



# 50N06

**Power MOSFET**

## 50 Amps, 60 Volts N-CHANNEL POWER MOSFET

■ DESCRIPTION

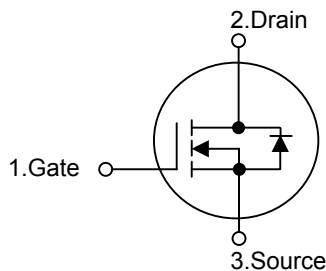
The UTC **50N06** is three-terminal silicon device with current conduction capability of about 50A, fast switching speed. Low on-state resistance, breakdown voltage rating of 60V, and max threshold voltages of 4 volt.

It is mainly suitable electronic ballast, and low power switching mode power appliances.

■ FEATURES

- \*  $R_{DS(ON)} = 23m\Omega @ V_{GS} = 10V$
- \* Ultra low gate charge ( typical 30 nC )
- \* Low reverse transfer capacitance (  $C_{RSS} =$  typical 80 pF )
- \* Fast switching capability
- \* 100% avalanche energy specified
- \* Improved dv/dt capability

■ SYMBOL

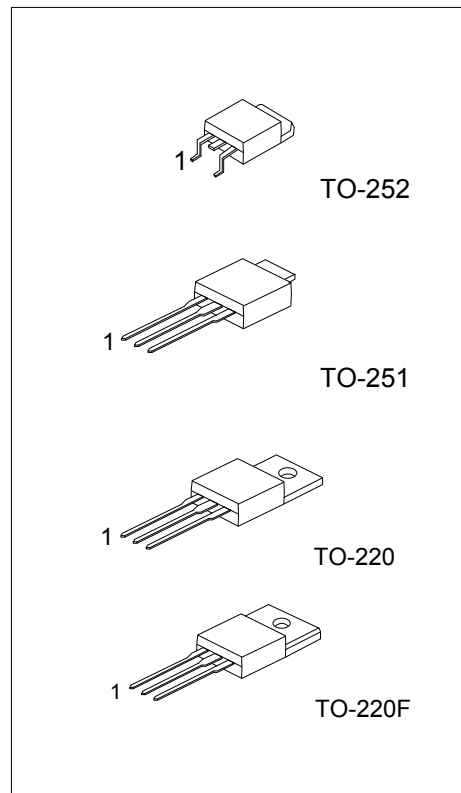


■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
50N06L-TA3-T	50N06G-TA3-T	TO-220	G	D	S	Tube
50N06L-TF3-T	50N06G-TF3-T	TO-220F	G	D	S	Tube
50N06L-TM3-T	50N06G-TM3-T	TO-251	G	D	S	Tube
50N06L-TN3-R	50N06G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>50N06L-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) TA3: TO-220, TF3: TO-220F, TN3: TO-252, TM3: TO-251</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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### ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	$I_D$	50	A
	$T_C = 100^\circ\text{C}$		35	A
Pulsed Drain Current (Note 2)		$I_{DM}$	200	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	480	mJ
	Repetitive (Note 2)	$E_{AR}$	13	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	7	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	TO-220	$P_D$	120	W
	TO-220F		70	W
	TO-251		136	W
	TO-252		136	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Operation and 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.  $L=0.38\text{mH}$ ,  $I_{AS}=50\text{A}$ ,  $V_{DD}=25\text{V}$ ,  $R_G=20\Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD}\leq 50\text{A}$ ,  $di/dt\leq 300\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220	$\theta_{JA}$	62	$^\circ\text{C}/\text{W}$
	TO-220F		62	$^\circ\text{C}/\text{W}$
	TO-251		100	$^\circ\text{C}/\text{W}$
	TO-252		100	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	1.24	$^\circ\text{C}/\text{W}$
	TO-220F		1.78	$^\circ\text{C}/\text{W}$
	TO-251		1.1	$^\circ\text{C}/\text{W}$
	TO-252		1.1	$^\circ\text{C}/\text{W}$

