



50N06

Power MOSFET

50 Amps, 60 Volts N-CHANNEL POWER MOSFET

■ DESCRIPTION

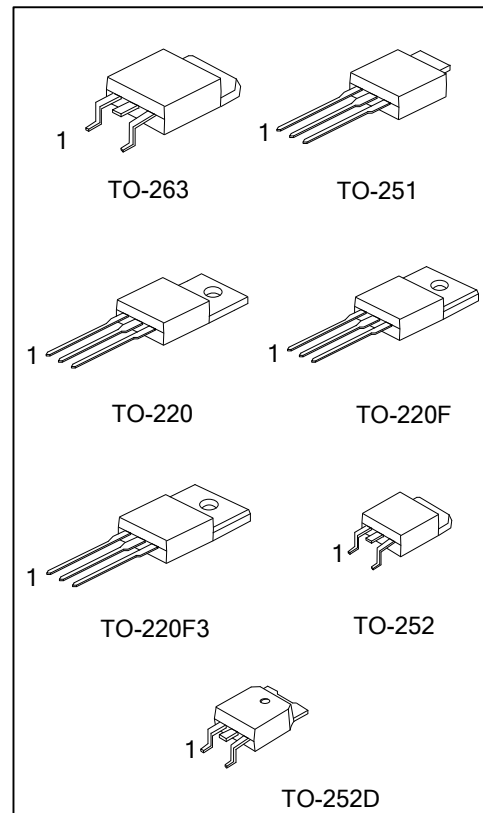
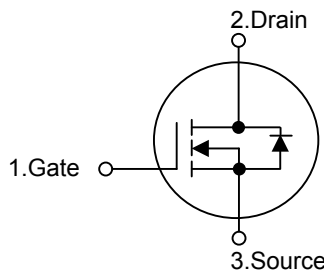
The UTC **50N06** is three-terminal silicon device with current conduction capability of about 50A, fast switching speed. Low on-state resistance, breakdown voltage rating of 60V, and max threshold voltages of 4 volt.

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

■ FEATURES

- * $R_{DS(ON)} < 23m\Omega @ V_{GS} = 10V$
- * Fast switching capability
- * 100% avalanche energy specified
- * Improved dv/dt capability

■ SYMBOL



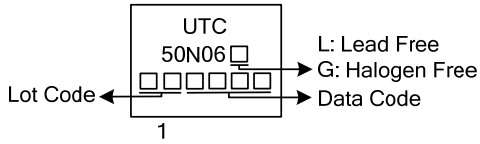
■ ORDERING INFORMATION

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-TF3T-T	50N06G-TF3T-T	TO-220F3	G	D	S	Tube
50N60L-TM3-T	50N60G-TM3-T	TO-251	G	D	S	Tube
50N06L-TN3-R	50N06G-TN3-R	TO-252	G	D	S	Tape Reel
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, TF3T: TO-220F3, TM3: TO-251, TN3: TO-252, TND: TO-252D, TQ2: TO-263</p> <p>(3) L: Lead Free, G: Halogen Free</p>
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MARKING INFORMATION

PACKAGE	MARKING
TO-220 TO-220F TO-220F3 TO-251 TO-252 TO-252D TO-263	 <p>UTC 50N06 Lot Code → [] [] [] [] [] → Data Code 1 L: Lead Free G: Halogen Free</p>

■ 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/TO-220F3		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-220F3/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/TO-220F3	θ_{JC}	1.78	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.7	$^\circ\text{C}/\text{W}$
	TO-252D			
	TO-263		1.24	$^\circ\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0 V, I _D = 250 μA	60			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D = 250 μA, Referenced to 25°C		0.07		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250 μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 25 A		18	23	mΩ
DYNAMIC CHARACTERISTICS						
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
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} = 30V, I _D = 0.5 A, R _G = 25Ω (Note 1, 2)		60	80	ns
Turn-On Rise Time	t _R			180	220	ns
Turn-Off Delay Time	t _{D(OFF)}			300	350	ns
Turn-Off Fall Time	t _F			200	250	ns
Total Gate Charge	Q _G	V _{DS} = 50V, V _{GS} = 10 V I _D = 1.3A (Note 1, 2)		60	80	nC
Gate-Source Charge	Q _{GS}			9		nC
Gate-Drain Charge	Q _{GD}			20		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V _{SD}	I _S = 50A, V _{GS} = 0 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 = 50A, V _{GS} = 0 V		54		ns
Reverse Recovery Charge	Q _{RR}	dI _F / dt = 100 A/μs		81		μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

