



5A, 400V N-CHANNEL POWER MOSFET

DESCRIPTION

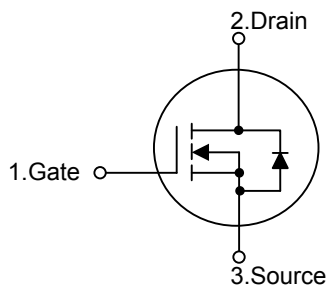
The UTC **5N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **5N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

FEATURES

- * $R_{DS(ON)}=1.2\Omega$ @ $V_{GS}=10V$
- * High switching speed
- * 100% avalanche tested

SYMBOL

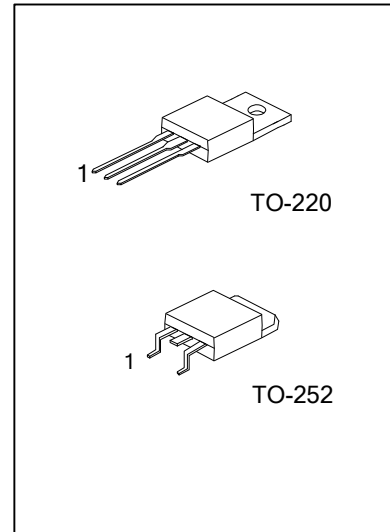


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N40L-TA3-T	5N40G-TA3-T	TO-220	G	D	S	Tube
5N40L-TN3-R	5N40G-TN3-R	TO-252	G	D	S	Tape Reel

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

5N40L-TA3-T (1) Packing Type (2) Package Type (3) Lead Free		(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TN3: TO-252 (3) G: Halogen Free, L: Lead Free
---	--	---



■ **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	5	A
	Pulsed (Note 2)	I_{DM}	20	A
Avalanche Current (Note 2)		I_{AR}	5	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	300	mJ
	Repetitive (Note 2)	E_{AR}	7.3	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	69	W
	TO-252		54	W
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

3. $L = 21.5\text{mH}$, $I_{AS} = 5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 5\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

