



# 8N60

**Power MOSFET**

## 7.5 Amps, 600/650 Volts N-CHANNEL POWER MOSFET

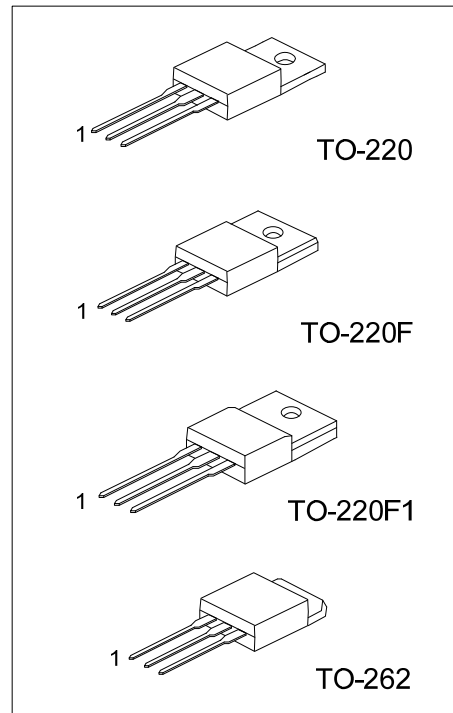
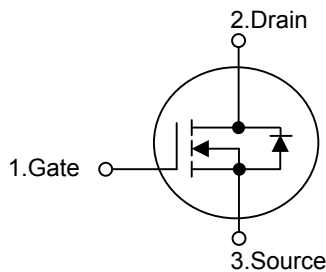
■ DESCRIPTION

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-x-TA3-T	8N60G-x-TA3-T	TO-220	G	D	S	Tube
8N60L-x-TF1-T	8N60G-x-TF1-T	TO-220F1	G	D	S	Tube
8N60L-x-TF3-T	8N60G-x-TF3-T	TO-220F	G	D	S	Tube
8N60L-x-T2Q-T	8N60G-x-T2Q-T	TO-262	G	D	S	Tube

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

<p>8N60L-x-TA3-T</p>	<p>(1) T: Tube                  (2) TA3: TO-220, TF1: TO220-F1, TF3: TO-220F                  T2Q: TO-262                  (3) A: 600V, B: 650V                  (4) G: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage	8N60-A	$V_{DSS}$	600	V
	8N60-B		650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)		$I_{AR}$	7.5	A
Drain Current	Continuous	$I_D$	7.5	A
	Pulsed (Note 2)	$I_{DM}$	30	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
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.  $L = 7.3\text{mH}$ ,  $I_{AS} = 7.5\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , 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	TO-220/TO-262	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		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	$^\circ\text{C}/\text{W}$

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

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	8N60-A	$BV_{DSS}$	$V_{GS} = 0\text{V}$ , $I_D = 250\ \mu\text{A}$	600			V
	8N60-B			650			V
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS} = 600\text{V}$ , $V_{GS} = 0\text{V}$			10	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$I_{GSS}$	$V_{GS} = 30\text{V}$ , $V_{DS} = 0\text{V}$			100	nA
	Reverse		$V_{GS} = -30\text{V}$ , $V_{DS} = 0\text{V}$			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		0.7		$\text{V}/^\circ\text{C}$
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{V}$ , $I_D = 3.75\text{A}$		1.0	1.2	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>							
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$			965	1255	pF
Output Capacitance	$C_{OSS}$				105	135	pF
Reverse Transfer Capacitance	$C_{RSS}$				12	16	pF
<b>SWITCHING CHARACTERISTICS</b>							
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 300\text{V}$ , $I_D = 7.5\text{A}$ , $R_G = 25\ \Omega$ (Note 1, 2)			16.5	45	ns
Turn-On Rise Time	$t_R$				60.5	130	ns
Turn-Off Delay Time	$t_{D(OFF)}$				81	170	ns
Turn-Off Fall Time	$t_F$				64.5	140	ns
Total Gate Charge	$Q_G$				28	36	nC
Gate-Source Charge	$Q_{GS}$	$V_{DS} = 480\text{V}$ , $I_D = 7.5\text{A}$ , $V_{GS} = 10\text{V}$ (Note 1, 2)			4.5		nC
Gate-Drain Charge	$Q_{GD}$				12		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				7.5	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				30	A
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A},$		365		ns
Reverse Recovery Charge	$Q_{RR}$	$di_F/dt = 100\text{ A}/\mu\text{s}$ (Note 2)		3.4		$\mu\text{C}$

Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$   
 2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

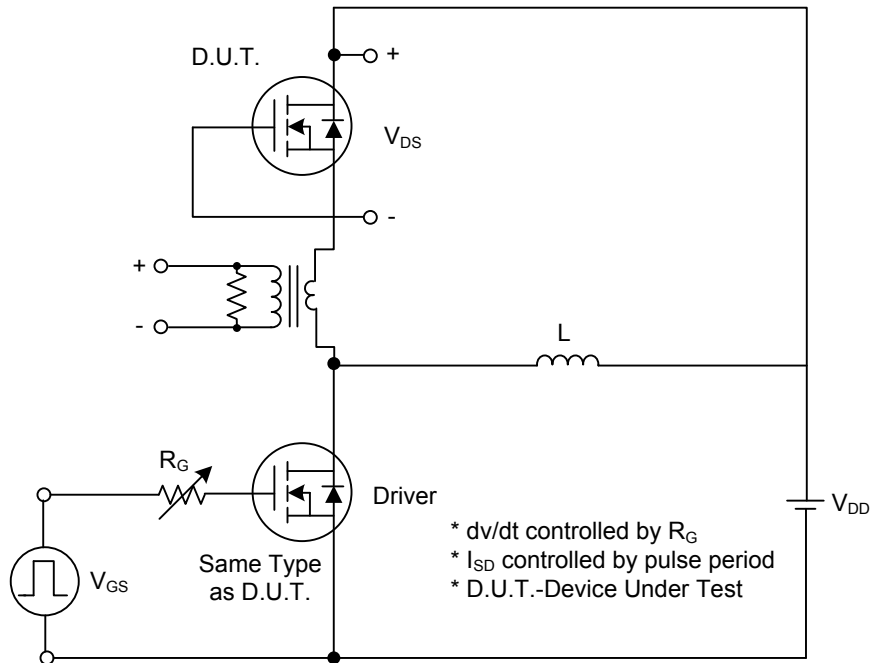


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

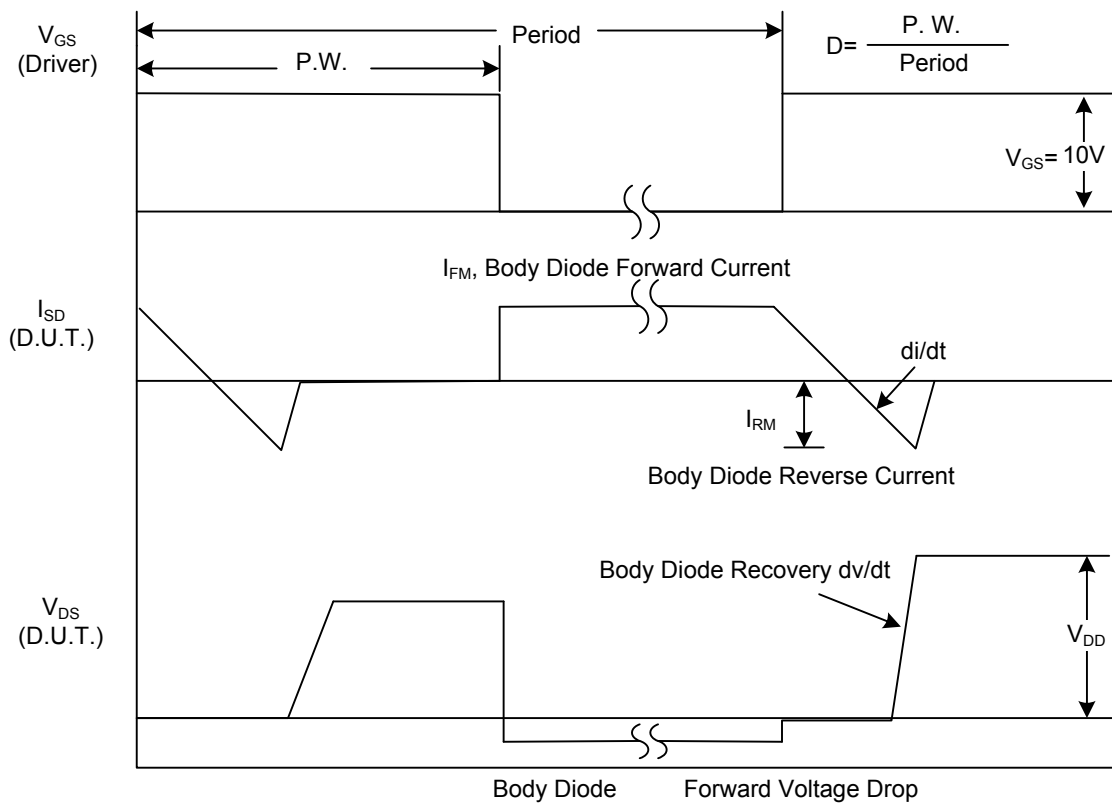


