



50N06

Power MOSFET

50 Amps, 60 Volts N-CHANNEL POWER MOSFET

■ DESCRIPTION

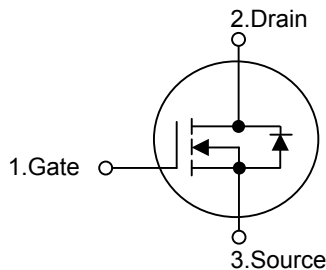
The UTC **50N06** is three-terminal silicon device with current conduction capability of about 50A, fast switching speed. Low on-state resistance, breakdown voltage rating of 60V, and max threshold voltages of 4 volt.

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

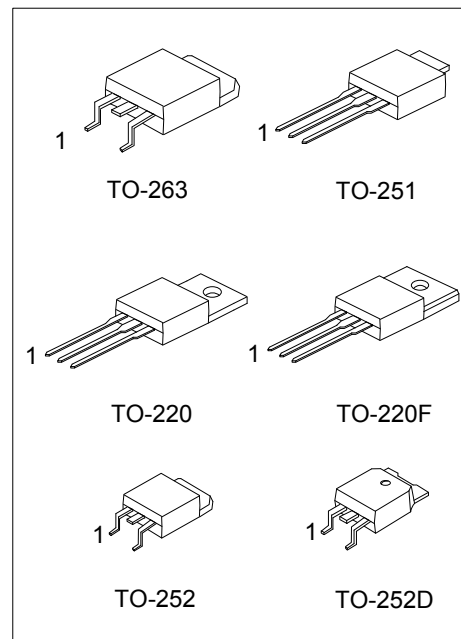


■ ORDERING INFORMATION

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
50N60L-TM3-T	50N60G-TM3-T	TO-251	G	D	S	Tube
50N06L-TN3-T	50N06G-TN3-T	TO-252	G	D	S	Tube
50N06L-TN3-R	50N06G-TN3-R	TO-252	G	D	S	Tape Reel
50N60L-TND-T	50N60G-TND-T	TO-252D	G	D	S	Tube
50N06L-TND-R	50N06G-TND-R	TO-252D	G	D	S	Tape Reel
50N06L-TQ2-T	50N06G-TQ2-T	TO-263	G	D	S	Tube
50N06L-TQ2-R	50N06G-TQ2-R	TO-263	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) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TM3: TO-251, TN3: TO-252, TND: TO-252, TQ2: TO-263</p> <p>(3) L: Lead Free, G: Halogen 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}	± 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/TO-263	P_D	120	W
	TO-220F		70	W
	TO-251/TO-252		46	W
	TO-252D			
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/TO-220F TO-263	θ_{JA}	62	$^\circ\text{C}/\text{W}$
	TO-251/TO-252 TO-252D		100	$^\circ\text{C}/\text{W}$
	TO-220		1.24	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F	θ_{JC}	1.78	$^\circ\text{C}/\text{W}$
	TO-251/TO-252 TO-252D		2.7	$^\circ\text{C}/\text{W}$
	TO-263		1.24	$^\circ\text{C}/\text{W}$

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
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	μA
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA
	Reverse				$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	-100
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		0.07		$\text{V}/^\circ\text{C}$
ON CHARACTERISTICS						
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	m Ω
DYNAMIC CHARACTERISTICS						
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	
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 30\text{ V}, I_D = 25\text{ A}$, $R_G = 50\ \Omega$ (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	$V_{DS} = 48\text{ V}, V_{GS} = 10\text{ V}$ $I_D = 50\text{ A}$ (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}	$I_S = 50\text{ A}, V_{GS} = 0\text{ V}$			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}	$I_S = 50\text{ A}, V_{GS} = 0\text{ V}$		54		ns
Reverse Recovery Charge	Q_{RR}	$di_F / dt = 100\text{ A}/\mu\text{s}$		81		μC