### ■ 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	$BV_{DSS}$	$V_{GS} = 0\text{V}$ , $I_D = 250\ \mu\text{A}$	60			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$			10	$\mu\text{A}$
Gate-Source Leakage Current		$I_{GSS}$	$V_{GS} = 20\text{V}$ , $V_{DS} = 0\text{V}$		100	nA
					$V_{GS} = -20\text{V}$ , $V_{DS} = 0\text{V}$	-100
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		0.07		$\text{V}/^\circ\text{C}$
<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	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$ , $I_D = 25\text{A}$		18	23	$\text{m}\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ $f = 1\text{MHz}$		900	1220	pF
Output Capacitance	$C_{OSS}$			430	550	pF
Reverse Transfer Capacitance	$C_{RSS}$			80	100	pF

■ ELECTRICAL CHARACTERISTICS(Cont.)

SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 30V, I_D = 25A,$ $R_G = 50\Omega$ (Note 1, 2)		40	60	ns
Turn-On Rise Time	$t_R$			100	200	ns
Turn-Off Delay Time	$t_{D(OFF)}$			90	180	ns
Turn-Off Fall Time	$t_F$			80	160	ns
Total Gate Charge	$Q_G$	$V_{DS} = 48V, V_{GS} = 10V$ $I_D = 50A$ (Note 1, 2)		30	40	nC
Gate-Source Charge	$Q_{GS}$			9.6		nC
Gate-Drain Charge	$Q_{GD}$			10		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S = 50A, V_{GS} = 0V$			1.5	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				50	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				200	A
Reverse Recovery Time	$t_{RR}$	$I_S = 50A, V_{GS} = 0V$		54		ns
Reverse Recovery Charge	$Q_{RR}$	$di_F / dt = 100 A/\mu s$		81		$\mu C$

Notes: 1. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$   
 2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

