



12N40

Preliminary

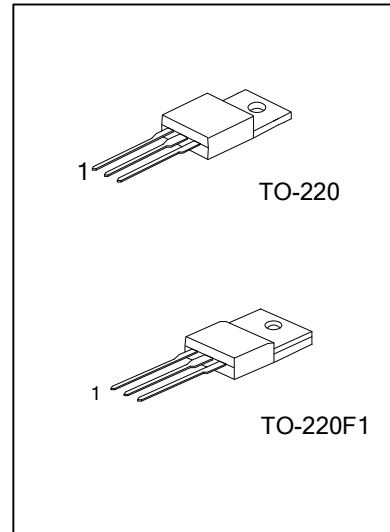
Power MOSFET

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.

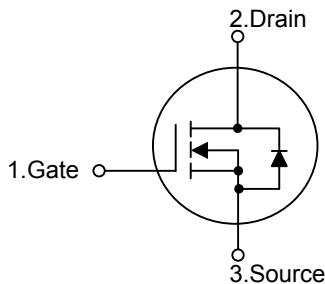
The UTC **12N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.



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>
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■ 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}	± 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°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		θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	0.65	$^\circ\text{C}/\text{W}$
	TO-220F1		3.0	

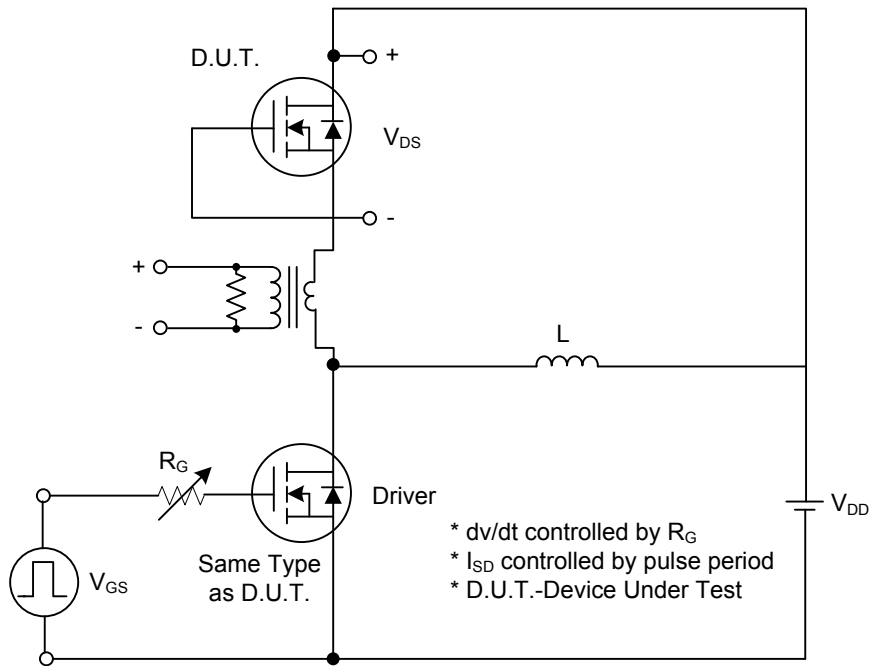
■ ELECTRICAL CHARACTERISTICS ($T_c=25^\circ\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
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	μA
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
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		$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=12\text{A}$		0.34	0.47	Ω
DYNAMIC PARAMETERS							
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
SWITCHING PARAMETERS							
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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
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