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

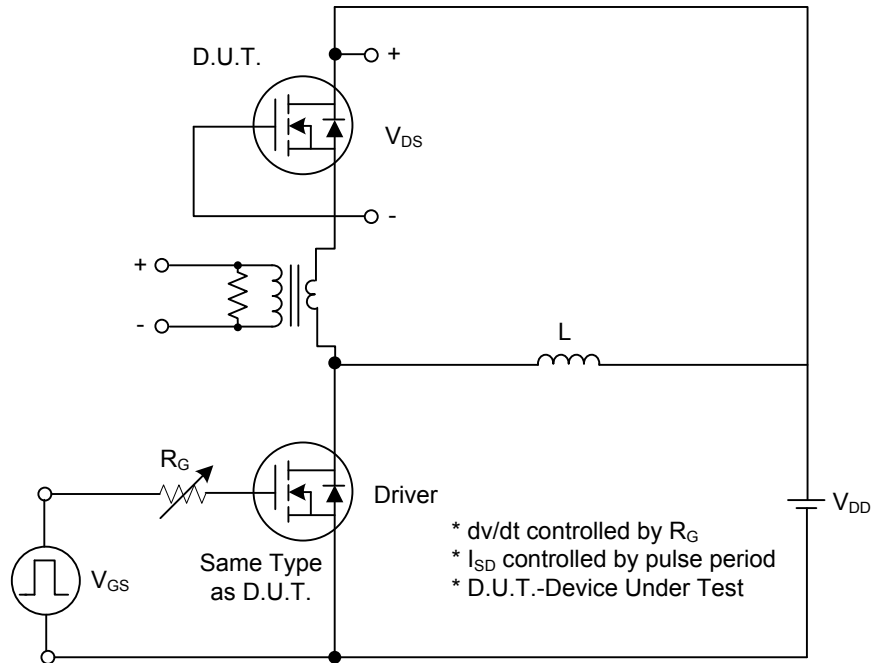


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

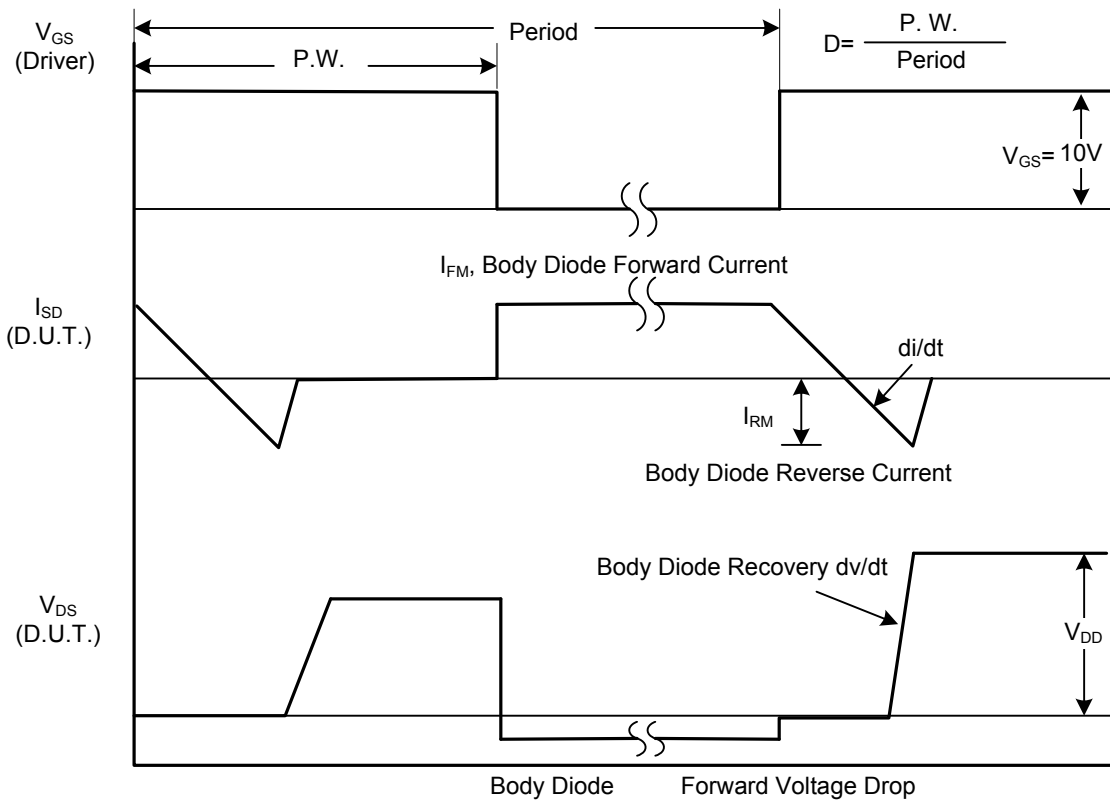


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

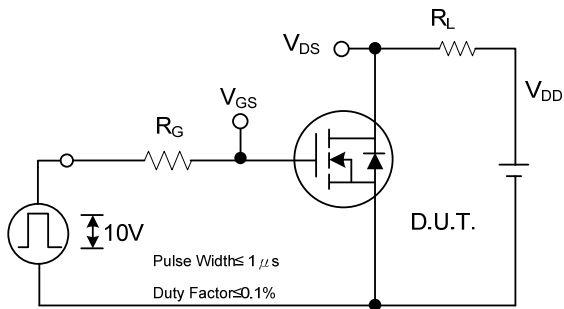


Fig. 2A Switching Test Circuit

