



## 11N50

Preliminary

Power MOSFET

### 500V N-CHANNEL MOSFET

#### DESCRIPTION

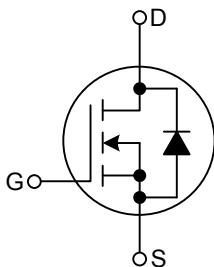
The **UTC 11N50** is an N-channel enhancement mode Power FET. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance. It also can withstand high energy pulse in the avalanche and commutation mode.

The **UTC 11N50** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

#### FEATURES

- \* Low Gate Charge: 43nC (TYP.)
- \* 11A, 500V,  $R_{DS(ON)}=0.55\Omega @ V_{GS}=10V$
- \* Fast Switching
- \* Low  $C_{RSS}$ : 25pF (TYP.)
- \* With 100% Avalanche Tested
- \* Improved dv/dt Capability
- \* Fast Recovery Body Diode: 90ns (TYP.)

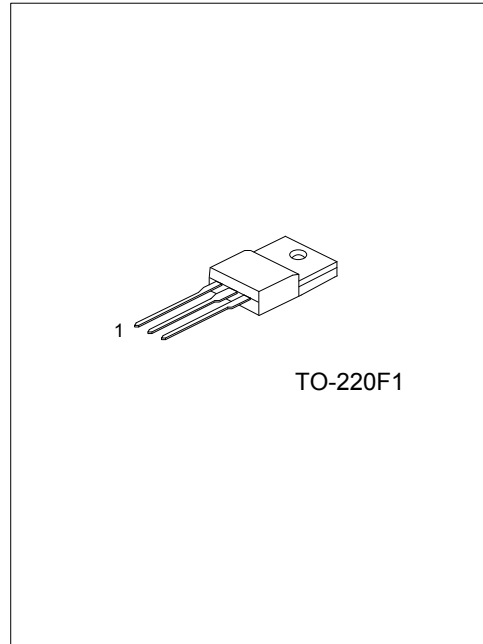
#### SYMBOL



#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11N50L- TF1-T	11N50G-TF1-T	TO-220F1	G	D	S	Tube

<p>11N50L-TF1-T</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Lead Free</li> </ul>	<ul style="list-style-type: none"> <li>(1) T: Tube</li> <li>(2) TF1:TO-220F1</li> <li>(3) L: Lead Free, G: Halogen Free</li> </ul>
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### ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Drain to Source Voltage	$V_{DSS}$	500	V
Gate to Source Voltage	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$T_C=25^\circ\text{C}$	$I_D$	11 (Note 1)
	$T_C=100^\circ\text{C}$	$I_D$	7 (Note 1)
Pulsed Drain Current (Note 2)	$I_{DM}$	44 (Note 1)	A
Single Pulsed Avalanche Energy(Note 3)	$E_{AS}$	670	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Total Power Dissipation	$T_C=25^\circ\text{C}$	$P_D$	48
	Derate above $25^\circ\text{C}$		0.39
Operating Junction Temperature	$T_J$	-55 ~ +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

Note: 1. Drain current limited by maximum junction temperature

2. Repetitive Rating : Pulse width limited by maximum junction temperature

3.  $L=10\text{mH}$ ,  $I_{AS}=11\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD} \leq 11\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

5. 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	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	2.58	$^\circ\text{C}/\text{W}$

### ■ 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	$BV_{DSS}$	$V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$	500			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$ , Referenced to $25^\circ\text{C}$		0.5		$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=500\text{V}$ , $V_{GS}=0\text{V}$			10	$\mu\text{A}$
		$V_{DS}=500\text{V}$ , $T_J=125^\circ\text{C}$			100	$\mu\text{A}$
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 30\text{V}$			$\pm 100$	nA
<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
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=5.5\text{A}$		0.48	0.55	$\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=40\text{V}$ , $I_D=5.5\text{A}$ (Note 1)		15		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1.0\text{MHz}$		1515	2055	pF
Output Capacitance	$C_{OSS}$			185	235	pF
Reverse Transfer Capacitance	$C_{RSS}$			25	30	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=400\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=11\text{A}$ (Note 1, 2)		43	55	nC
Gate-Source Charge	$Q_{GS}$			8		nC
Gate-Drain Charge	$Q_{GD}$			19		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=250\text{V}$ , $I_D=11\text{A}$ , $R_G=3\Omega$ (Note 1, 2)		24	57	ns
Turn-ON Rise Time	$t_R$			70	150	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			120	250	ns
Turn-OFF Fall Time	$t_F$			75	160	ns

