



## 13N50

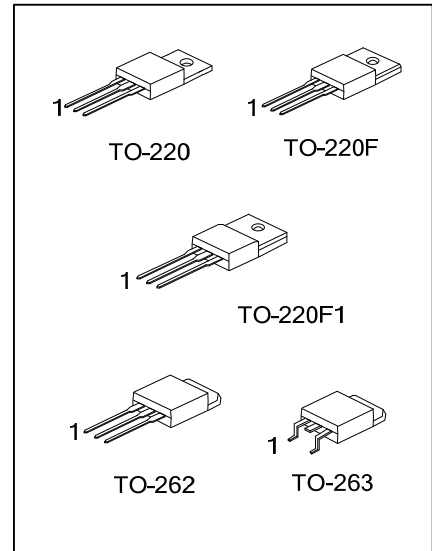
Power MOSFET

### 13A, 500V N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC **13N50** is a N-Channel enhancement mode power MOSFET. The device adopts planar stripe and uses DMOS technology to minimize and provide lower on-state resistance and faster switching speed. It can also withstand high energy pulse under the avalanche and commutation mode conditions.

The UTC **13N50** is ideally suitable for high efficiency switch mode power supply, power factor correction, electronic lamp ballast based on half bridge topology.

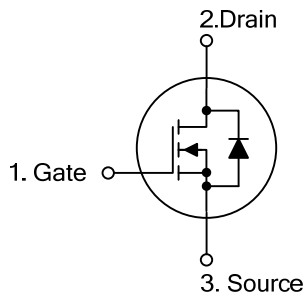


#### FEATURES

\*  $R_{DS(ON)} < 0.48\Omega$  @  $V_{GS} = 10V, I_D = 6.5A$

\* Avalanche energy tested

#### SYMBOL



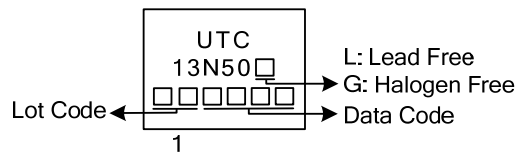
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13N50L-TA3-T	13N50G-TA3-T	TO-220	G	D	S	Tube
13N50L-TF3-T	13N50G-TF3-T	TO-220F	G	D	S	Tube
13N50L-TF1-T	13N50G-TF1-T	TO-220F1	G	D	S	Tube
13N50L-T2Q-T	13N50G-T2Q-T	TO-262	G	D	S	Tube
13N50L-TQ2-T	13N50G-TQ2-T	TO-263	G	D	S	Tube
13N50L-TQ2-R	13N50G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>13N50G-TA3-T</p>	<p>(1) T: Tube, R: Tape Reel  (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1  T2Q: TO-262, TQ2: TO-263  (3) G: Halogen Free and Lead Free, L: Lead Free</p>
---------------------	---

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	13	A
	Pulsed (Note 2)	$I_{DM}$	52	A
Avalanche Current (Note 2)		$I_{AR}$	11.3	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	638	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.7	V/ns
Power Dissipation	TO-220/TO-262	$P_D$	168	W
	TO-263			
	TO-220F/TO-220F1		35	W
Junction Temperature		$T_J$	+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 maximum junction temperature.

3.  $L=10\text{mH}$ ,  $I_{AS}=11.3\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 13\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262	$\theta_{JC}$	0.74	$^\circ\text{C}/\text{W}$
	TO-263			
	TO-220F/TO-220F1		3.57	