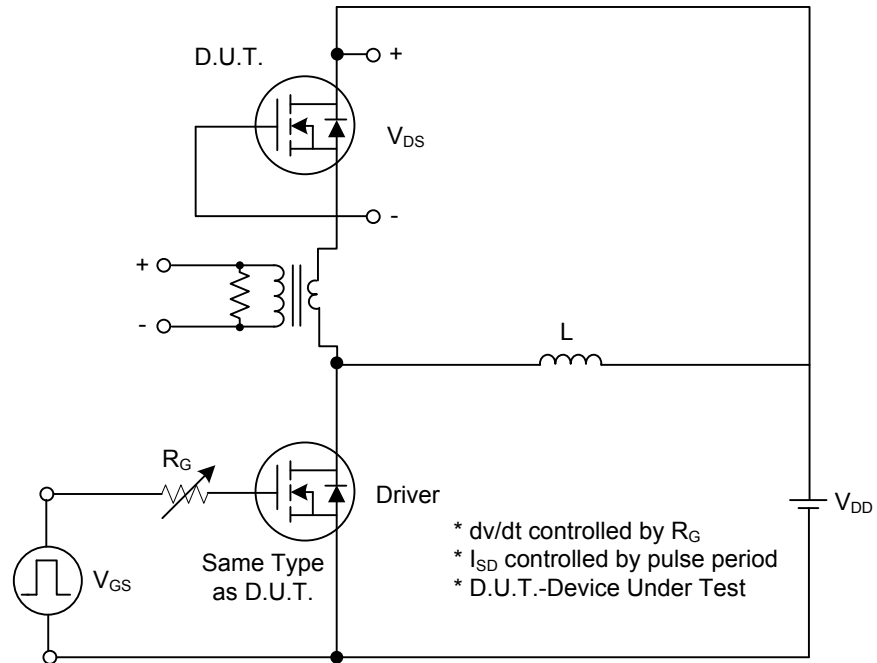


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

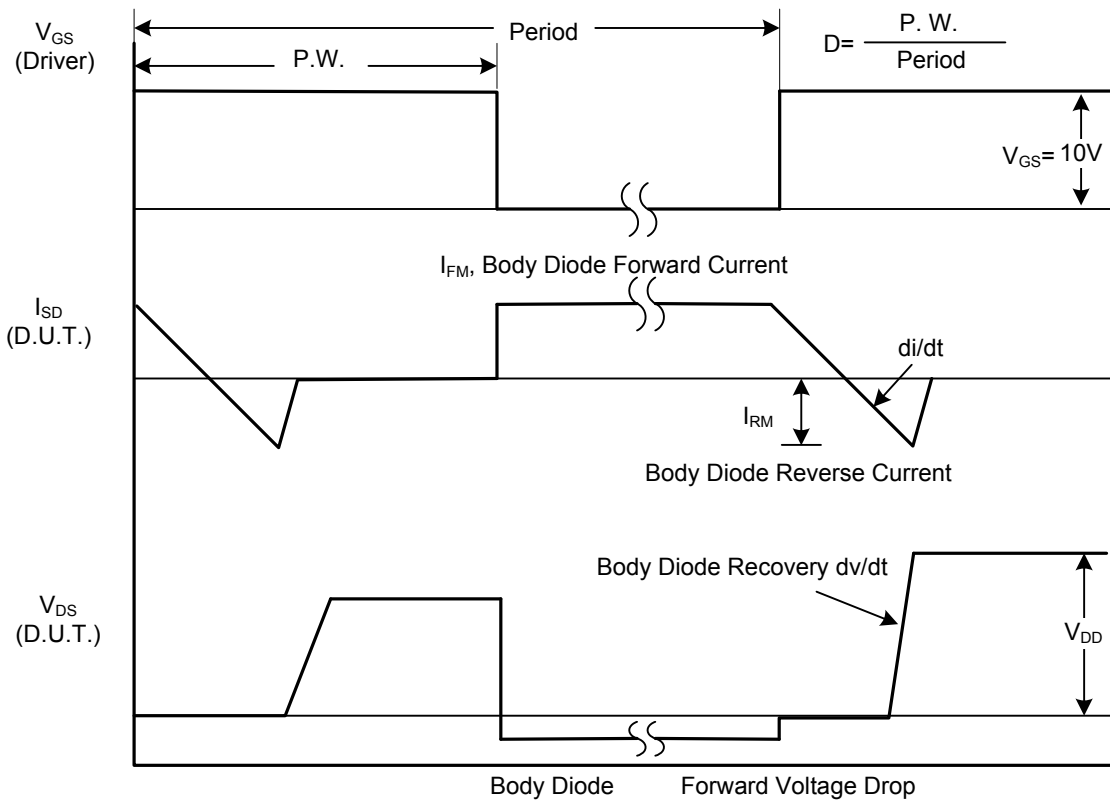


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

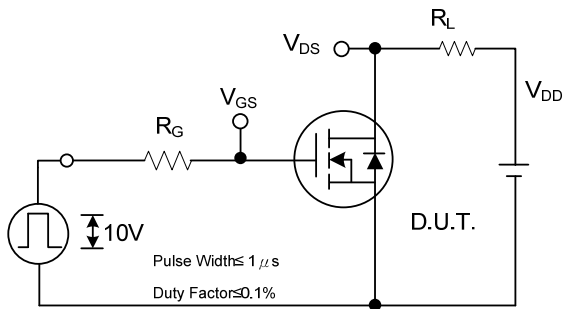


Fig. 2A Switching Test Circuit

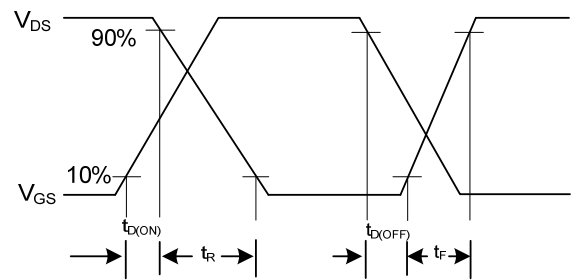


