



# 8N60

*Power MOSFET*

## 8A, 600V N-CHANNEL POWER MOSFET

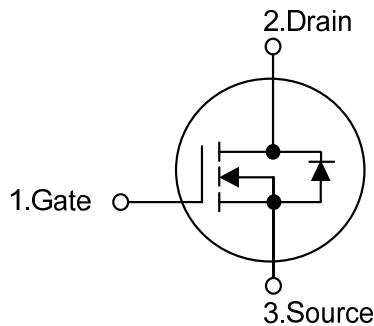
■ DESCRIPTION

The UTC **8N60** 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 have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- \*  $R_{DS(ON)} < 1.2\Omega @ V_{GS} = 10V$
- \* Ultra low gate charge ( typical 28 nC )
- \* Low reverse transfer capacitance (  $C_{RSS} =$  typical 12.0 pF )
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL

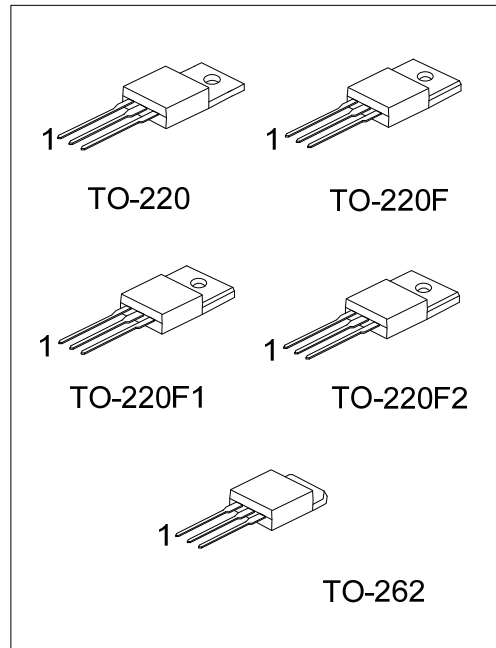


■ ORDERING INFORMATION

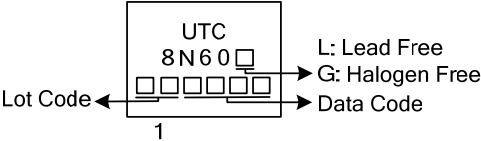
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
8N60L-TA3-T	8N60G-TA3-T	TO-220	G	D	S	Tube
8N60L-TF1-T	8N60G-TF1-T	TO-220F1	G	D	S	Tube
8N60L-TF2-T	8N60G-TF2-T	TO-220F2	G	D	S	Tube
8N60L-TF3-T	8N60G-TF3-T	TO-220F	G	D	S	Tube
8N60L-T2Q-T	8N60G-T2Q-T	TO-262	G	D	S	Tube

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

<p>8N60L-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO220-F1, TF2: TO-220F2 TF3: TO-220F, T2Q: TO-262 (3) L: Lead Free, G: Halogen 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		$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)		$I_{AR}$	8	A
Drain Current	Continuous	$I_D$	8	A
	Pulsed (Note 2)	$I_{DM}$	32	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	230	mJ
	Repetitive (Note 2)	$E_{AR}$	14.7	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220/TO-262	$P_D$	147	W
	TO-220F/TO-220F1		48	W
	TO-220F2		50	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Operating Temperature		$T_{OPR}$	-55 ~ +150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

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  $T_J$

3.  $L = 7.1\text{mH}$ ,  $I_{AS} = 8\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 7.5\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