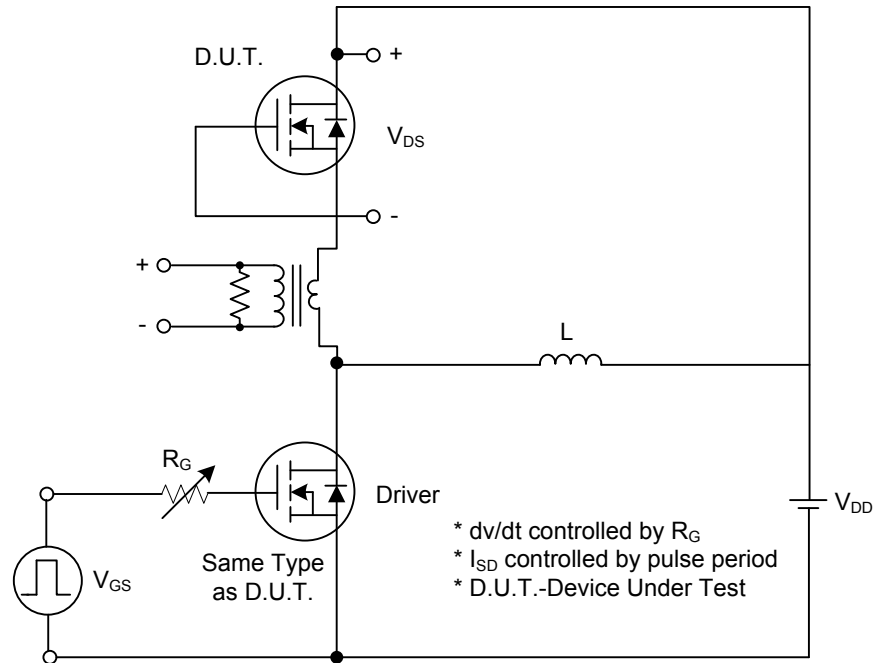


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

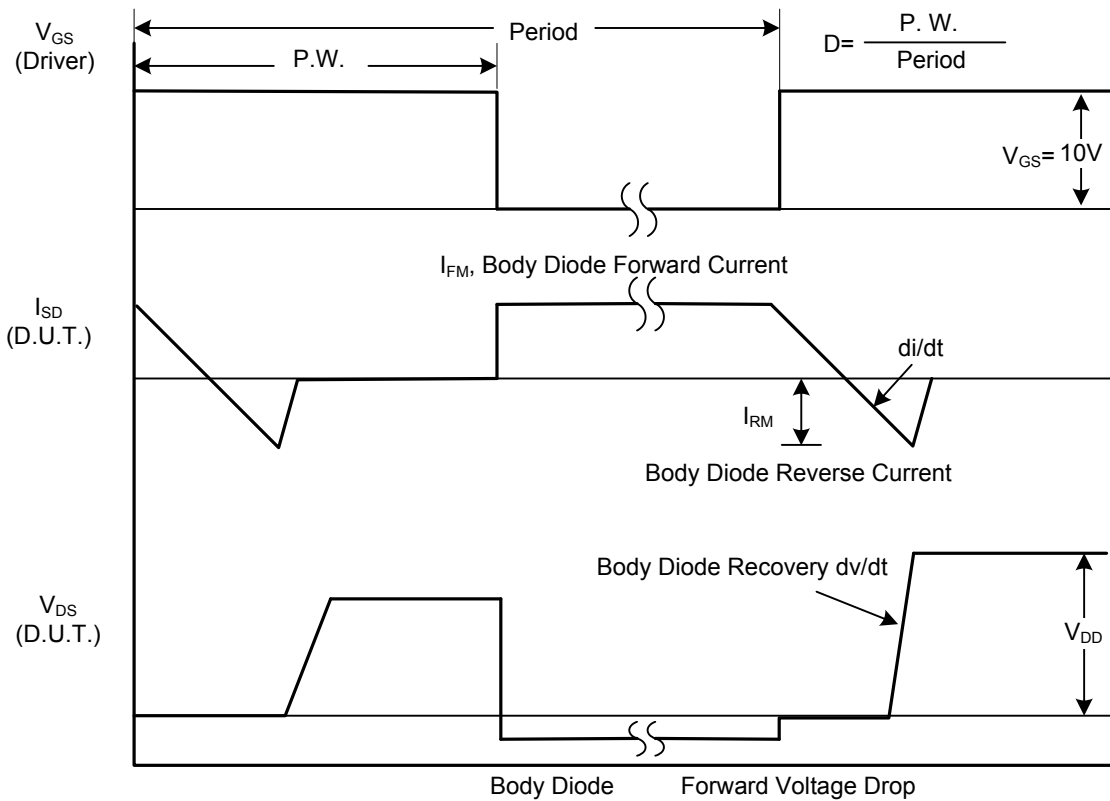


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

