



# 50N06

MOSFET

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

### DESCRIPTION

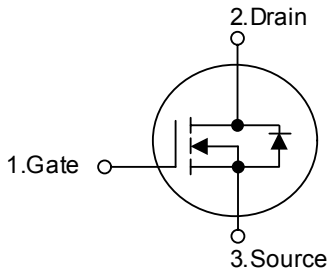
The UTC **50N06** is three-terminal silicon device with current conduction capability of about 50A, fast switching speed. Low on-state resistance, breakdown voltage rating of 60V, and max threshold voltages of 4 volt.

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

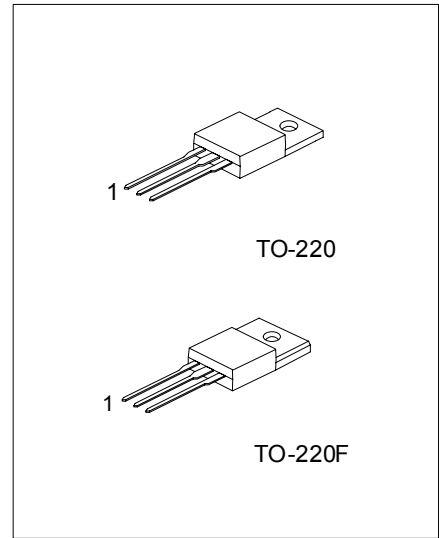
### SYMBOL



### ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
50N06-TA3-T	50N06L-x-TA3-T	TO-220	G	D	S	Tube
50N06-TF3-T	50N06L-x-TF3-T	TO-220F	G	D	S	Tube

<p>50N06L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Plating</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF3: TO-220F</p> <p>(3) L: Lead Free Plating Blank: Pb/Sn</p>
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\*Pb-free plating product number: 50N06L

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	60	V
Gate to Source Voltage	$V_{GSS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C = 25$	50
		$T_C = 100$	35
Drain Current Pulsed (Note 1)	$I_{DM}$	200	A
Single Pulsed Avalanche Energy (Note 2)	$E_{AS}$	480	mJ
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	13	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	7	V/ns
Total Power Dissipation ( $T_C = 25$ )	$P_D$	130	W
Derating Factor above 25		0.9	W/
Operation Junction Temperature	$T_J$	-55 ~ +150	
Storage Temperature	$T_{STG}$	-55 ~ +150	

Note: 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.

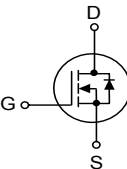
■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Thermal Resistance, Junction-to-Case	$\theta_{JC}$			1.15	$^{\circ}C/W$
Thermal Resistance, Case-to-Sink	$\theta_{CS}$		0.5		$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$\theta_{JA}$			62.5	$^{\circ}C/W$

■ ELECTRICAL CHARACTERISTICS  $T_C = 25$  unless otherwise specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0 V, I_D = 250 \mu A$	60			V
Breakdown Voltage Temperature Coefficient	$BV_{DSS}/T_J$	$I_D = 250 \mu A$ , Referenced to 25		0.07		V/
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 60 V, V_{GS} = 0 V$			1	$\mu A$
		$V_{DS} = 48 V, T_C = 125$				$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = 20V, V_{DS} = 0 V$			100	nA
Gate-Source Leakage Reverse		$V_{GS} = -20V, V_{DS} = 0 V$			-100	nA
<b>On Characteristics</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250 \mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10 V, I_D = 25 A$		18	23	m $\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0 V, V_{DS} = 25 V$ $f = 1MHz$		900	1220	pF
Output Capacitance	$C_{OSS}$			430	550	pF
Reverse Transfer Capacitance	$C_{RSS}$			80	100	pF
<b>Dynamic Characteristics</b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 30V, I_D = 25 A$ , $R_G = 50\Omega$ (Note 4, 5)		40	60	ns
Rise Time	$t_R$			100	200	ns
Turn-Off Delay Time	$t_{D(OFF)}$			90	180	ns
Fall Time	$t_F$			80	160	ns
Total Gate Charge	$Q_G$		$V_{DS} = 48V, V_{GS} = 10 V$ $I_D = 50A$ , (Note 4, 5)		30	40
Gate-Source Charge	$Q_{GS}$			9.6		nC
Gate-Drain Charge (Miller Charge)	$Q_{GD}$			10		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Source-Drain Diode Ratings and Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$I_S = 50A, V_{GS} = 0V$			1.5	V
Continuous Source Current	$I_S$	Integral Reverse p-n Junction Diode in the MOSFET 			50	A
Pulsed Source Current	$I_{SM}$				200	
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		$\mu C$