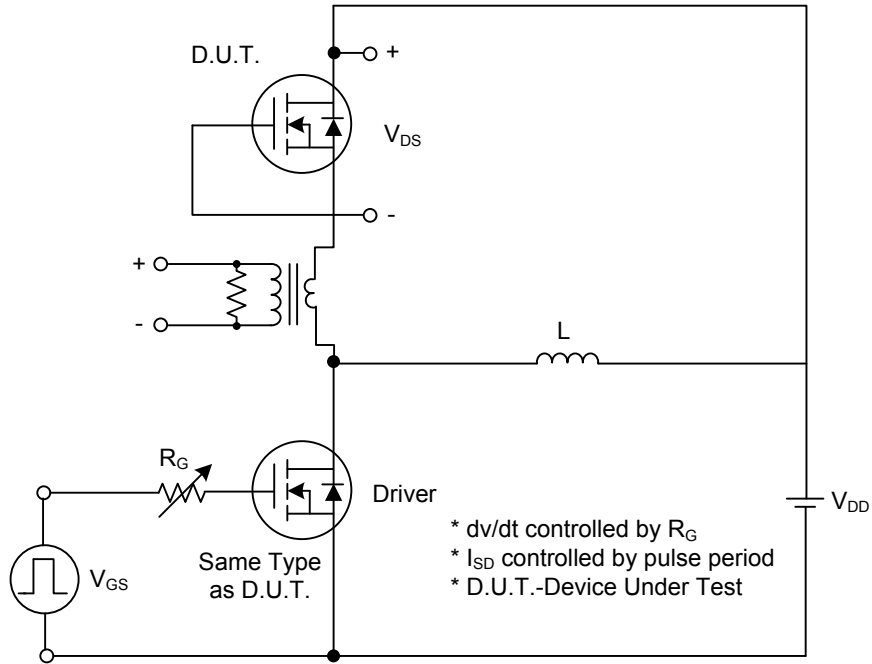
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262	$\theta_{JC}$	0.85	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		2.6	$^\circ\text{C}/\text{W}$
	TO-220F2		2.5	$^\circ\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

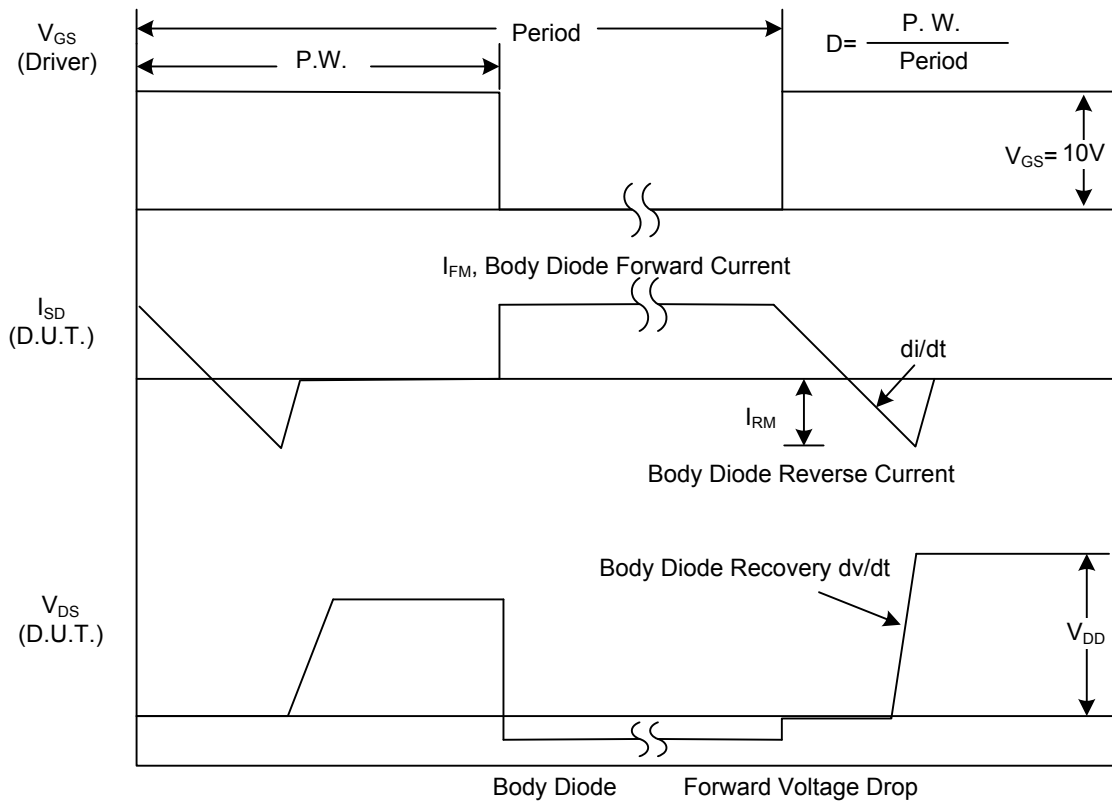
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	600			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0V			10	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA
	Reverse				V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0V	
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.7		V/°C
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 4A		1.0	1.2	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz		965	1255	pF
Output Capacitance	C <sub>OSS</sub>			105	135	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			12	16	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> = 300V, I <sub>D</sub> = 8A, R <sub>G</sub> = 25Ω (Note 1, 2)		16.5	45	ns
Turn-On Rise Time	t <sub>R</sub>			60.5	130	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			81	170	ns
Turn-Off Fall Time	t <sub>F</sub>			64.5	140	ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> = 480V, I <sub>D</sub> =8A, V <sub>GS</sub> = 10V (Note 1, 2)		28	36	nC
Gate-Source Charge	Q <sub>GS</sub>			4.5		nC
Gate-Drain Charge	Q <sub>GD</sub>			12		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 8A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				8	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				32	A
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 8A, dI <sub>F</sub> /dt = 100 A/μs (Note 2)		365		ns
Reverse Recovery Charge	Q <sub>RR</sub>			3.4		μC