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

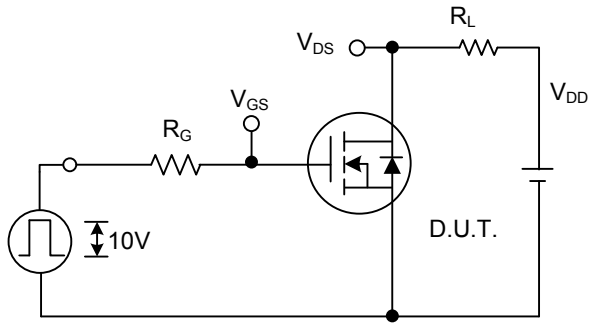


Fig. 2A Switching Test Circuit

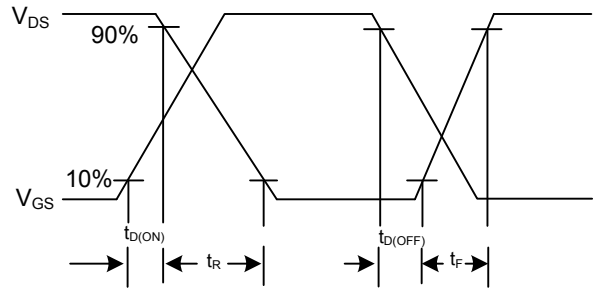


Fig. 2B Switching Waveforms

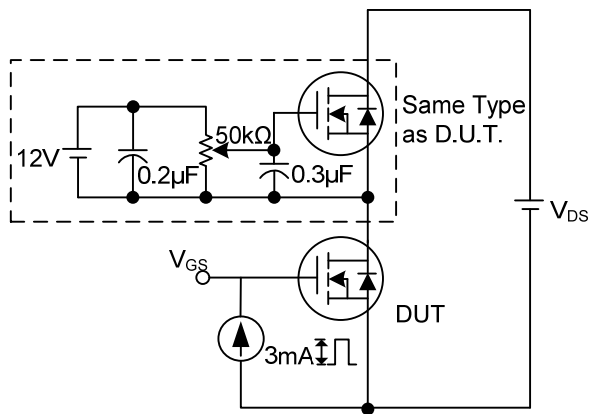


Fig. 3A Gate Charge Test Circuit

