



## 12N40

Preliminary

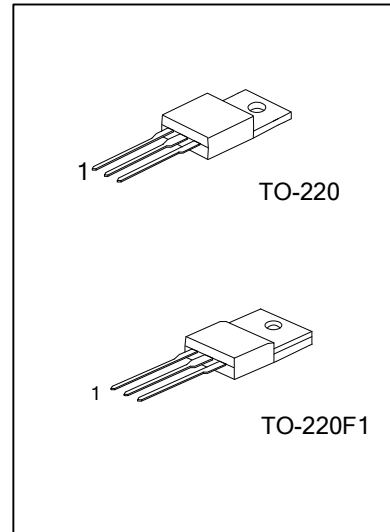
Power MOSFET

### 12A, 400V N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC **12N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

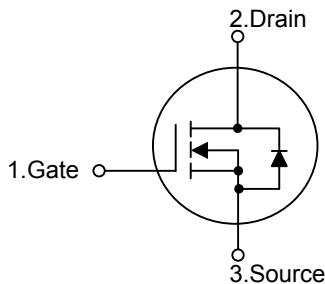
The UTC **12N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.



#### FEATURES

- \*  $R_{DS(ON)}=0.47\Omega @ V_{GS}=10V$
- \* High switching speed
- \* 100% avalanche tested

#### SYMBOL



#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12N40L-TA3-T	12N40G-TA3-T	TO-220	G	D	S	Tube
12N40L-TF1-T	12N40G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>12N40L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF1: TO-220F1</p> <p>(3) G: Halogen Free, L: Lead Free</p>
---	---

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	400	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous ( $T_c=25^\circ\text{C}$ )	$I_D$	12	A
	Pulsed (Note 2)	$I_{DM}$	48	A
Single Pulsed Avalanche Energy		$E_{AS}$	474	mJ
Power Dissipation	TO-220	$P_D$	192	W
	TO-220F1		42	W
Derate above $25^\circ\text{C}$	TO-220		1.53	W/ $^\circ\text{C}$
	TO-220F1		0.33	W/ $^\circ\text{C}$
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55~+150	$^\circ\text{C}$

Note: 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

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	0.65	$^\circ\text{C}/\text{W}$
	TO-220F1		3.0	

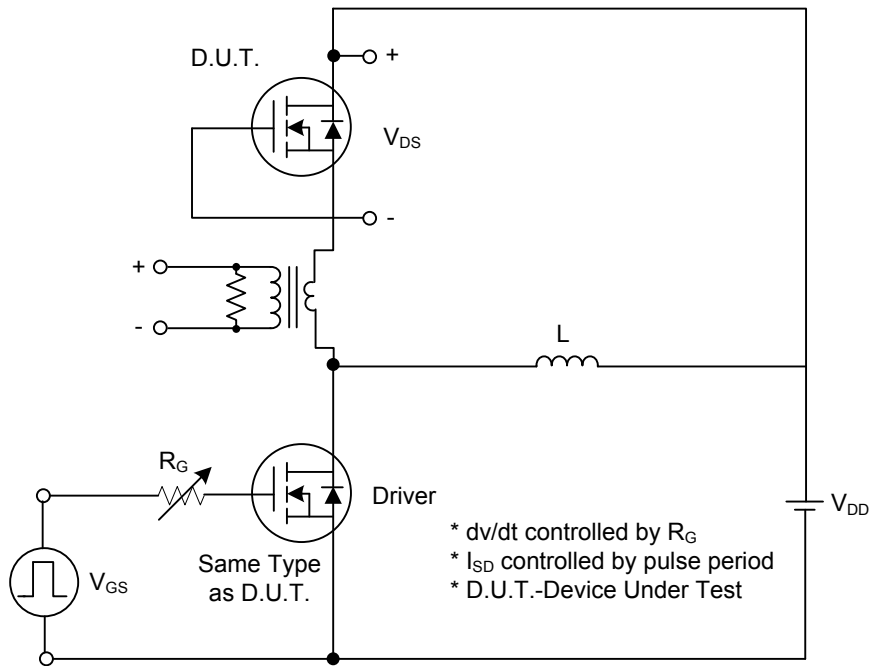
■ ELECTRICAL CHARACTERISTICS ( $T_c=25^\circ\text{C}$ , unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	400			V
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=400\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$			+100	nA
	Reverse		$V_{GS}=-30\text{V}$ , $V_{DS}=0\text{V}$			-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
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=12\text{A}$		0.34	0.47	$\Omega$
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance		$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$			3000	pF
Output Capacitance		$C_{OSS}$				900	pF
Reverse Transfer Capacitance		$C_{RSS}$				400	pF
<b>SWITCHING PARAMETERS</b>							
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=200\text{V}$ , $I_D=12\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		30	50	ns
Rise Time		$t_R$			105	150	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			480	750	ns
Fall-Time		$t_F$			140	200	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
Drain-Source Diode Forward Voltage		$V_{SD}$	$I_S=12\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Maximum Body-Diode Continuous Current		$I_S$				12	A
Maximum Body-Diode Pulsed Current		$I_{SM}$				48	A