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

■ TEST CIRCUITS AND WAVEFORMS

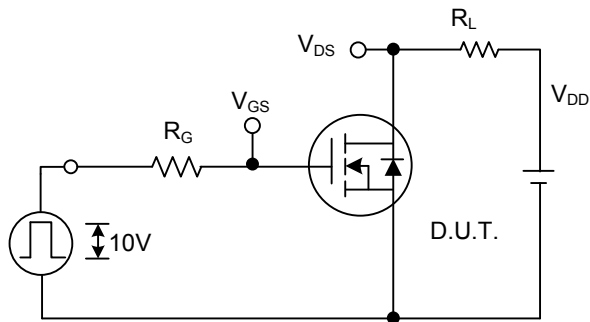


Peak Diode Recovery dv/dt Test Circuit

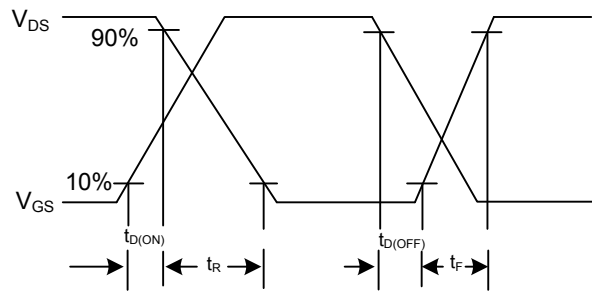


Peak Diode Recovery dv/dt Waveforms

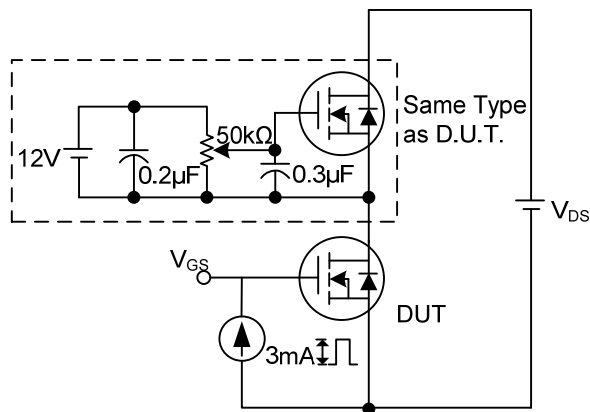
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