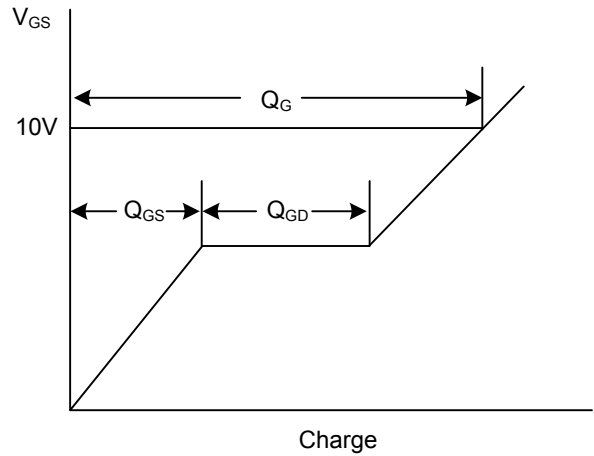


Fig. 3B Gate Charge Waveform

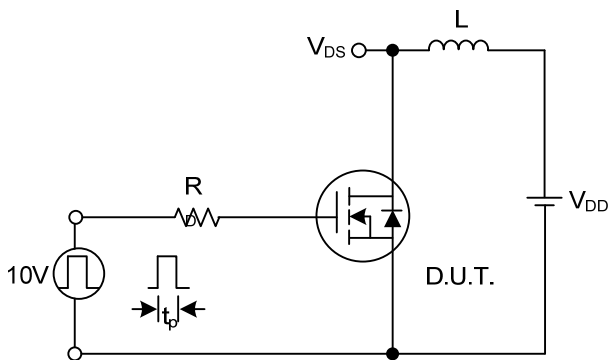


Fig. 4A Unclamped Inductive Switching Test Circuit

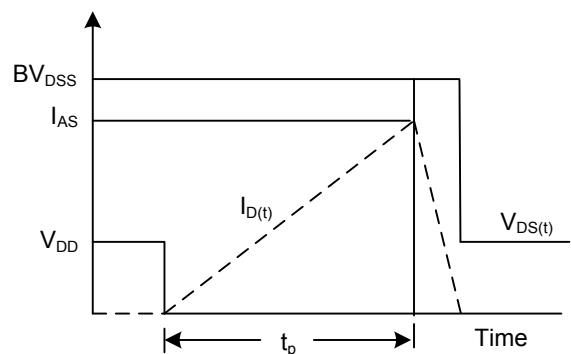
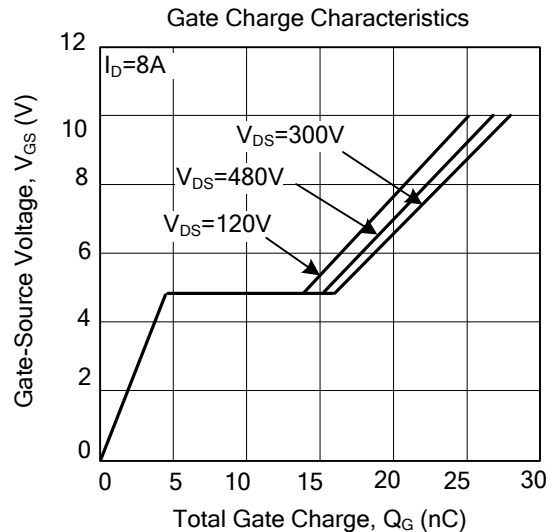