Fig. 2B Switching Waveforms

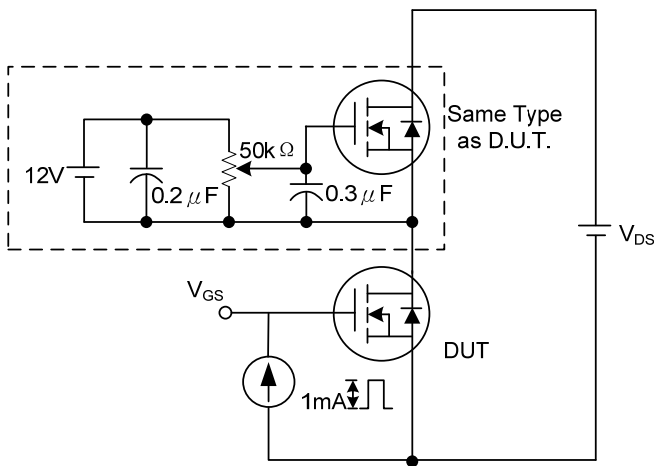


Fig. 3A Gate Charge Test Circuit

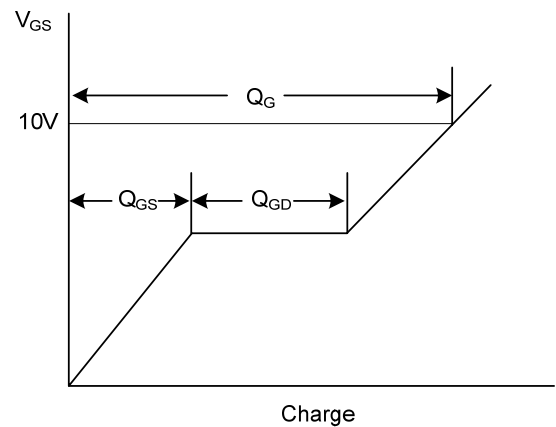


Fig. 3B Gate Charge Waveform

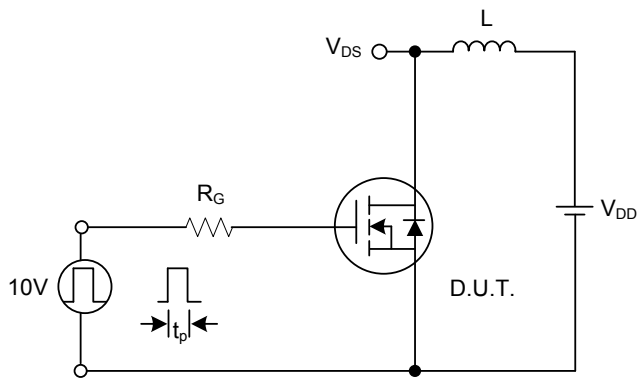


Fig. 4A Unclamped Inductive Switching Test Circuit