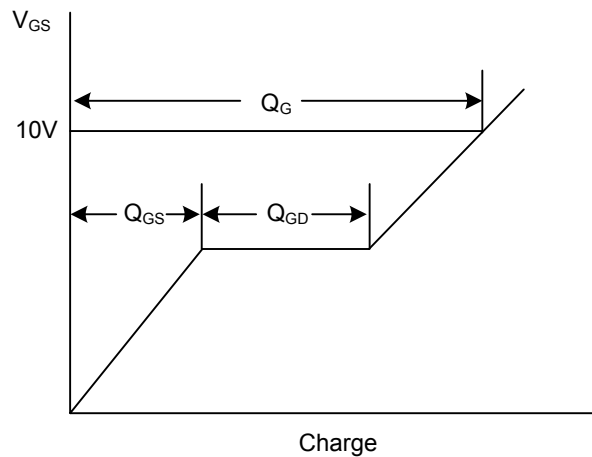
Switching Test Circuit



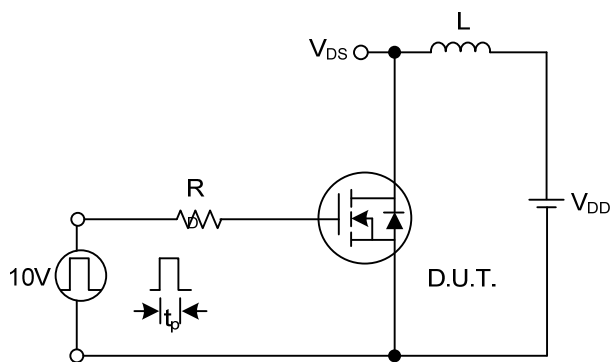
Switching Waveforms



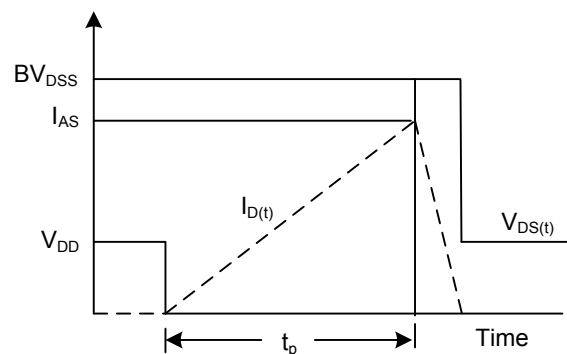
Gate Charge Test Circuit



Gate Charge Waveform