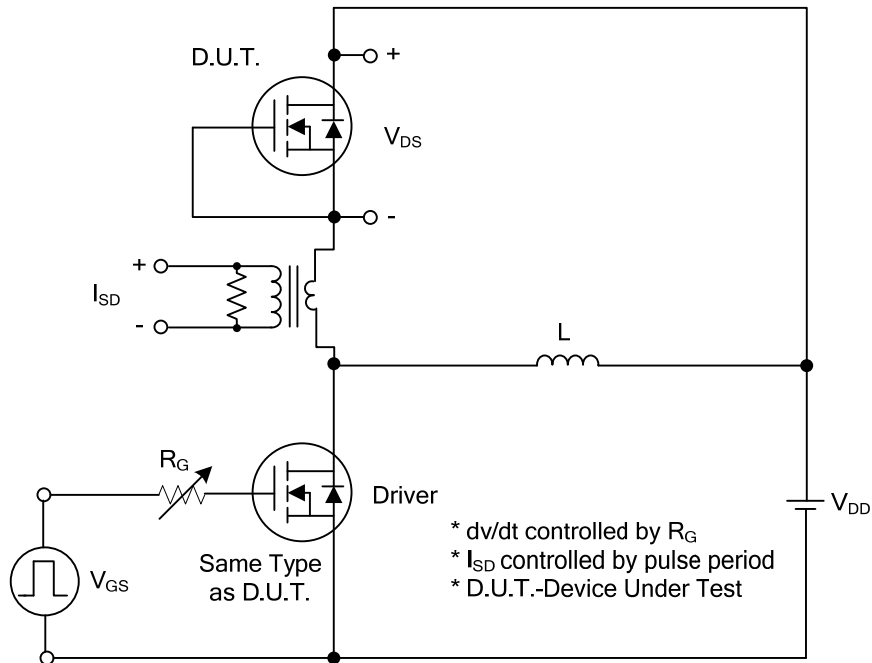
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 500V, V_{GS} = 0V$			1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = 30V, V_{DS} = 0V$			100	nA
		$V_{GS} = -30V, V_{DS} = 0V$			-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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 6.5A$			0.48	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$		1630		pF
Output Capacitance	$C_{OSS}$			202		pF
Reverse Transfer Capacitance	$C_{RSS}$			32		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=50V, V_{GS}=10V, I_D=1.3A,$ $I_D=100\mu A$ (Note 1, 2)		140		nC
Gate to Source Charge	$Q_{GS}$			13		nC
Gate to Drain Charge	$Q_{GD}$			33.8		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=30V, V_{GS}=10V, I_D=0.5A,$ $R_G=25\Omega$ (Note 1, 2)		94		nS
Rise Time	$t_R$			158		nS
Turn-OFF Delay Time	$t_{D(OFF)}$			470		nS
Fall-Time	$t_F$			166		nS
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				13	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				52	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=13A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=13A, V_{GS}=0V,$ $di_F/dt=100A/\mu s$		350		nS
Body Diode Reverse Recovery Charge	$Q_{rr}$			4.5		$\mu C$

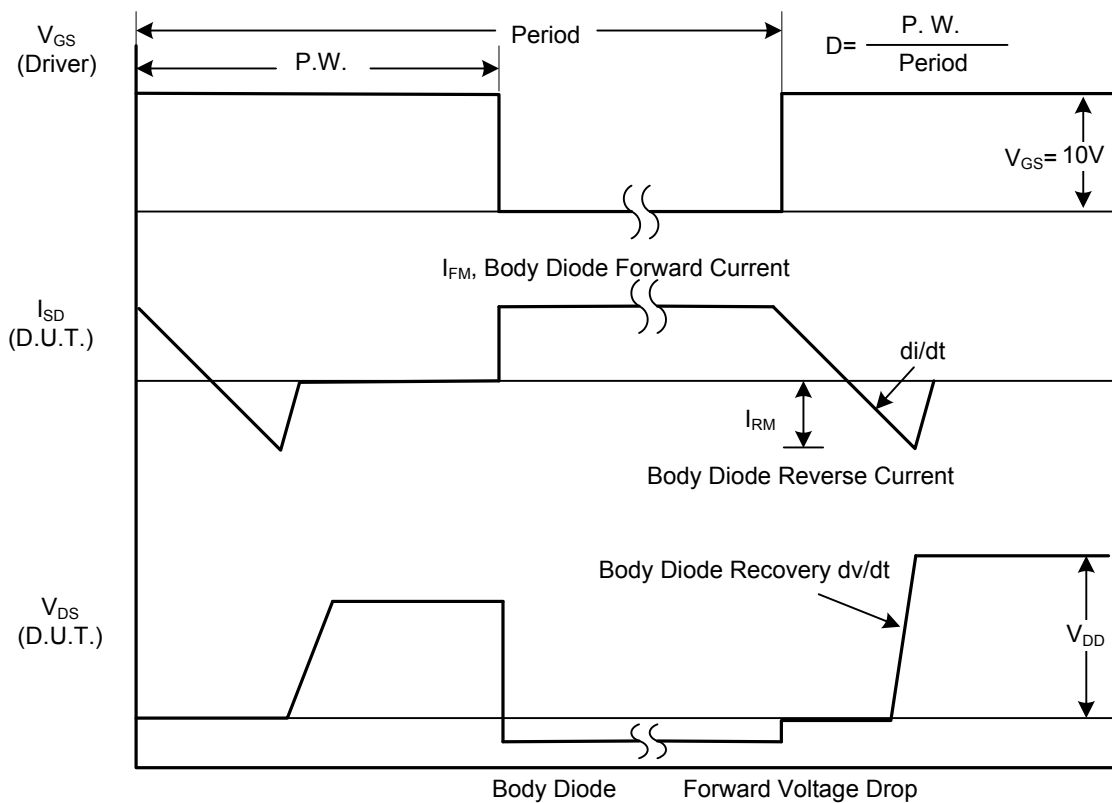
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery  $dv/dt$  Test Circuit