- Note 1. Repeativity rating: pulse width limited by junction temperature  
 2.  $L=5.6mH, I_{AS}=50A, V_{DD}=25V, R_G=0\Omega$ , Starting  $T_J=25$   
 3.  $I_{SD}\leq 50A, di/dt\leq 300A/\mu s, V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25$   
 4. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$   
 5. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

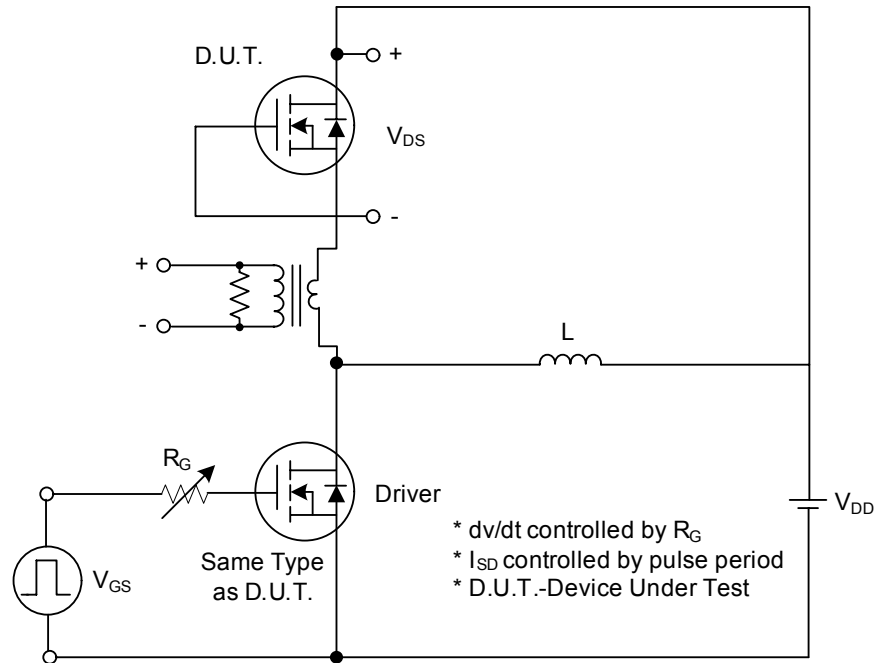


Fig. 1A Peak Diode Recovery  $dv/dt$  Test Circuit

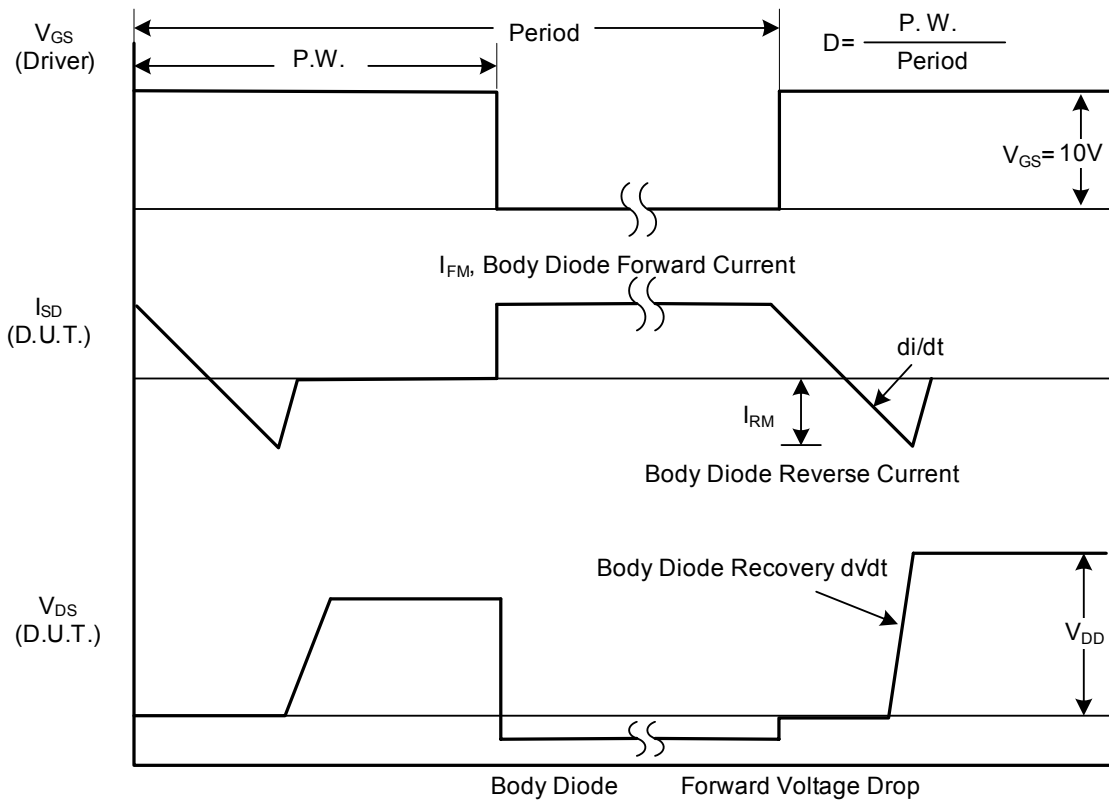


Fig. 1B Peak Diode Recovery  $dv/dt$  Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