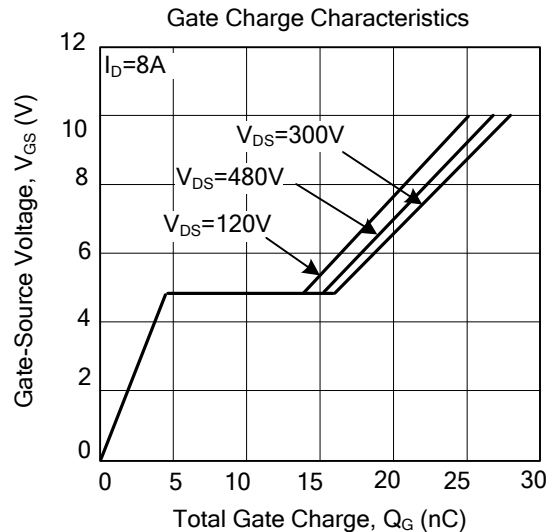
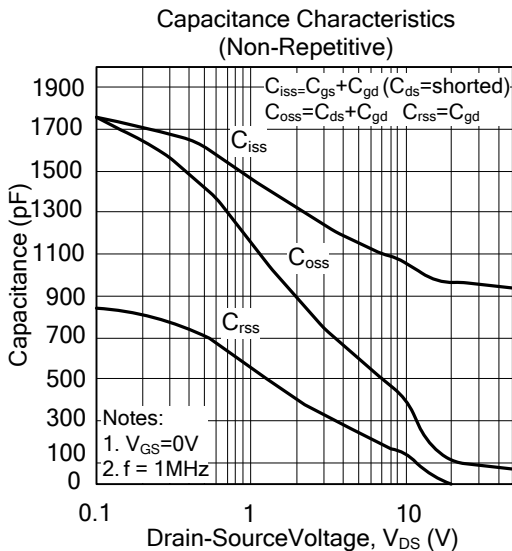
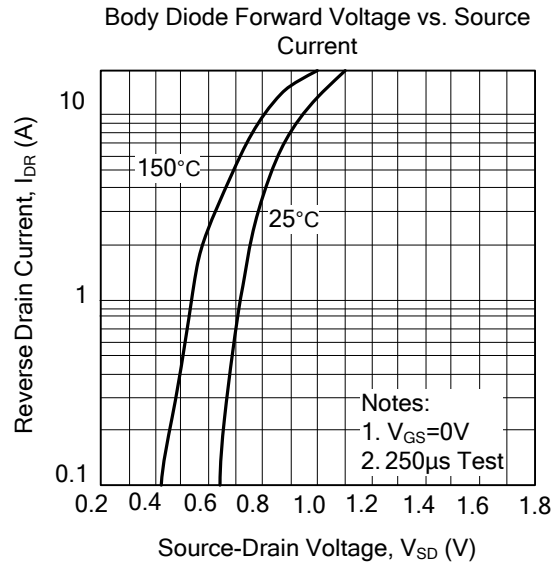
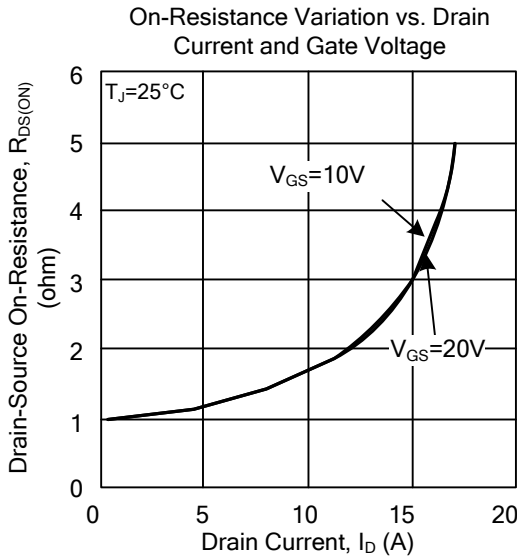
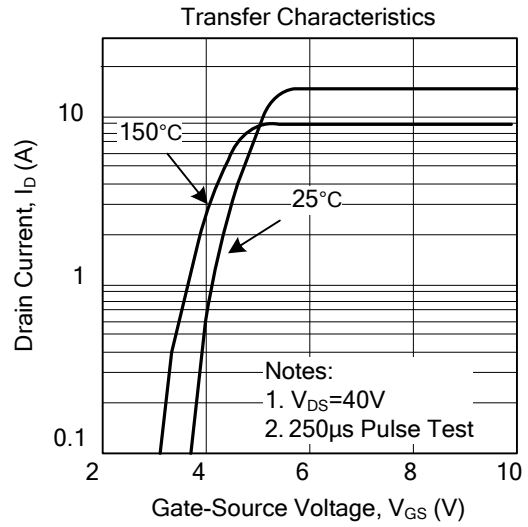
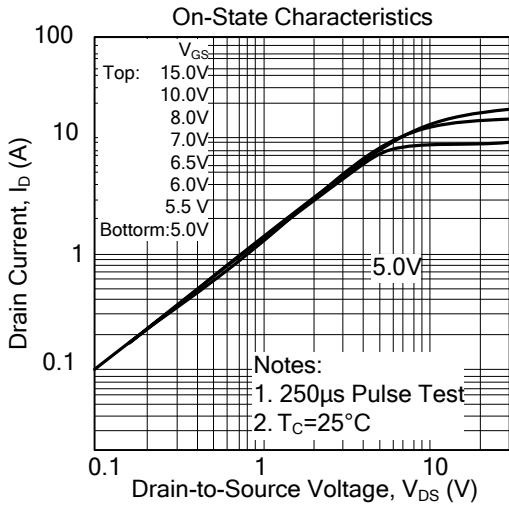