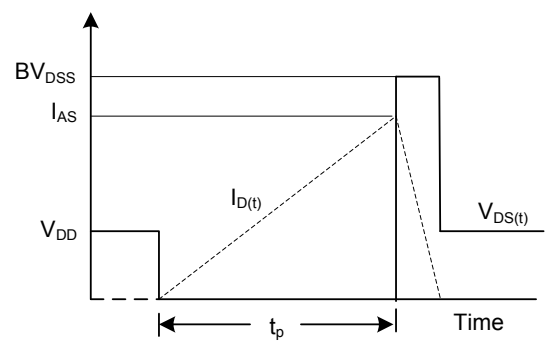
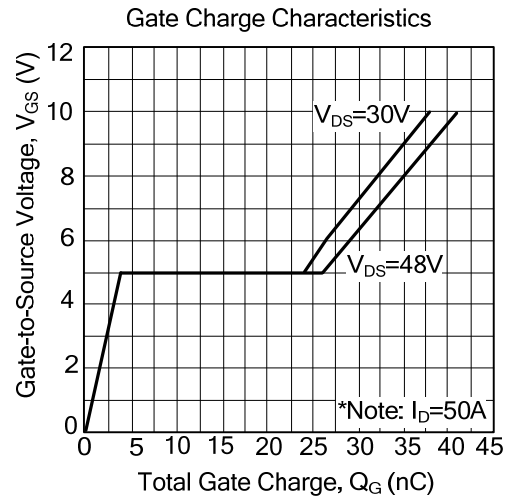
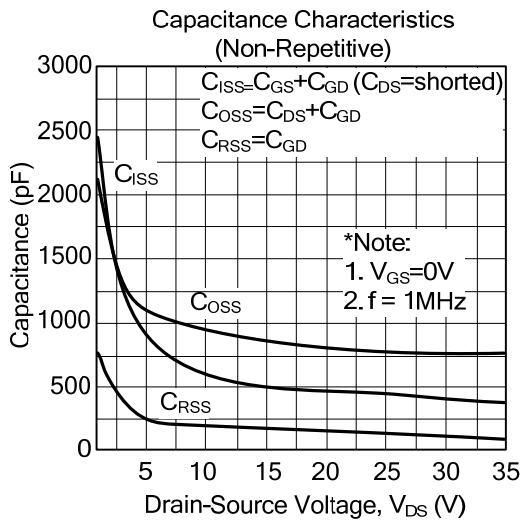
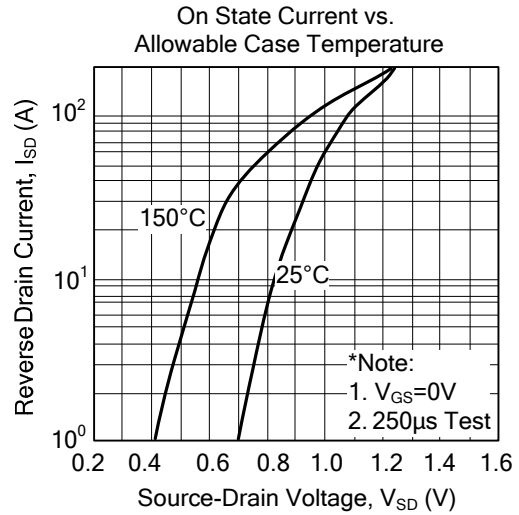
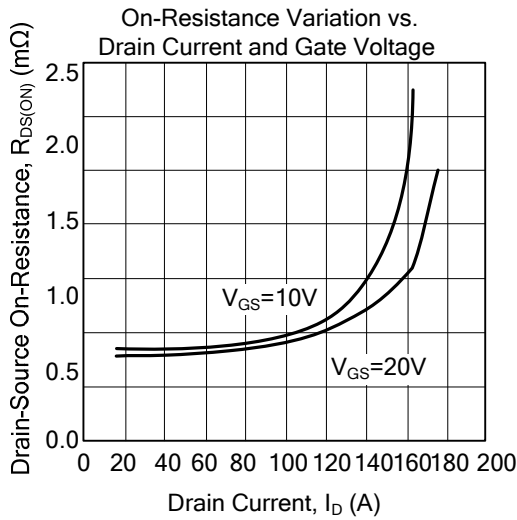
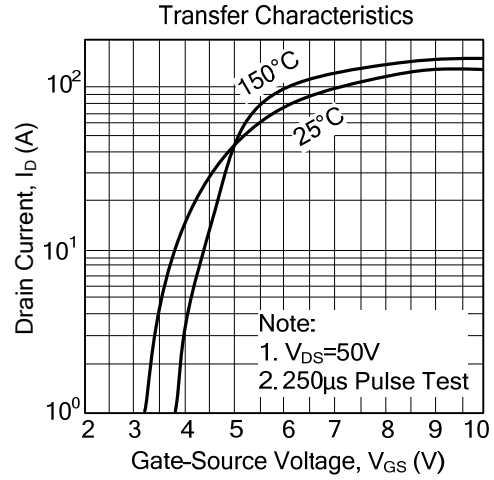
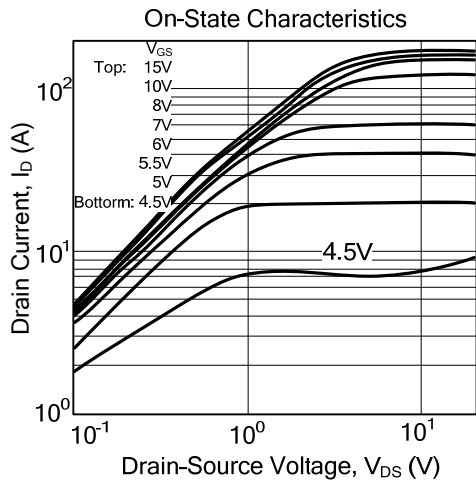