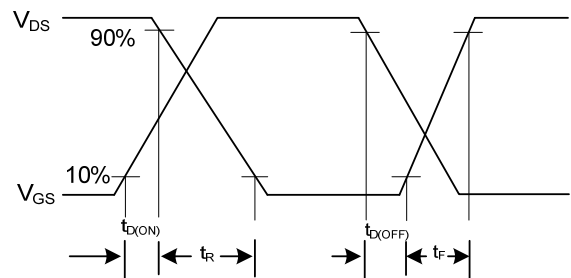


Fig. 2B Switching Waveforms

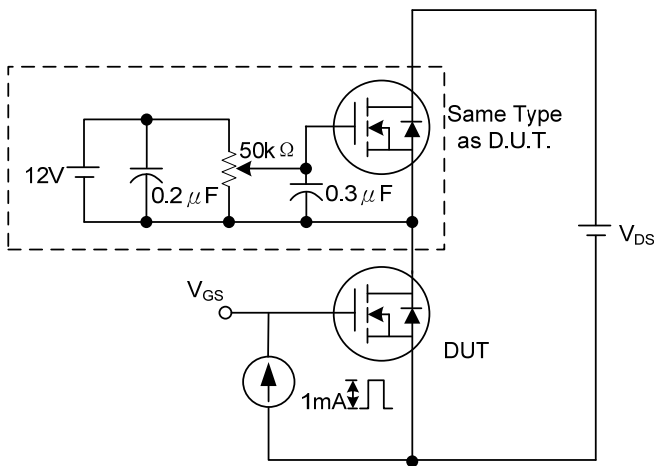


Fig. 3A Gate Charge Test Circuit

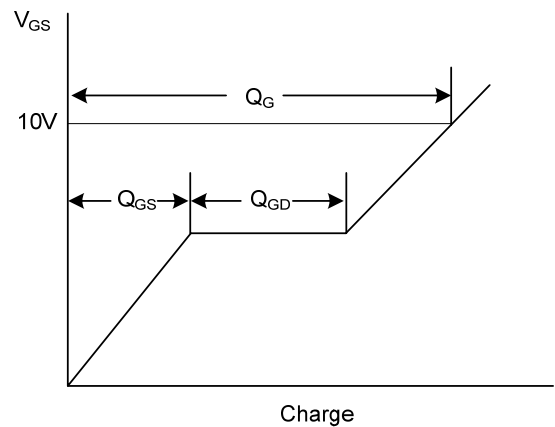


Fig. 3B Gate Charge Waveform

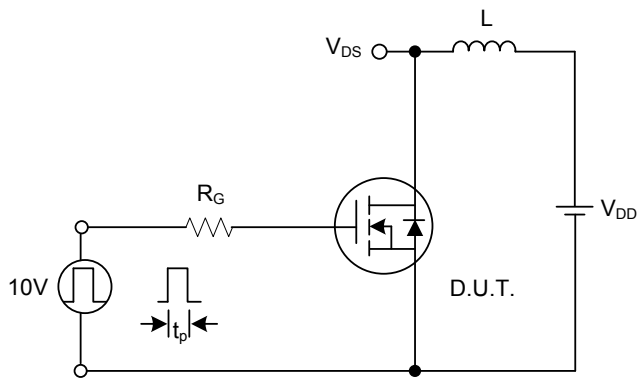


Fig. 4A Unclamped Inductive Switching Test Circuit