Note: 1. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

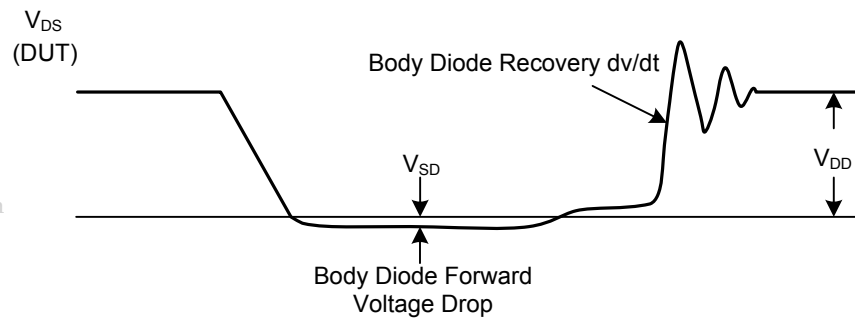
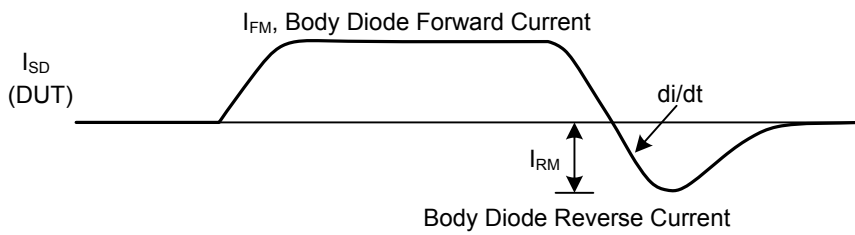
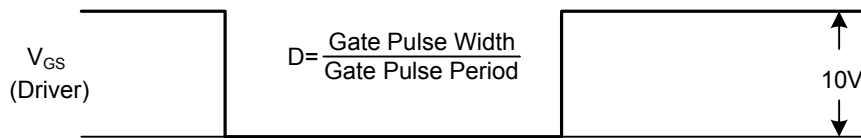
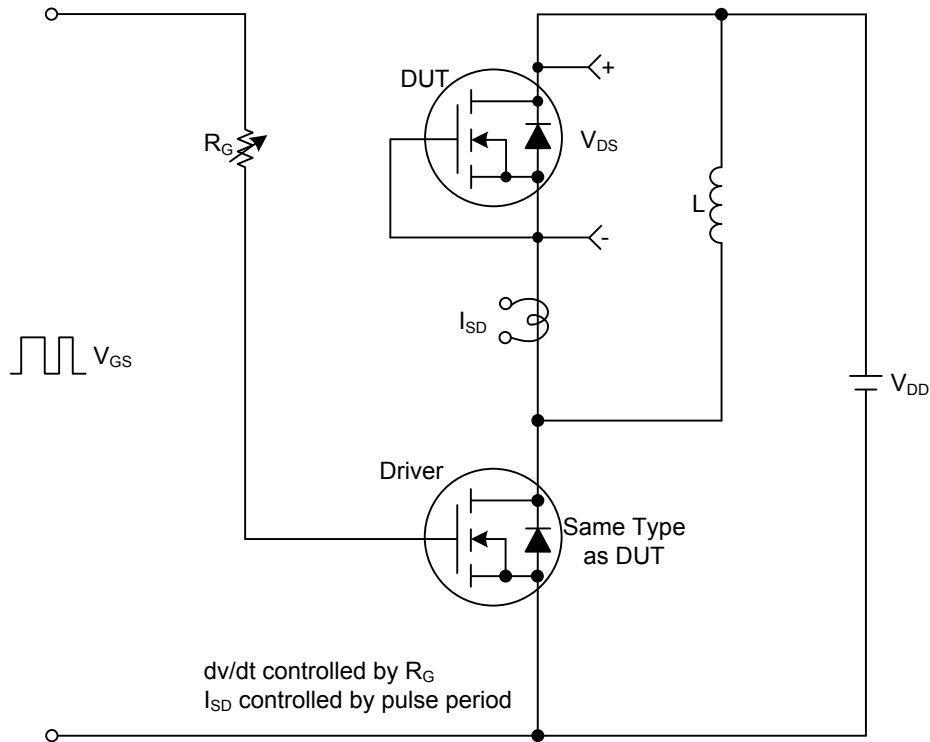
2. Essentially independent of operating temperature

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				11	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				44	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S = 11A, V_{GS} = 0V$			1.4	V
Body Diode Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0V, I_S = 11A,$		90		ns
Body Diode Reverse Recovery Charge	$Q_{RR}$	$di_F/dt = 100A/\mu s^4$		1.5		$\mu C$