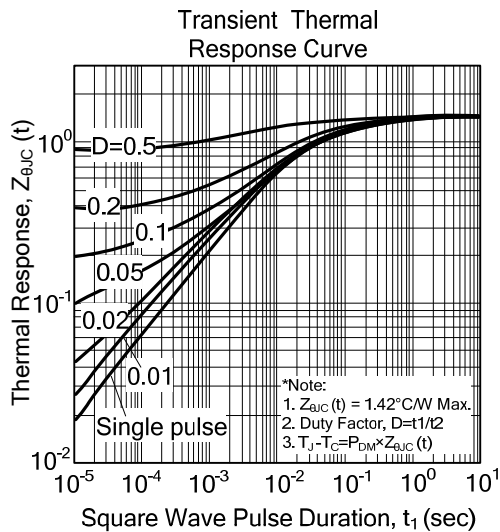
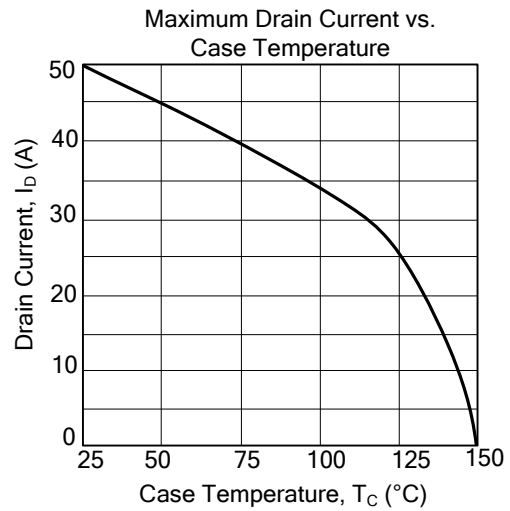
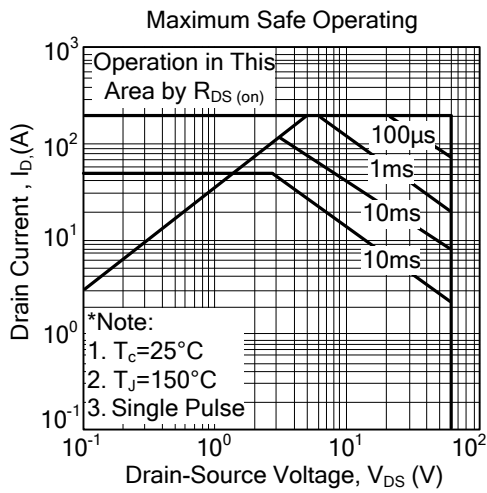
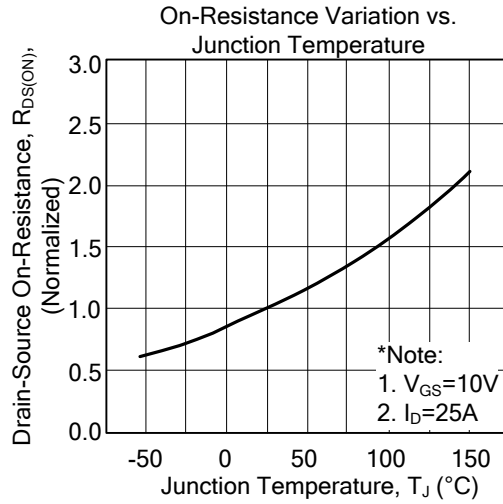
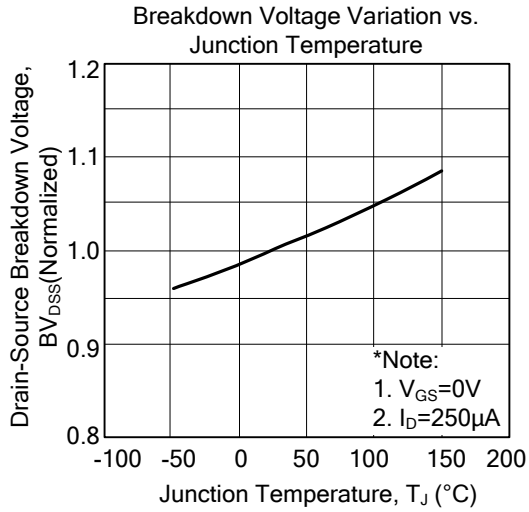


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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