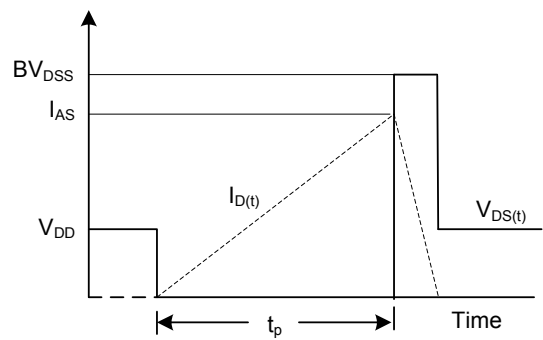
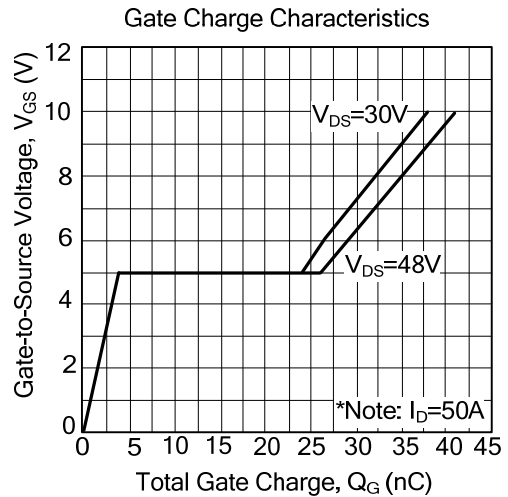
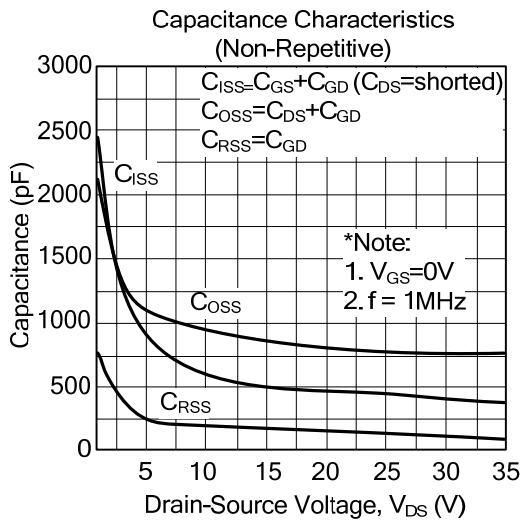
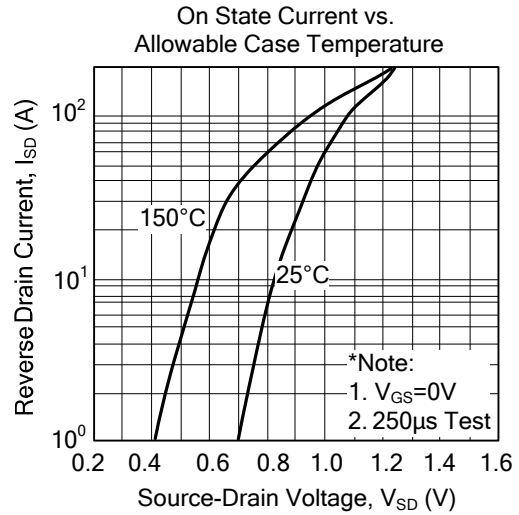
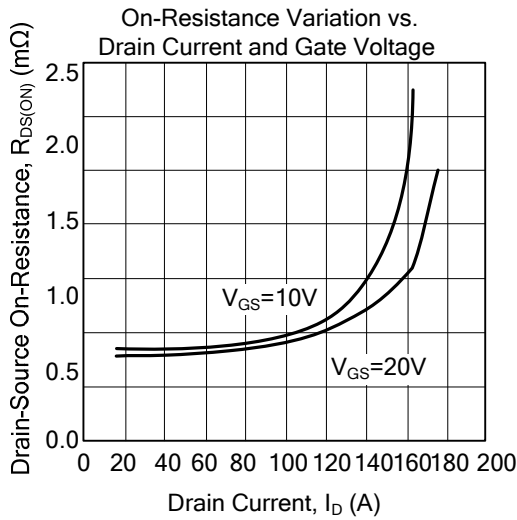
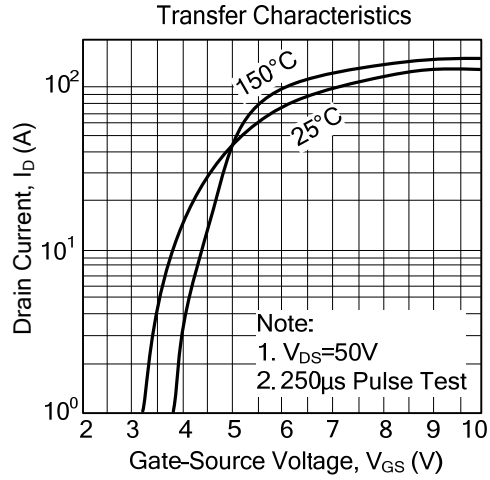
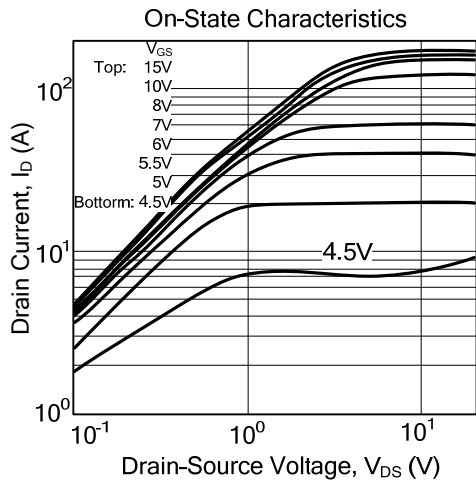