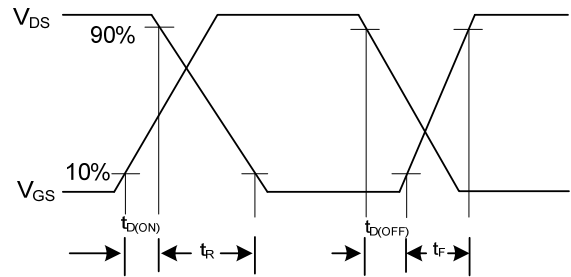
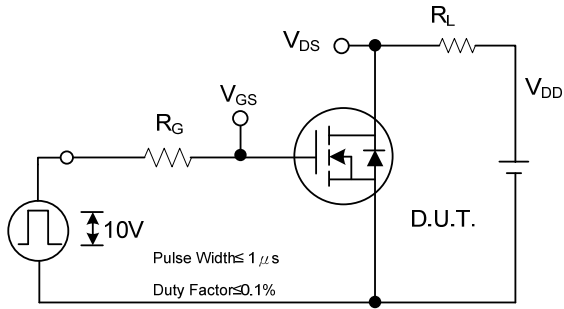


Fig. 2A Switching Test Circuit

Fig. 2B Switching Waveforms

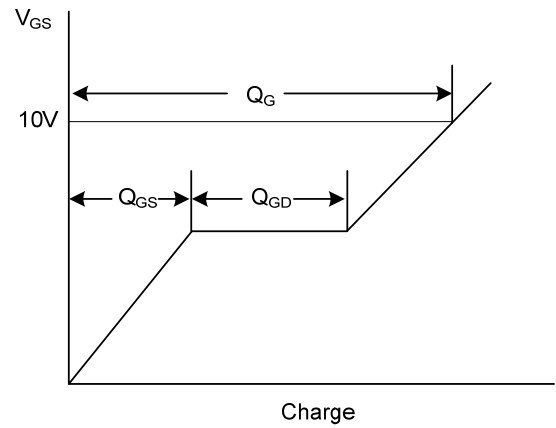
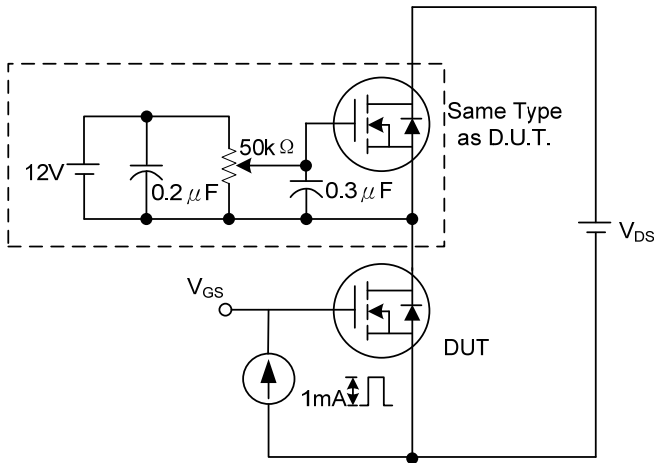