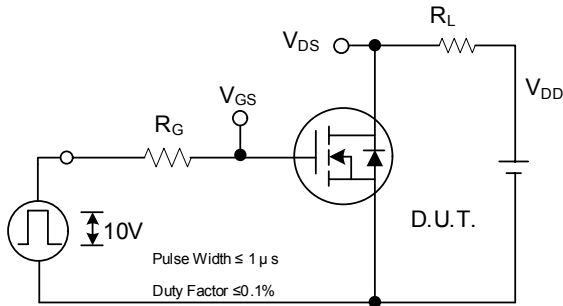


Fig. 2A Switching Test Circuit

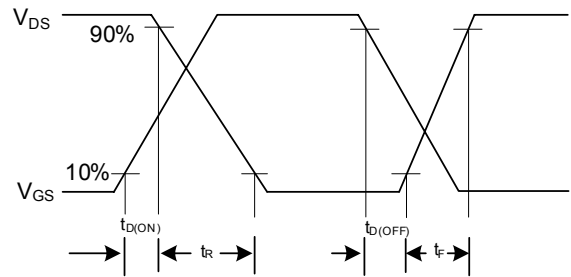


Fig. 2B Switching Waveforms

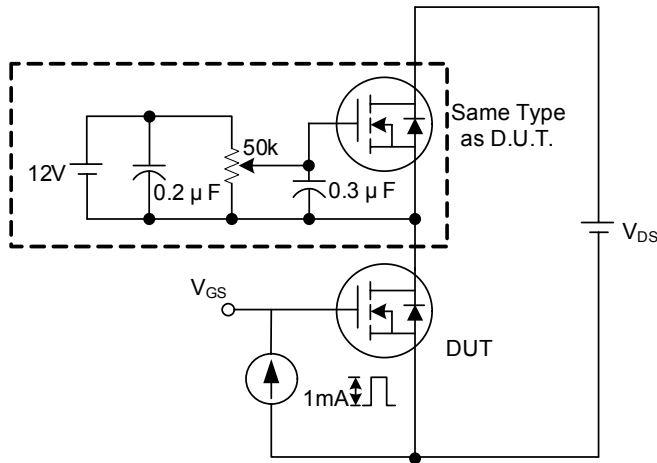


Fig. 3A Gate Charge Test Circuit

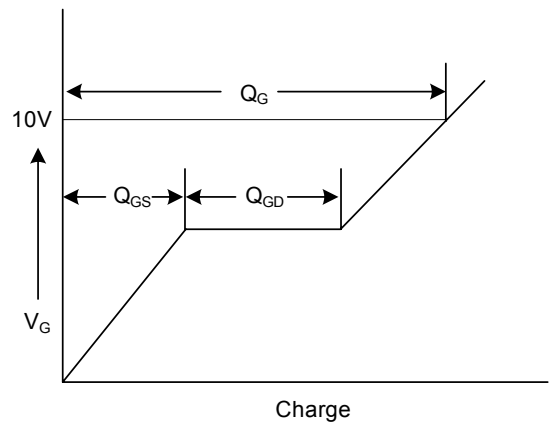