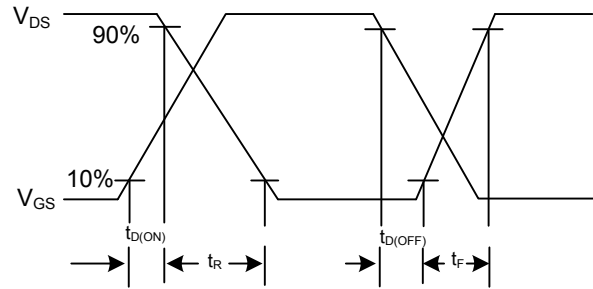


Peak Diode Recovery  $dv/dt$  Waveforms

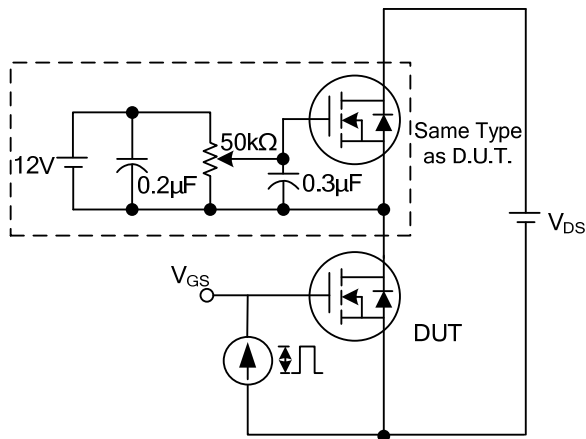
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