Fig. 3A Gate Charge Test Circuit

Fig. 3B Gate Charge Waveform

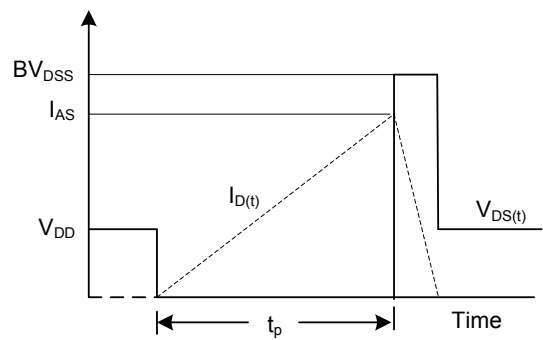
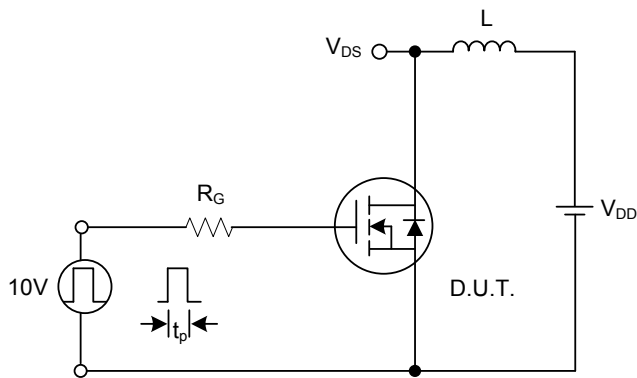
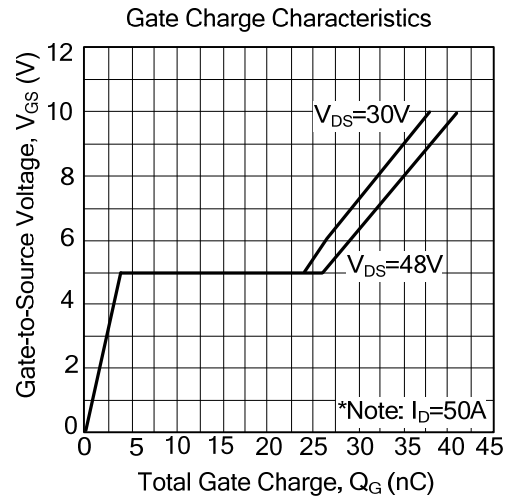
