



3N65

Power MOSFET

3A, 650V N-CHANNEL POWER MOSFET

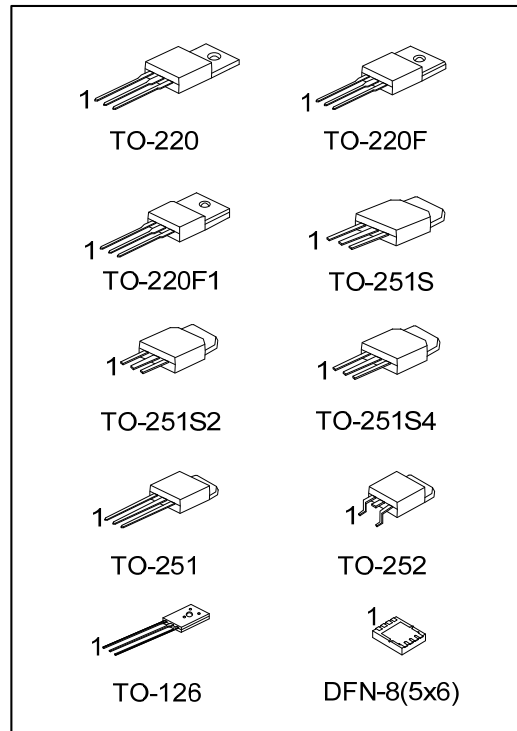
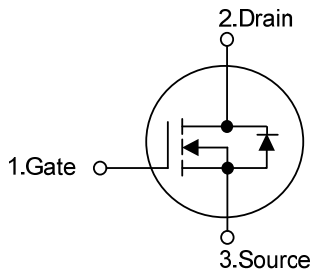
■ DESCRIPTION

The UTC **3N65** is a high voltage and high current power MOSFET 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 in high speed switching applications at power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- * $R_{DS(ON)} < 3.8\Omega @ V_{GS} = 10V, I_D = 1.5A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
3N65L-TA3-T	3N65G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
3N65L-TF1-T	3N65G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
3N65L-TF3-T	3N65G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
3N65L-TM3-T	3N65G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
3N65L-TMS-T	3N65G-TMS-T	TO-251S	G	D	S	-	-	-	-	-	Tube
3N65L-TMS2-T	3N65G-TMS2-T	TO-251S2	G	D	S	-	-	-	-	-	Tube
3N65L-TMS4-T	3N65G-TMS4-T	TO-251S4	G	D	S	-	-	-	-	-	Tube
3N65L-TN3-R	3N65G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
3N65L-T60-K	3N65G-T60-K	TO-126	G	D	S	-	-	-	-	-	Bulk
-	3N65G-K08-5060-R	DFN-8(5x6)	S	S	S	G	D	D	D	D	Tape Reel

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

<p>3N65L-TA3-T</p>	<p>(1) R: Tape Reel, T: Tube, K: Bulk</p> <p>(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TM3: TO-251, TN3: TO-252, TMS: TO-251S, T60: TO-126, K08-5060: DFN-8(5x6)</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING

Package		MARKING
TO-220 TO-220F TO-220F1 TO-251	TO-251S TO-251S2 TO-251S4 TO-252	
TO-126		
DFN-8(5x6)		

■ 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
Avalanche Current (Note 2)	I_{AR}	3.0	A
Continuous Drain Current	I_D	3.0	A
Pulsed Drain Current (Note 2)	I_{DM}	12	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	200
	Repetitive (Note 2)	E_{AR}	7.5
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	75
	TO-220F/TO-220F1		34
	TO-251/TO-252/TO-251S TO-251S2/TO-251S4		50
	TO-126		17
	DFN-8(5×6)		25
Junction Temperature	T_J	+150	$^\circ\text{C}$
Operating Temperature	T_{OPR}	-55 ~ +150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55 ~ +150	$^\circ\text{C}$

Note: 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. $L = 64\text{mH}$, $I_{AS} = 2.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 3.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	TO-220/TO-220F TO-220F1	62.5
		TO-251/TO-252/TO-251S TO-251S2/TO-251S4	110
		TO-126	132
		DFN-8(5×6)	75 (Note)
Junction to Case	θ_{JC}	TO-220	1.67
		TO-220F/TO-220F1	3.68
		TO-251/TO-252/TO-251S TO-251S2/TO-251S4	2.5
		TO-126	7.36
		DFN-8(5×6)	5 (Note)