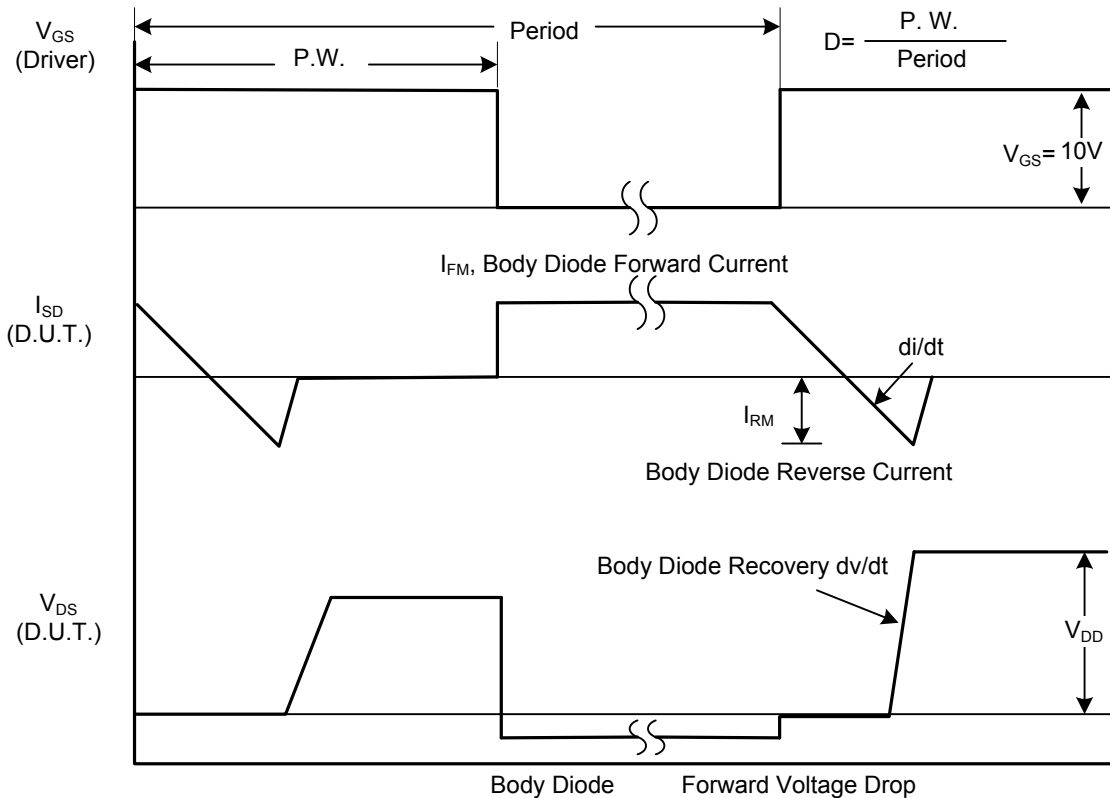
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

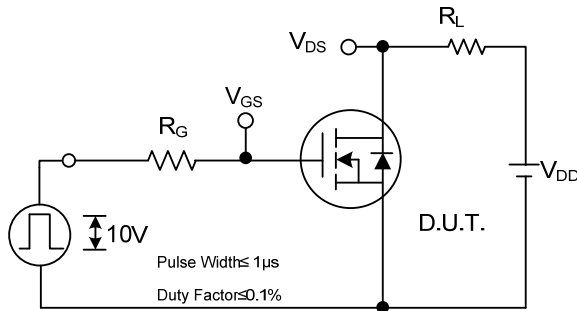


Peak Diode Recovery  $dv/dt$  Test Circuit

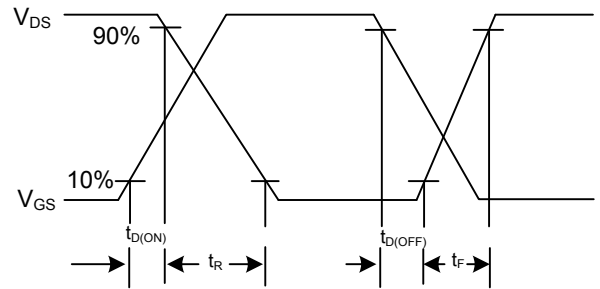


Peak Diode Recovery  $dv/dt$  Waveforms

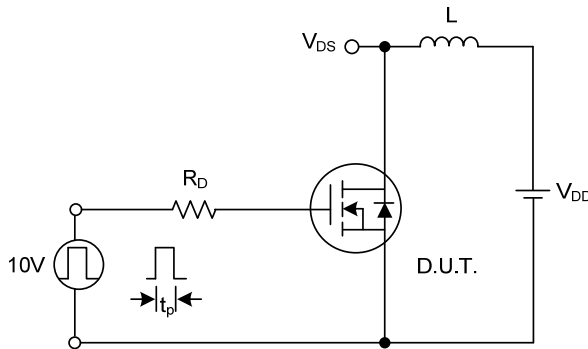
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



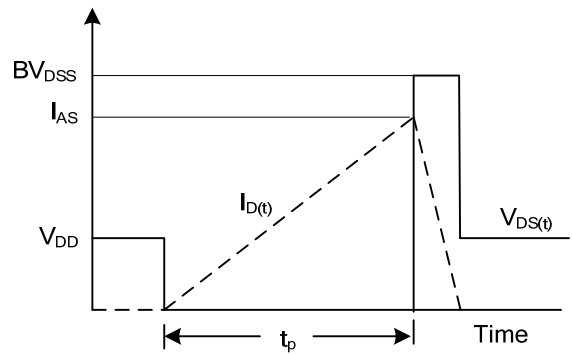
Switching Test Circuit



Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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.