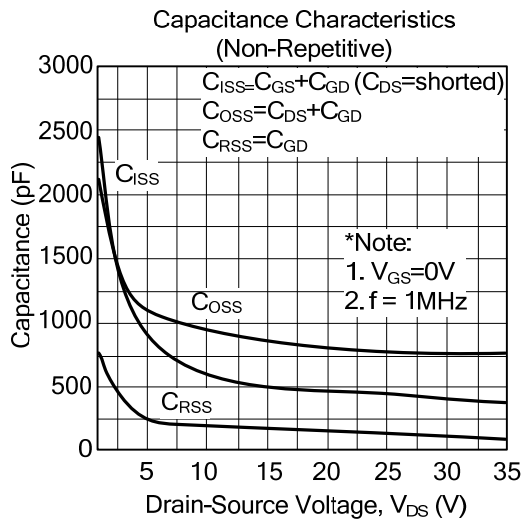
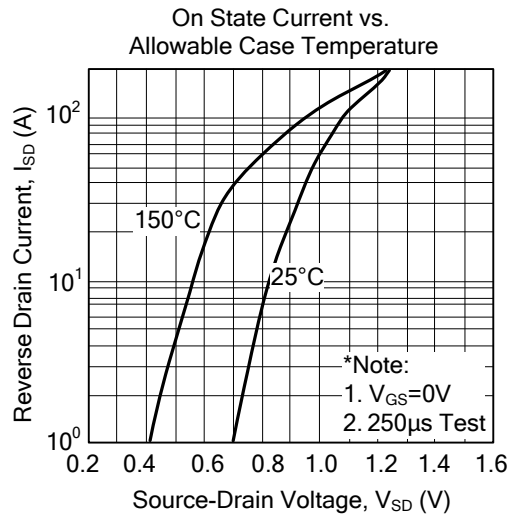
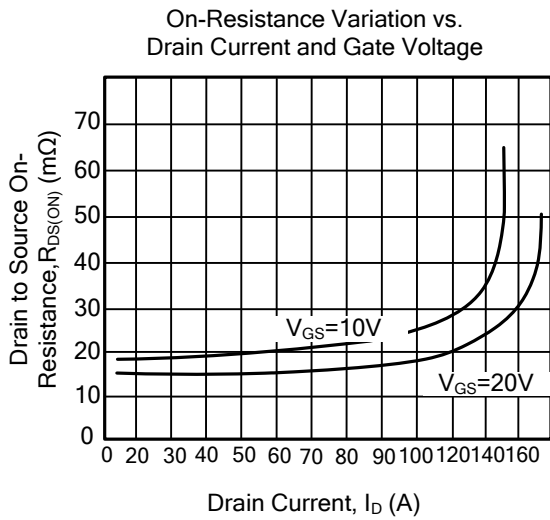
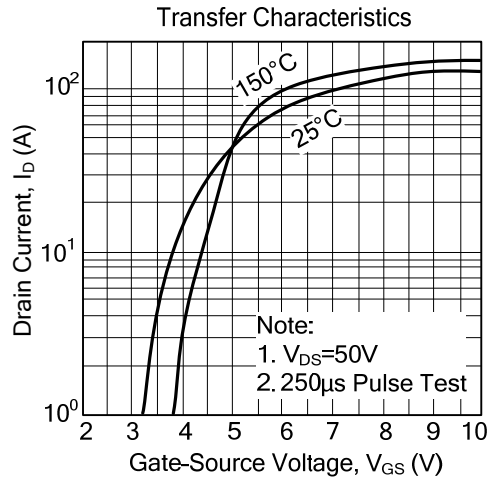
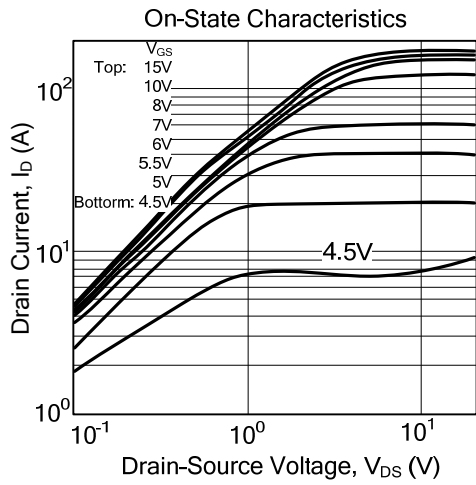