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

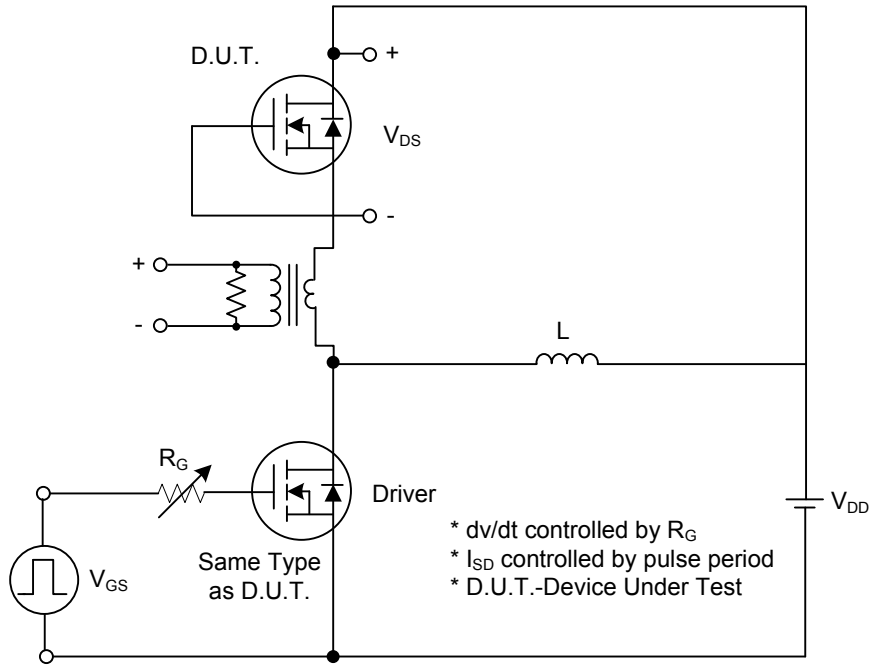
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0 V, I _D = 250 μA	650			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 650 V, V _{GS} = 0 V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}			100	nA
	Reverse					
		V _{GS} = -30 V, V _{DS} = 0 V			-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250 μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 1.5A		2.8	3.8	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz		430	500	pF
Output Capacitance	C _{OSS}			50	65	pF
Reverse Transfer Capacitance	C _{RSS}			11	20	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} = 30V, I _D = 0.5A, R _G = 25Ω (Note 1, 2)		32	45	ns
Turn-On Rise Time	t _R			64	80	ns
Turn-Off Delay Time	t _{D(OFF)}			115	140	ns
Turn-Off Fall Time	t _F			60	75	ns
Total Gate Charge	Q _G	V _{DS} = 50V, I _D =1.3A, V _{GS} = 10 V (Note 1, 2)		51	70	nC
Gate-Source Charge	Q _{GS}			13		nC
Gate-Drain Charge	Q _{GD}			11		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0 V, I _S = 3.0 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I _S				3.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				12	A

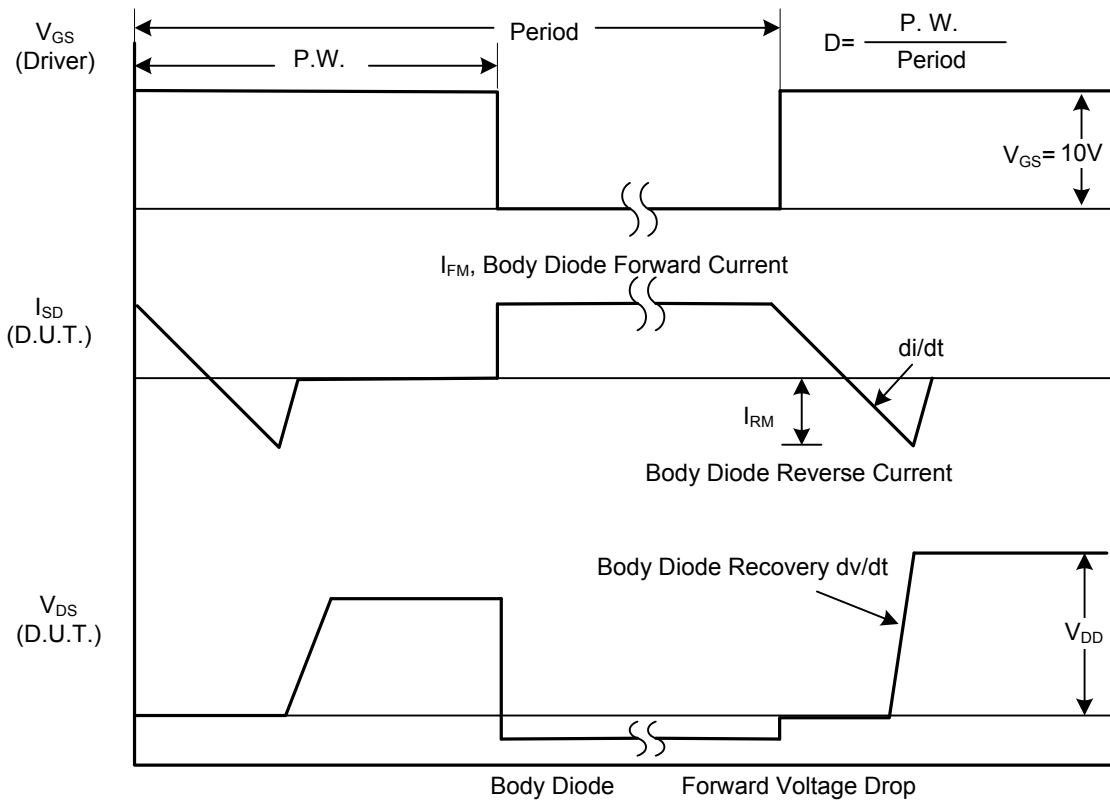
Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. L = 64mH, I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