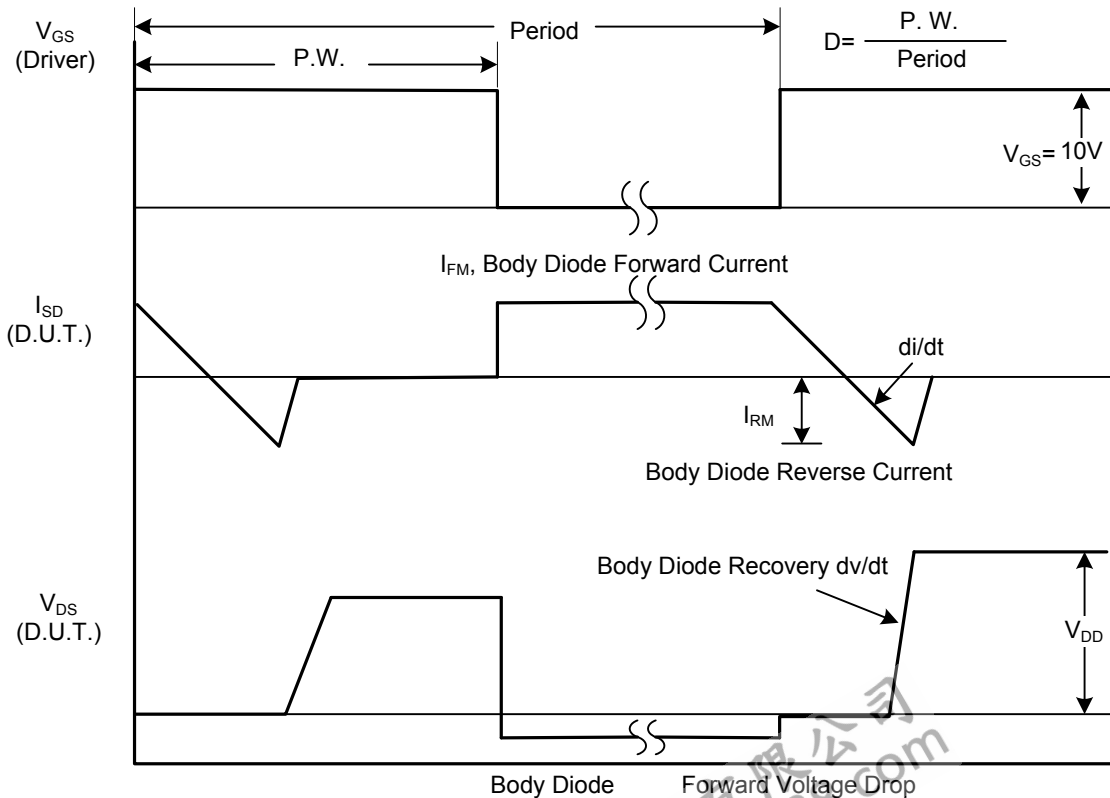
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

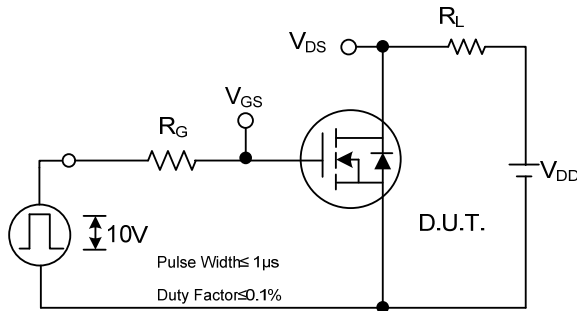


Peak Diode Recovery dv/dt Test Circuit

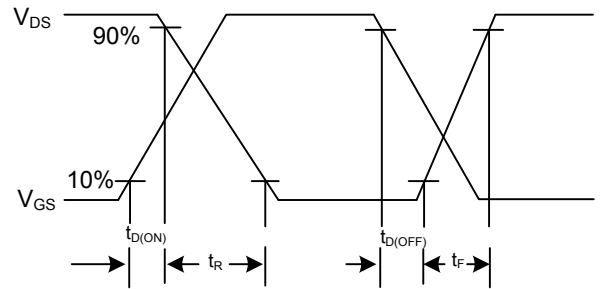


Peak Diode Recovery dv/dt Waveforms

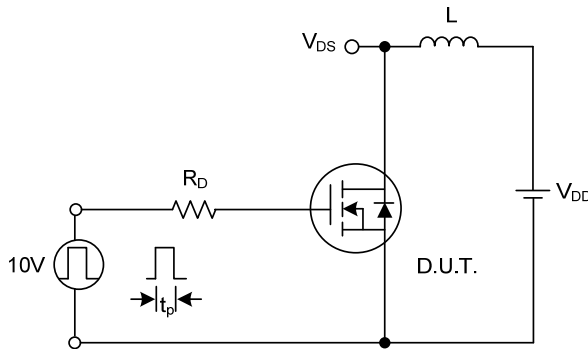
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



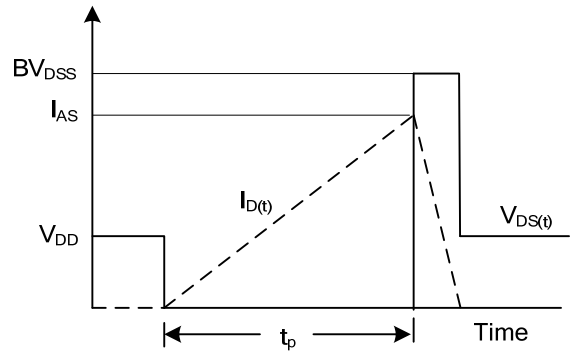
Switching Test Circuit



Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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