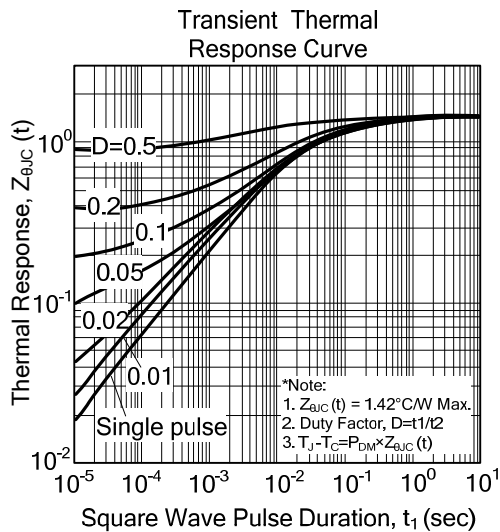
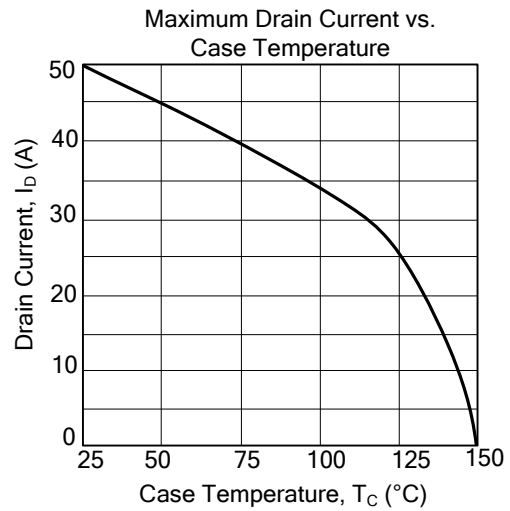
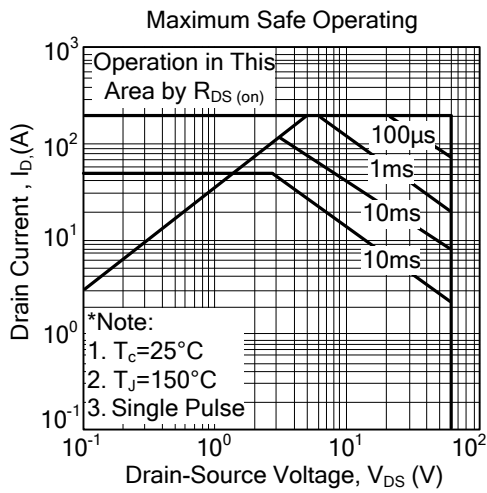
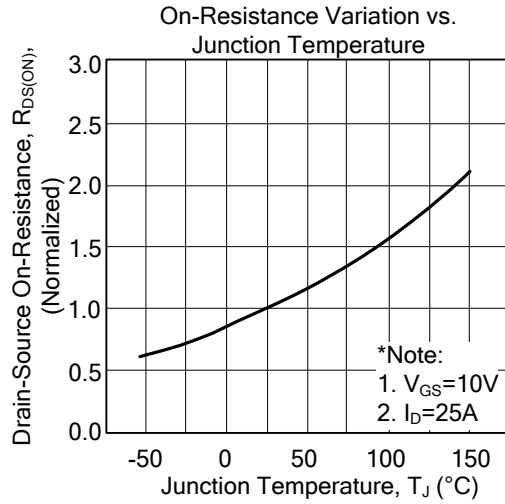
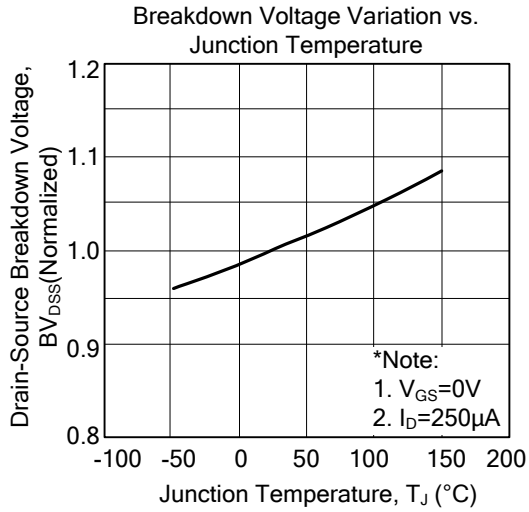


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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