■ TEST CIRCUITS AND WAVEFORMS

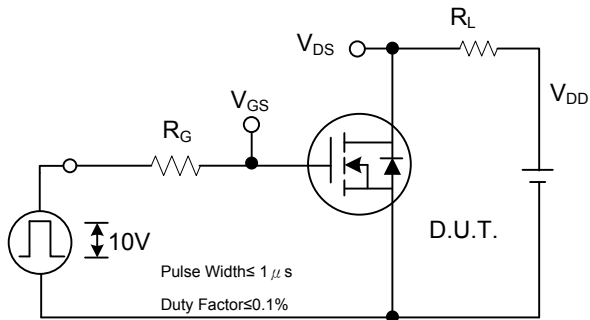


Peak Diode Recovery dv/dt Test Circuit

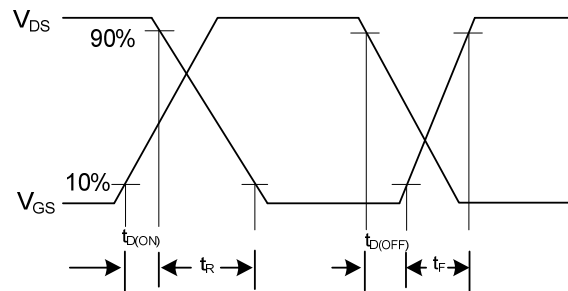


Peak Diode Recovery dv/dt Waveforms

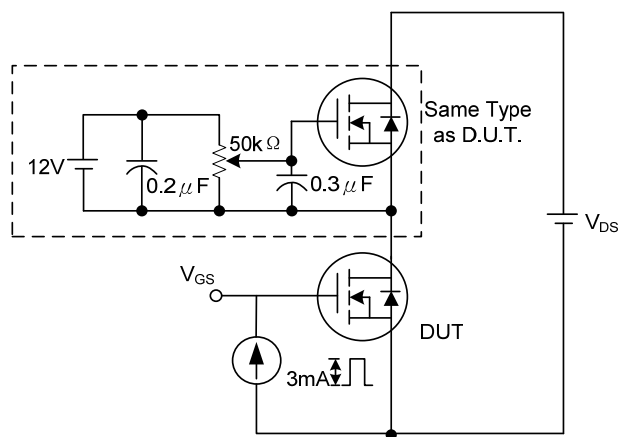
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