■ TEST CIRCUITS AND WAVEFORMS

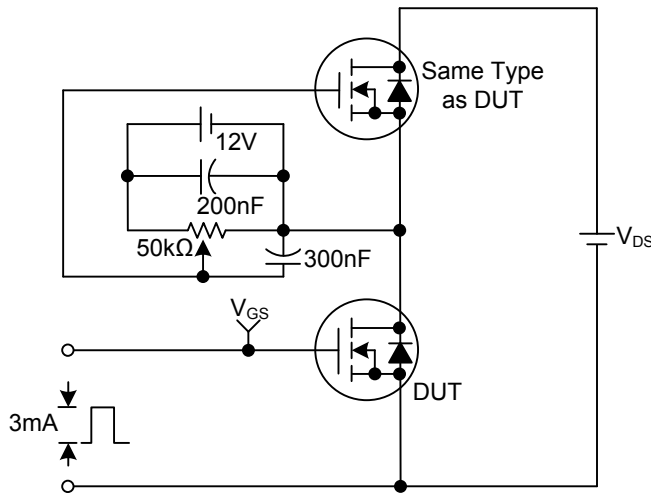
Peak Diode Recovery dv/dt Test Circuit & Waveforms



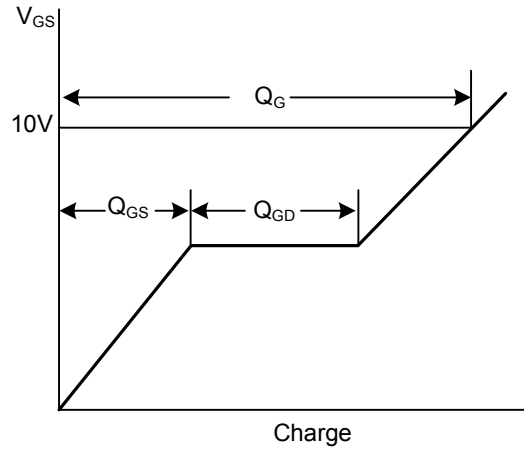
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■ TEST CIRCUITS AND WAVEFORMS (Cont.)

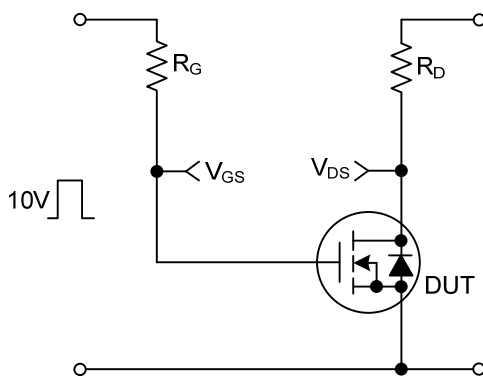
Gate Charge Test Circuit



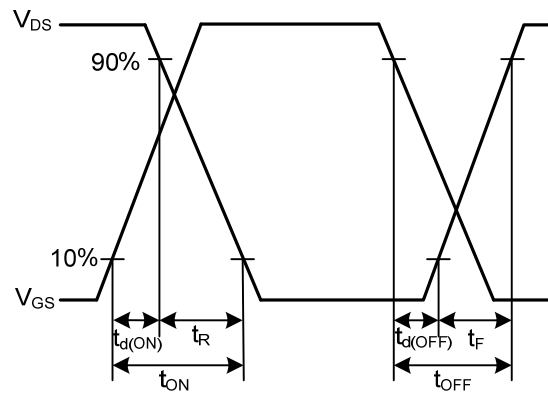
Gate Charge Waveforms



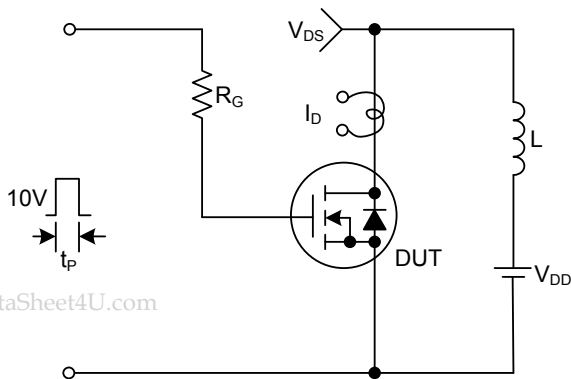
Resistive Switching Test Circuit



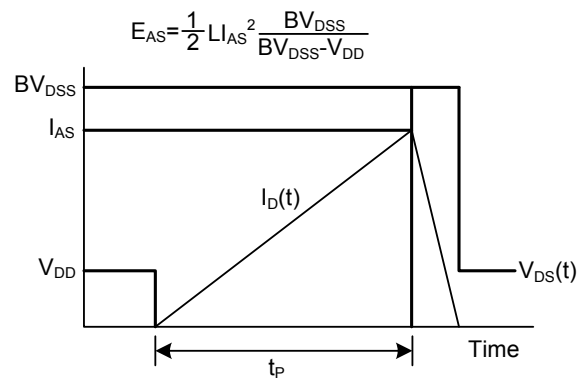
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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