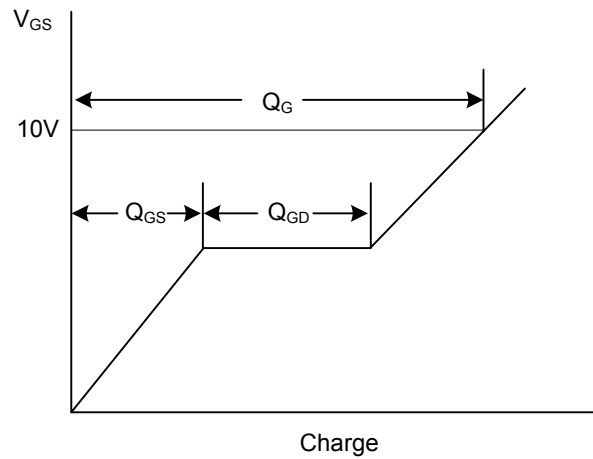
**Switching Test Circuit**



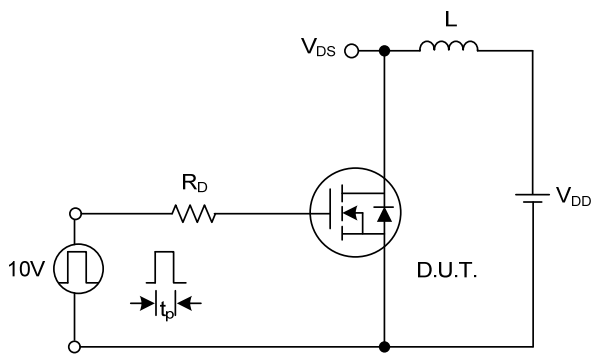
**Switching Waveforms**



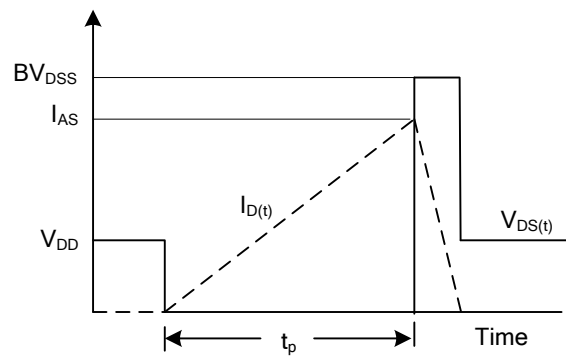
**Gate Charge Test Circuit**



**Gate Charge Waveform**

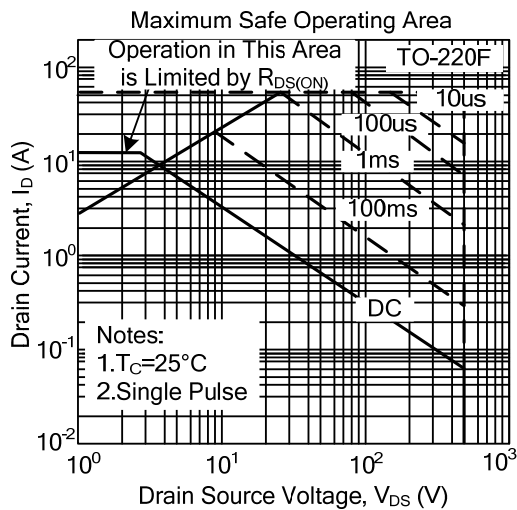
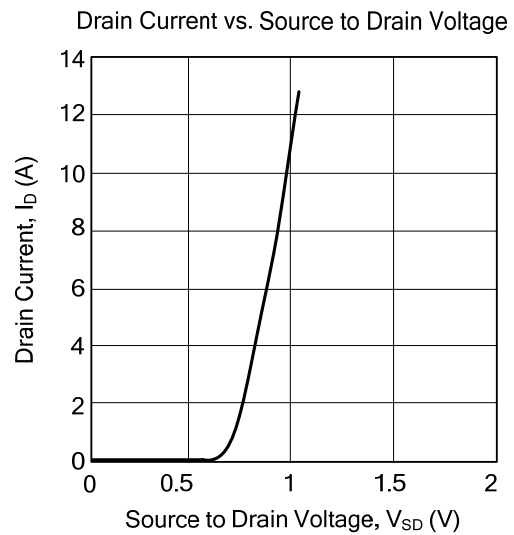
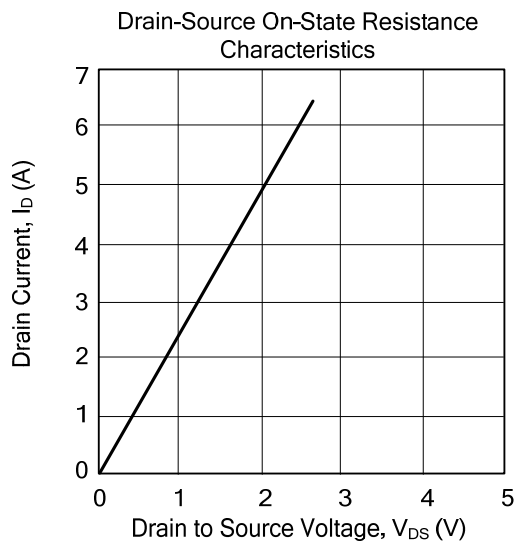
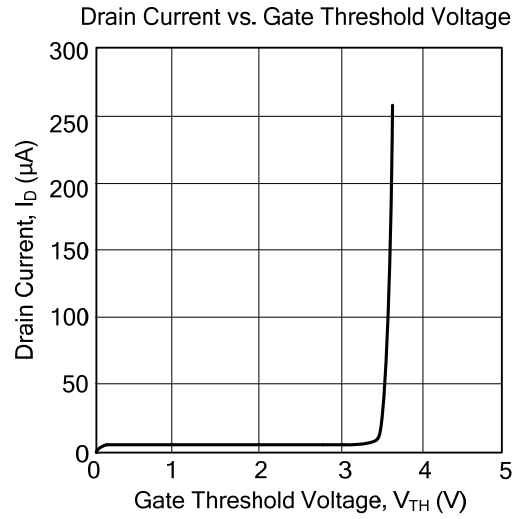
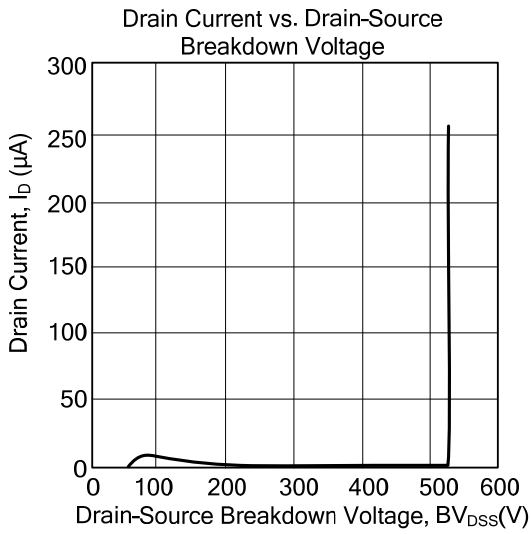


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

## ■ TYPICAL CHARACTERISTICS



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.