Fig. 3B Gate Charge Waveform

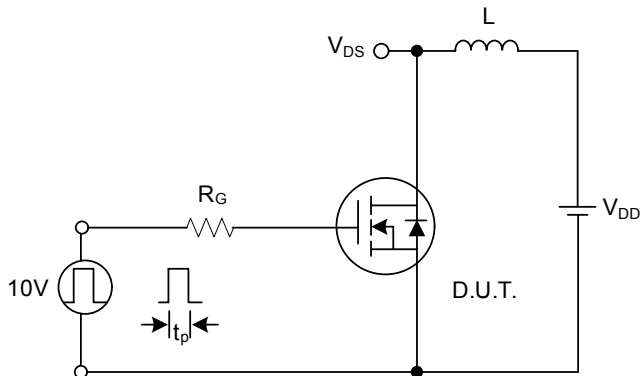


Fig. 4A Unclamped Inductive Switching Test Circuit

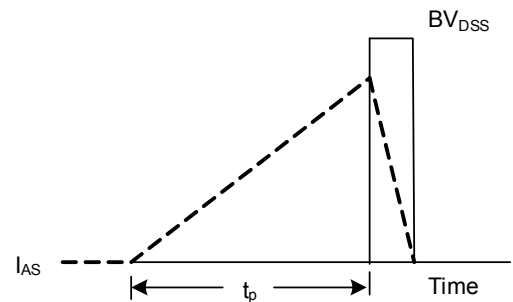
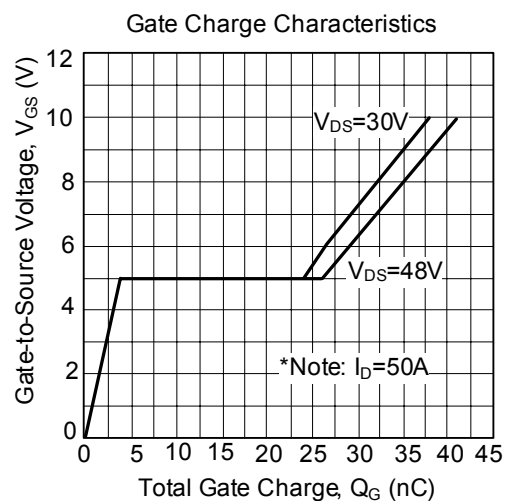
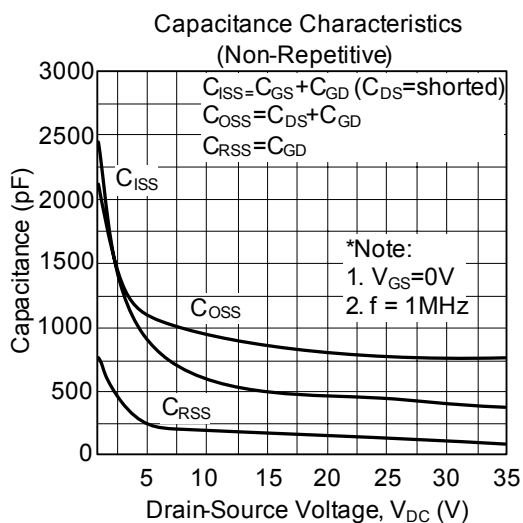