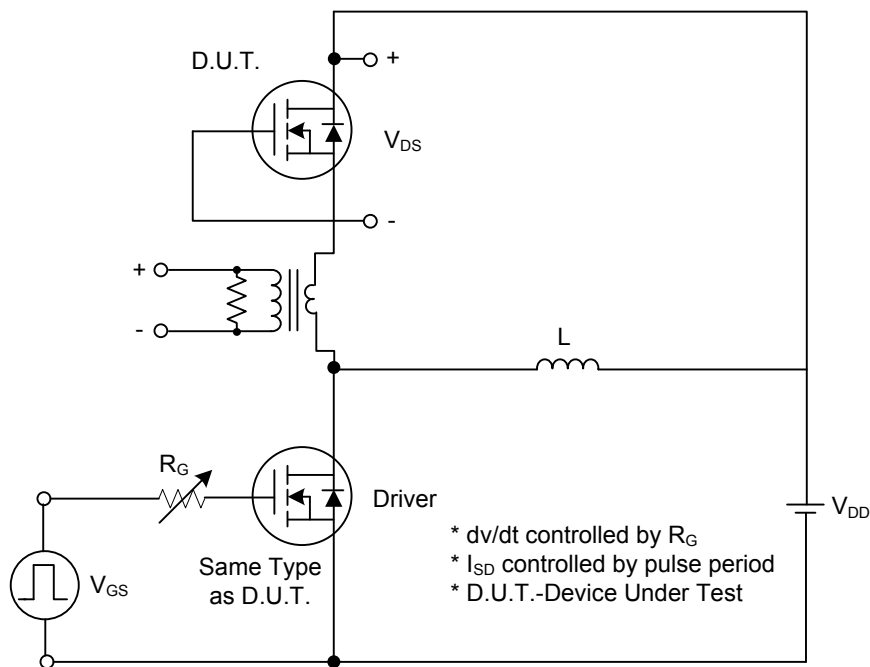
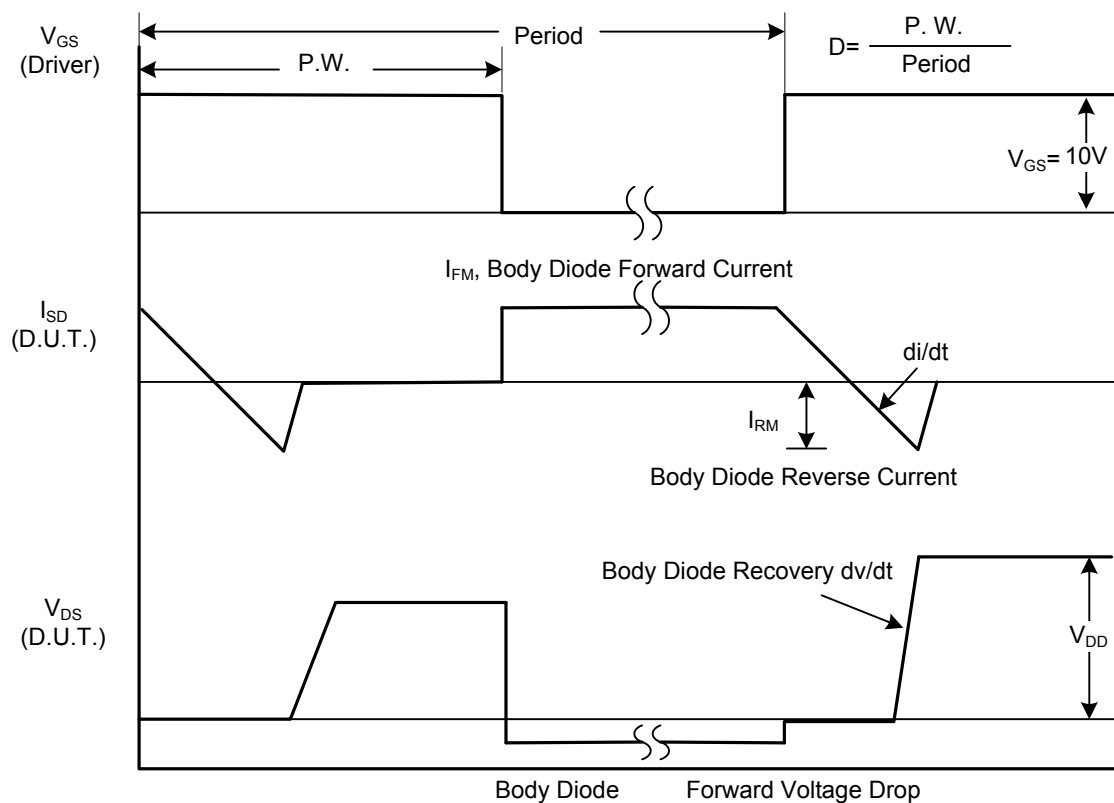
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-252		110	
Junction to Case	TO-220	θ_{JC}	1.8	$^{\circ}\text{C}/\text{W}$
	TO-252		2.13	

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

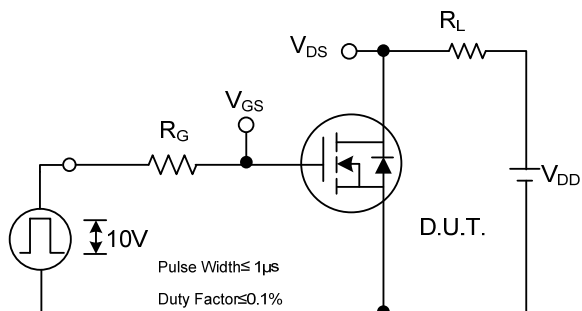
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$I_D=250\mu A$, $V_{GS}=0V$	400			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C, $I_D=250\mu A$		0.4		V/°C
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=400V$, $V_{GS}=0V$			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	$V_{GS}=+30V$, $V_{DS}=0V$			+100	nA
	Reverse		$V_{GS}=-30V$, $V_{DS}=0V$			-100	nA
ON CHARACTERISTICS							
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		$R_{DS(ON)}$	$V_{GS}=10V$, $I_D=2.5A$		0.96	1.2	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	$V_{GS}=0V$, $V_{DS}=25V$, $f=1.0MHz$		480	625	pF
Output Capacitance		C_{OSS}			80	105	pF
Reverse Transfer Capacitance		C_{RSS}			15	20	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	$V_{GS}=10V$, $V_{DS}=320V$, $I_D=5A$ (Note 1, 2)		18	24	nC
Gate to Source Charge		Q_{GS}			2.2		nC
Gate to Drain Charge		Q_{GD}			9.7		nC
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=200V$, $I_D=5A$, $R_G=25\Omega$ (Note 1, 2)		12	35	ns
Rise Time		t_R			46	100	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			50	110	ns
Fall-Time		t_F			48	105	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				5	A
Maximum Body-Diode Pulsed Current		I_{SM}				20	A
Drain-Source Diode Forward Voltage		V_{SD}	$I_S=5A$, $V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	$I_S=5A$, $V_{GS}=0V$, $dI_F/dt=100A/\mu s$		263		ns
Body Diode Reverse Recovery Charge		Q_{RR}	(Note 1)		1.9		μC