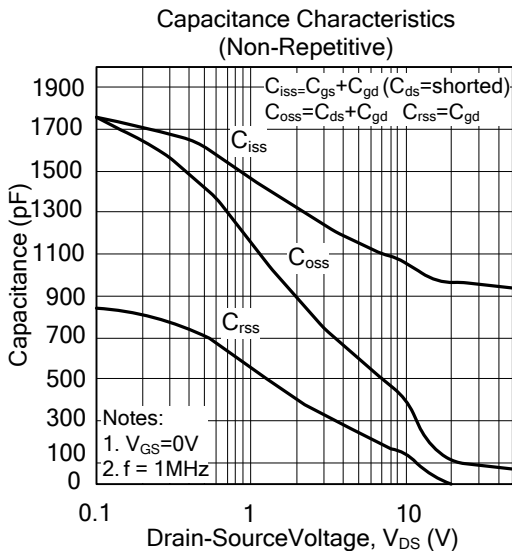
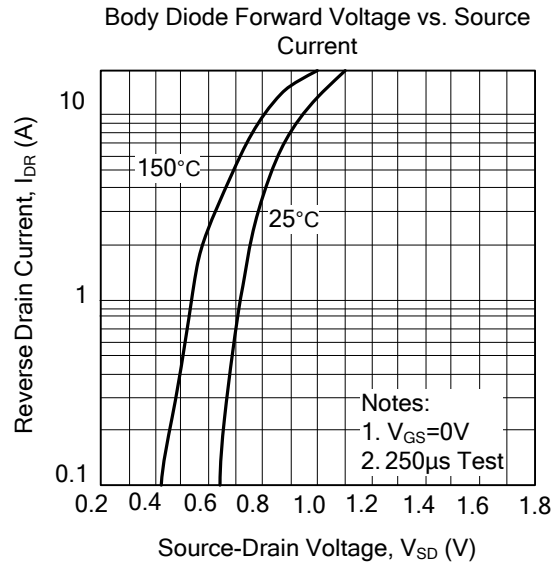
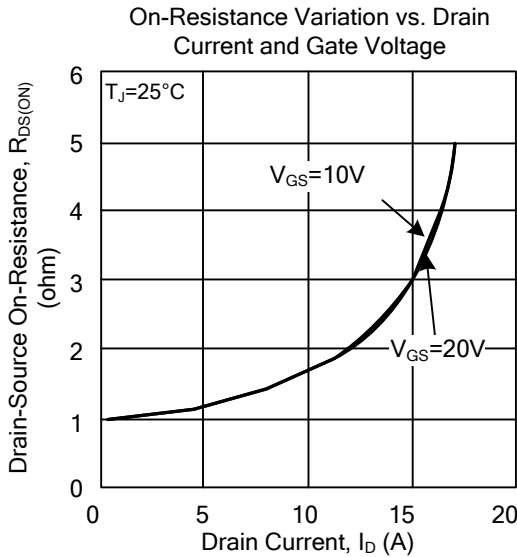
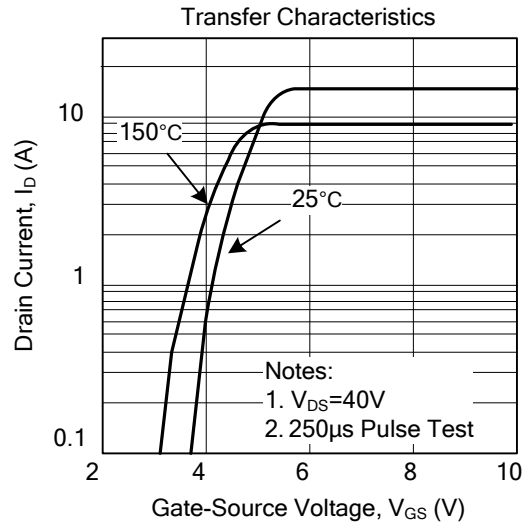
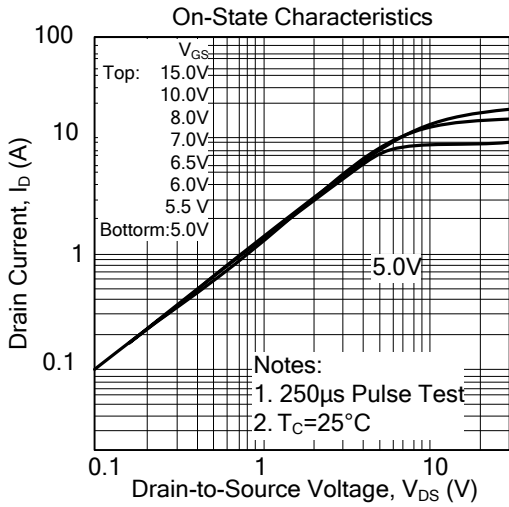
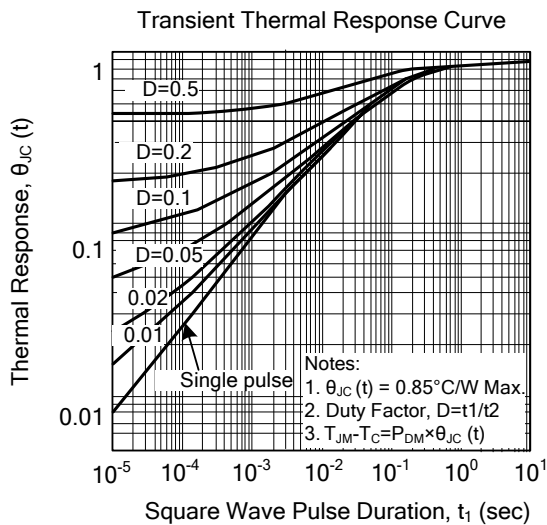
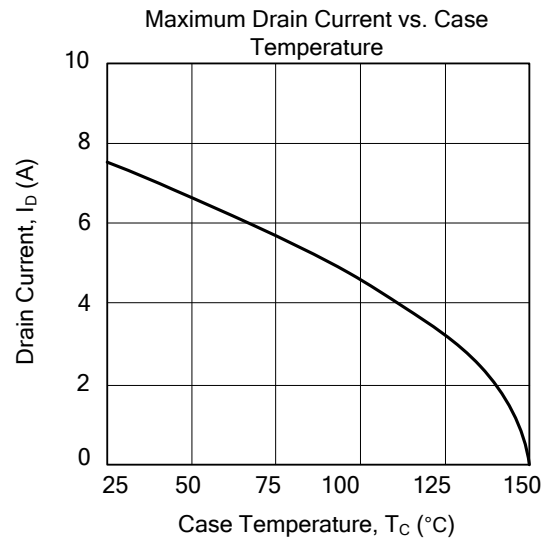
