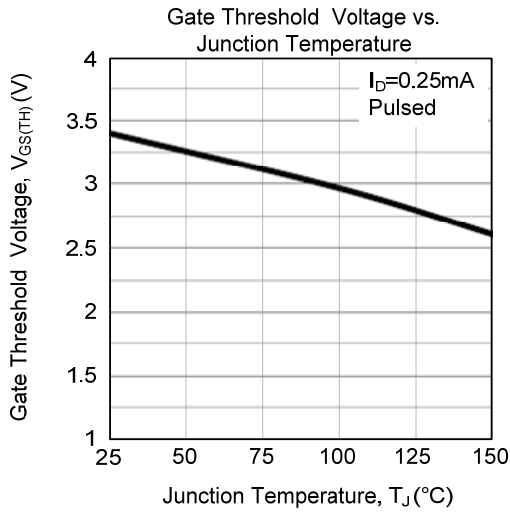
TEST CIRCUITS AND WAVEFORMS



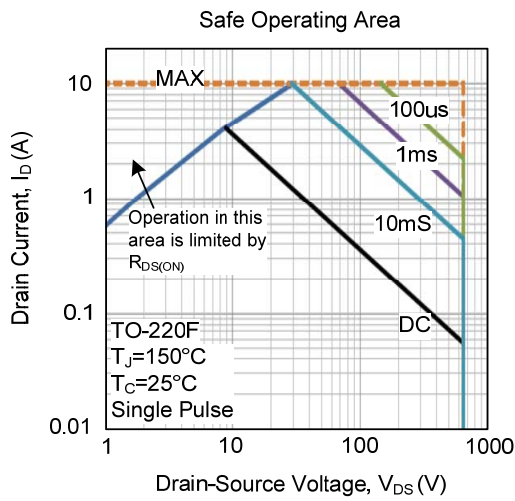
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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