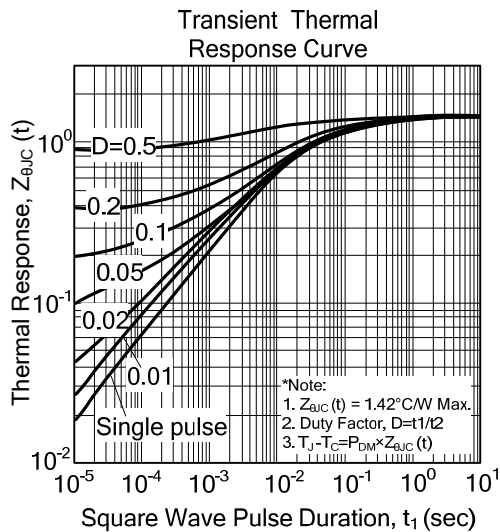
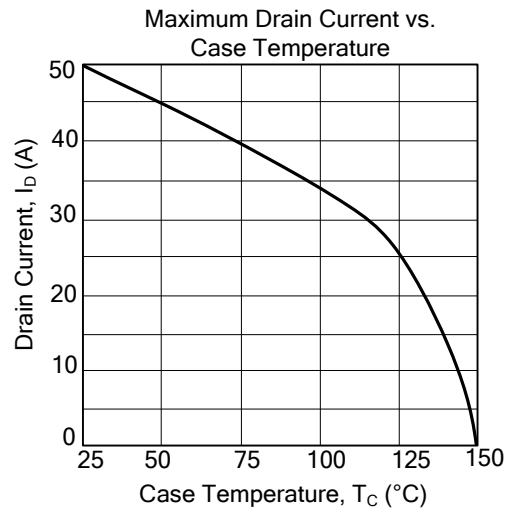
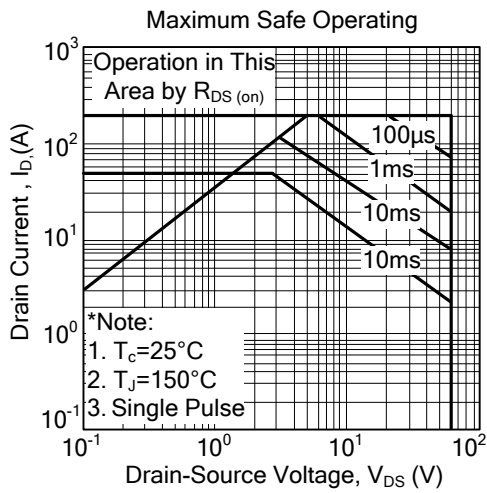
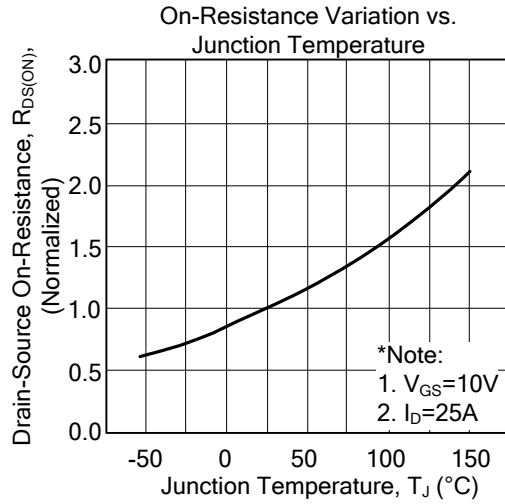
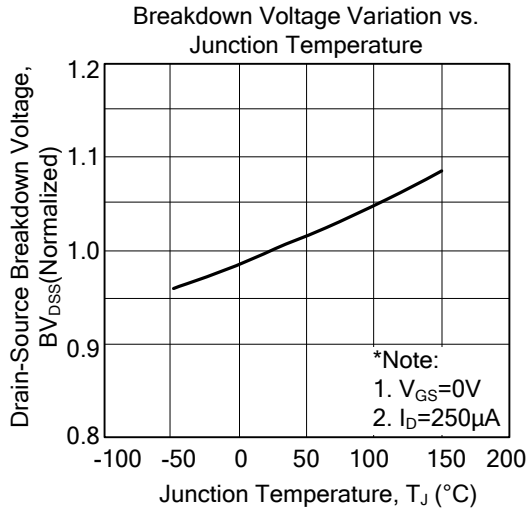
Fig. 4A Unclamped Inductive Switching Test Circuit

Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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