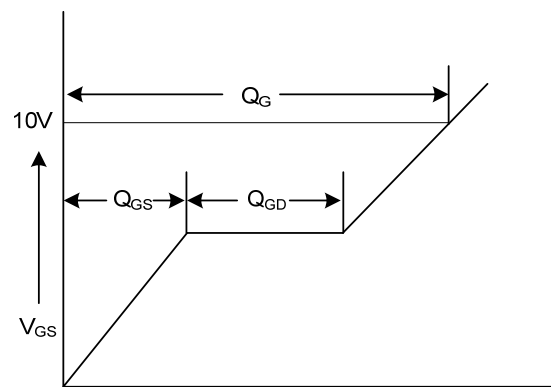
Switching Test Circuit



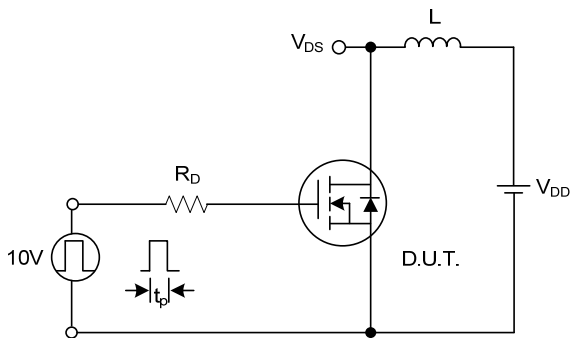
Switching Waveforms



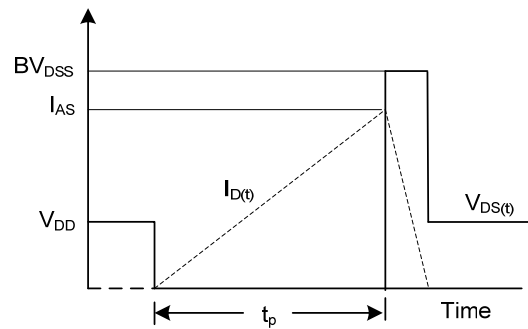
Gate Charge Test Circuit



Gate Charge Waveform



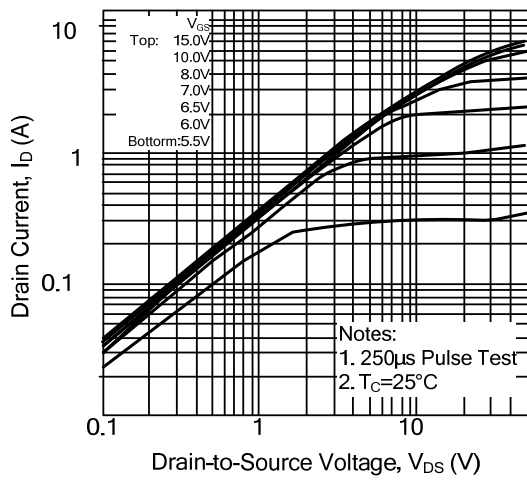
Unclamped Inductive Switching Test Circuit



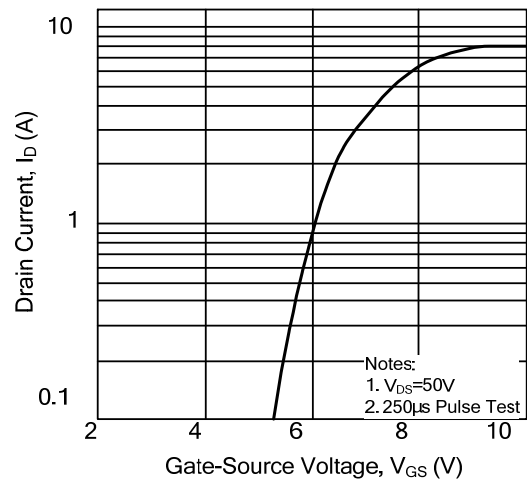
Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS