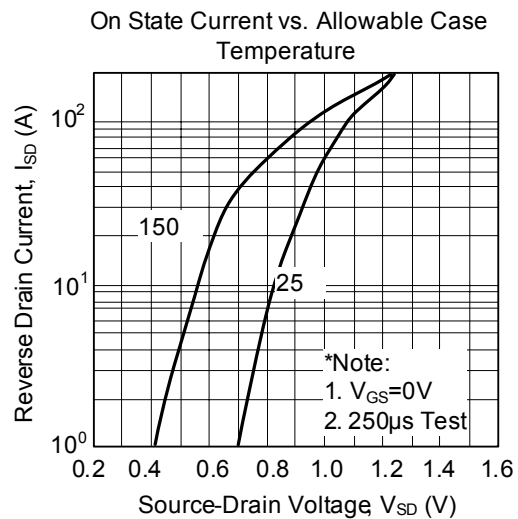
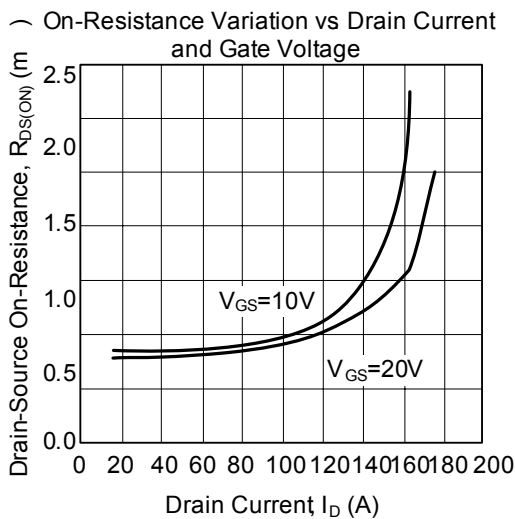
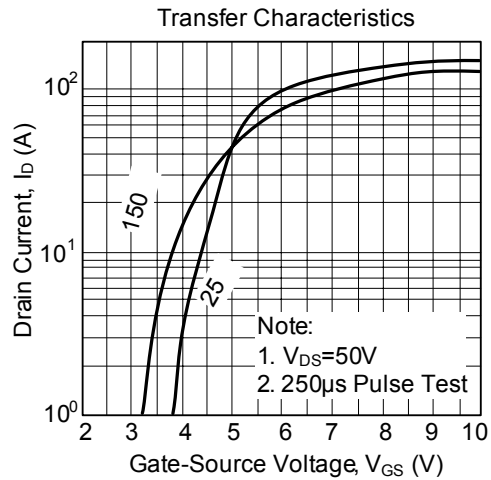
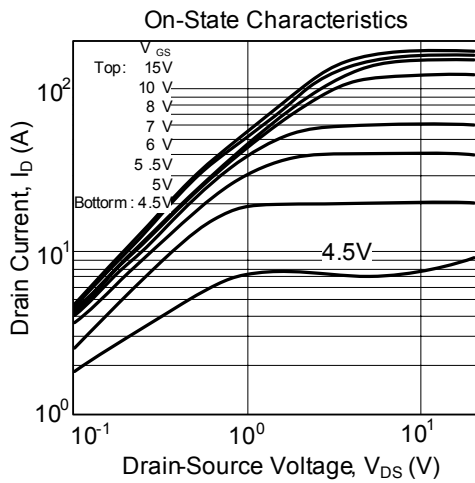
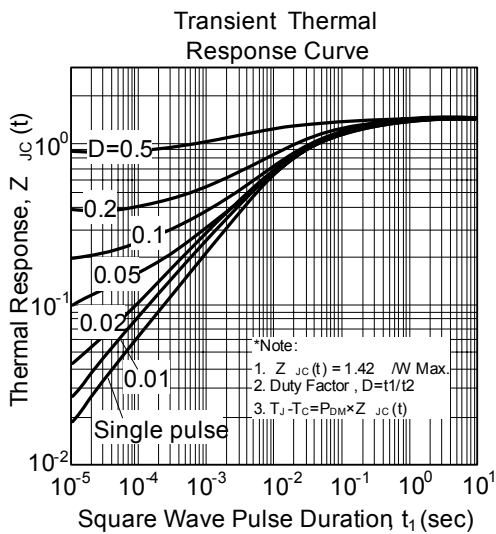
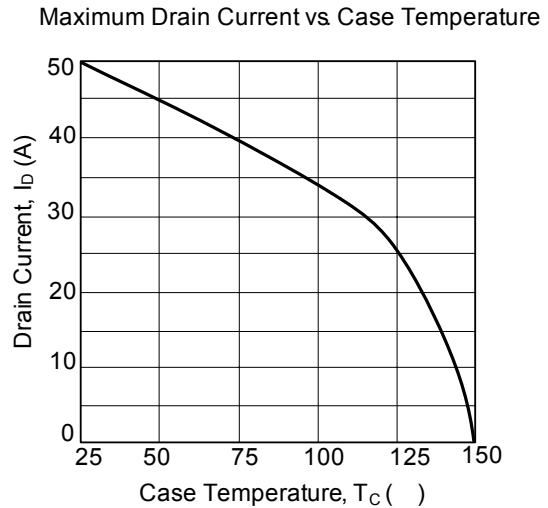