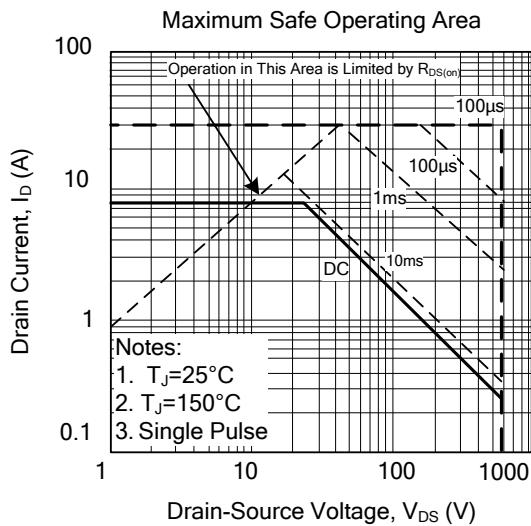
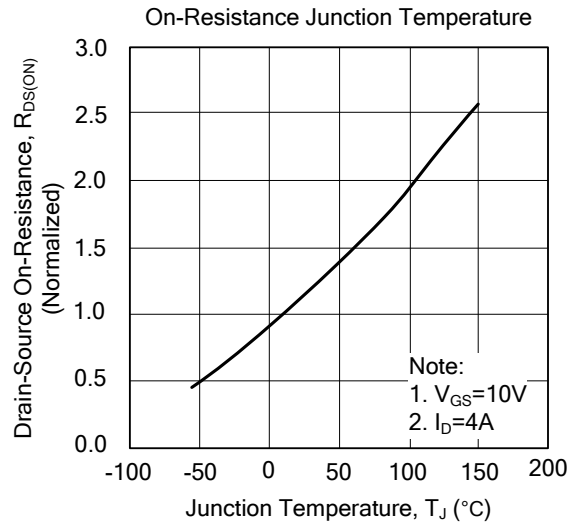
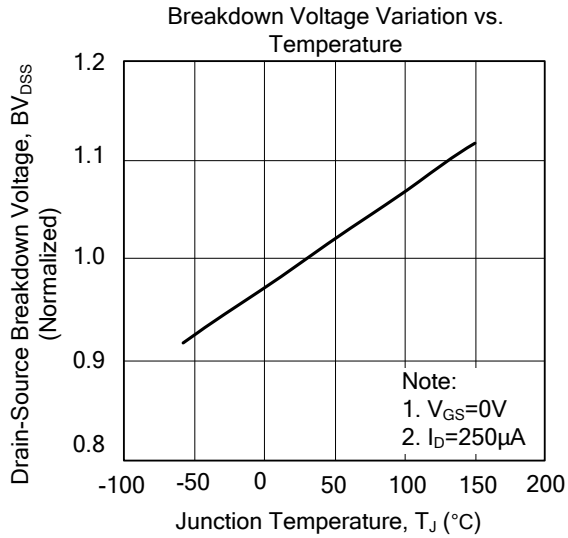


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS(Cont.)



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