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

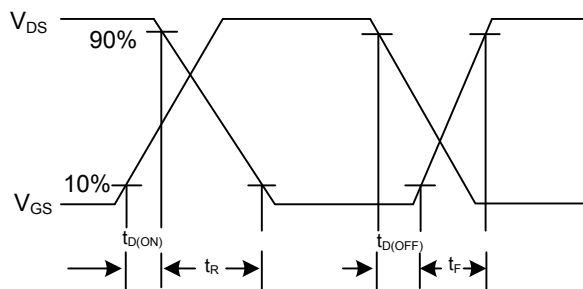
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test CircuitPeak Diode Recovery dv/dt Waveforms

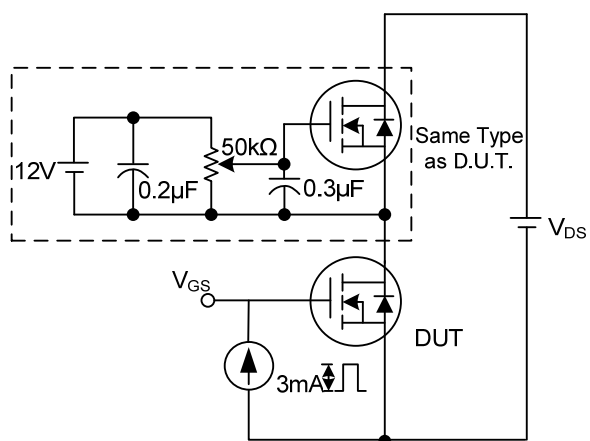
TEST CIRCUITS AND WAVEFORMS (Cont.)



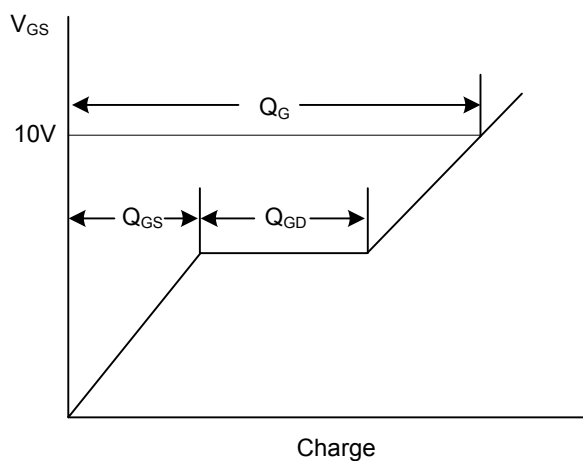
Switching Test Circuit



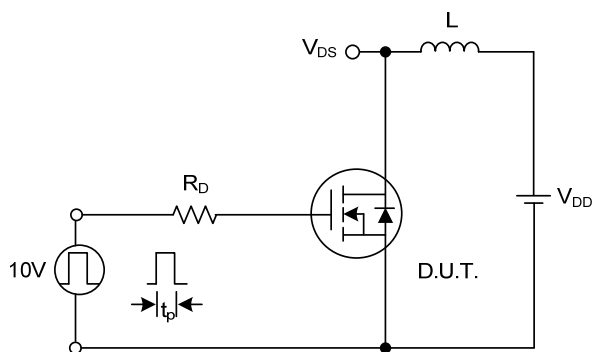
Switching Waveforms



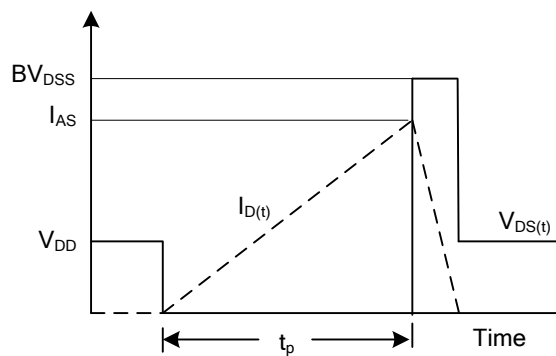
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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.