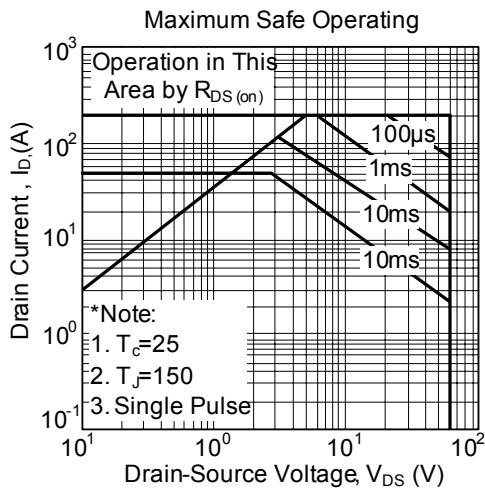
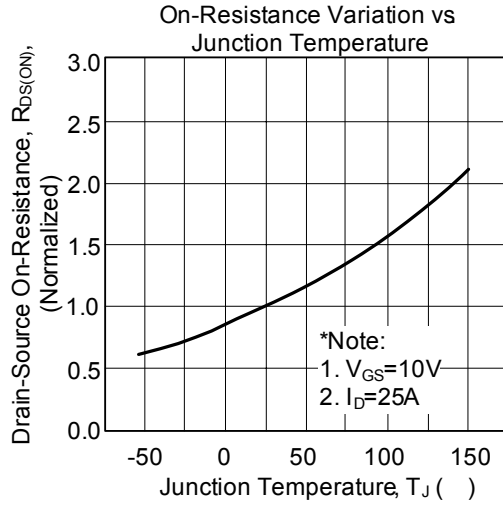
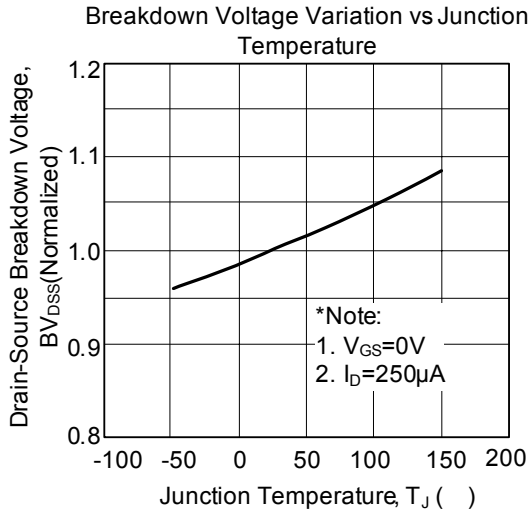


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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