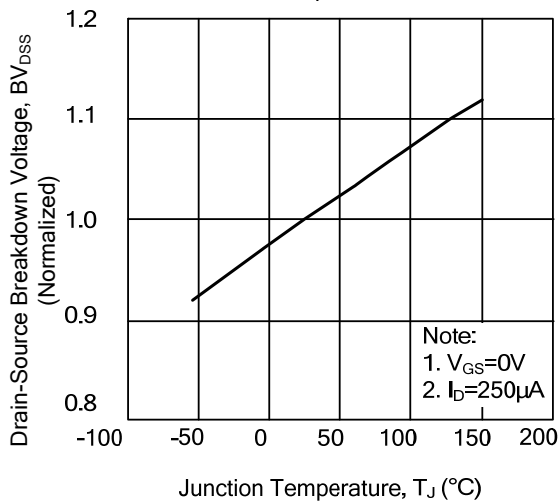
On-State Characteristics



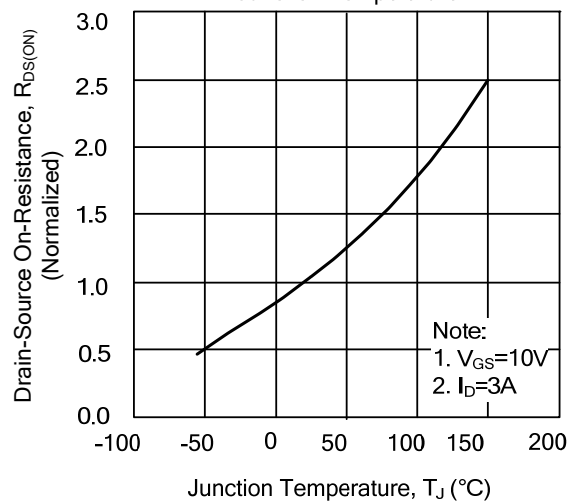
Transfer Characteristics



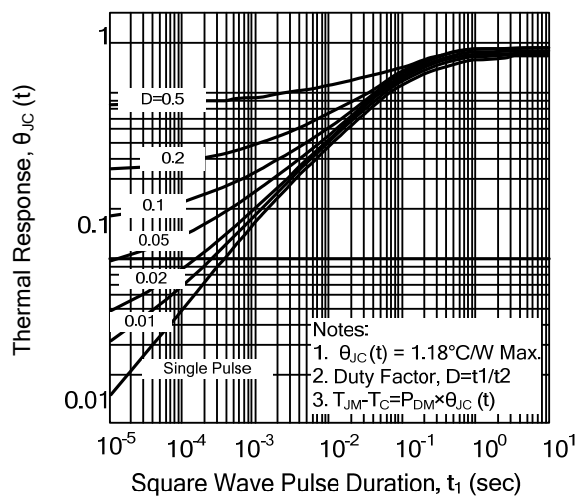
Breakdown Voltage Variation vs. Junction Temperature



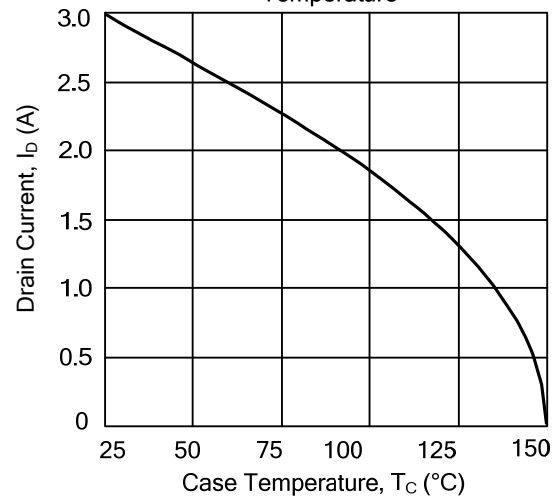
On-Resistance Variation vs. Junction Temperature



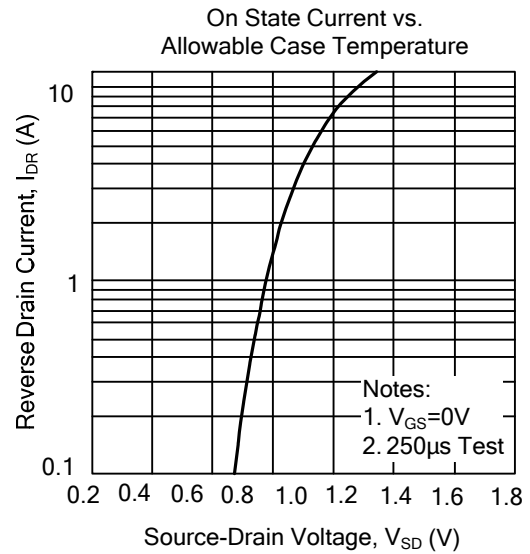
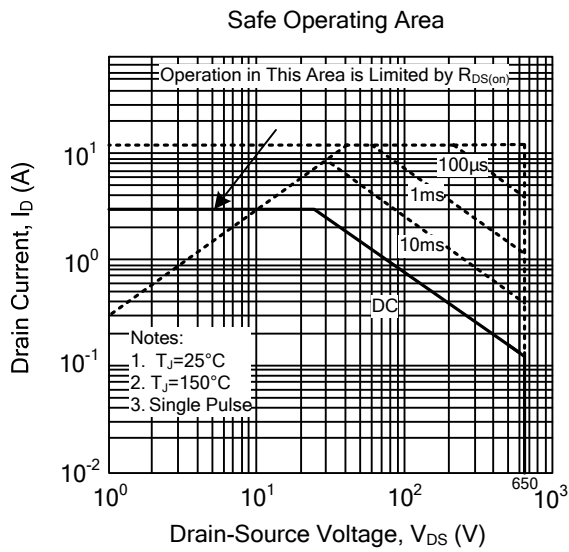
Transient Thermal Response Curve



Maximum Drain Current vs. Case Temperature



■ TYPICAL CHARACTERISTICS(Cont.)



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