Unclamped Inductive Switching Test Circuit

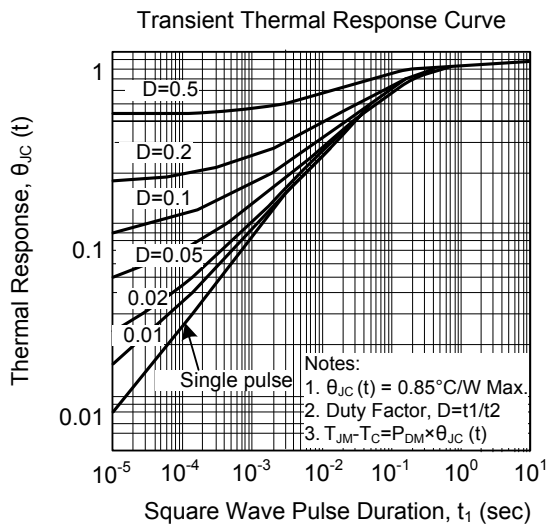
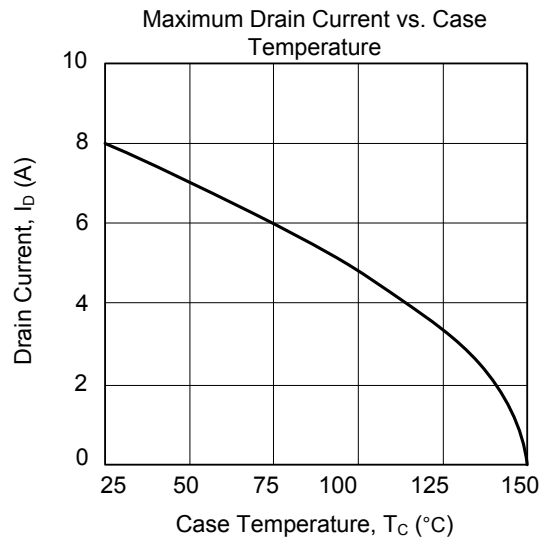
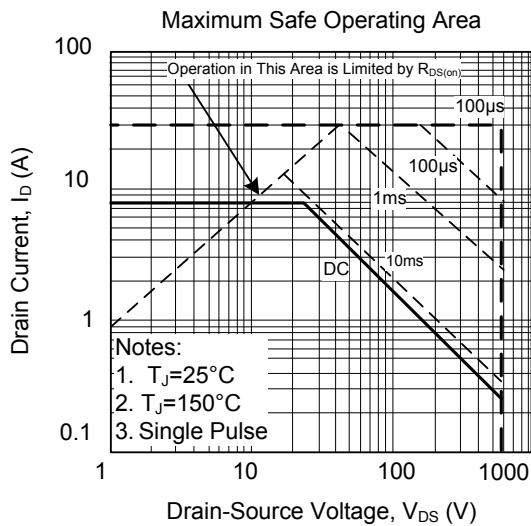
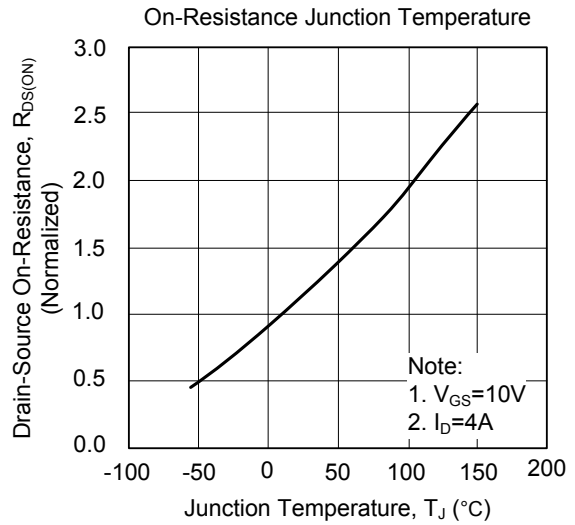
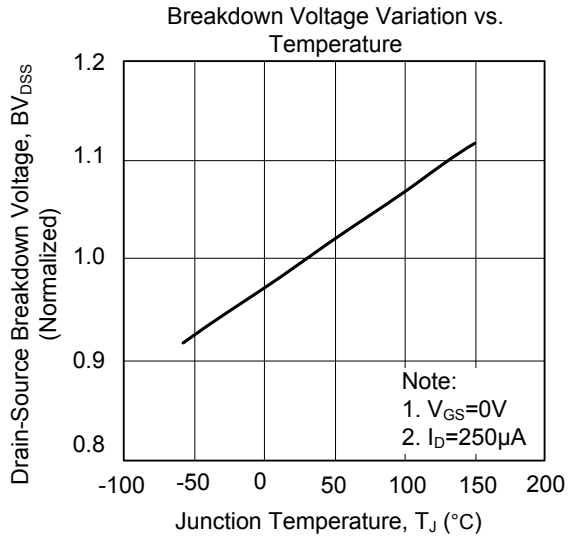


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)





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