



4N40

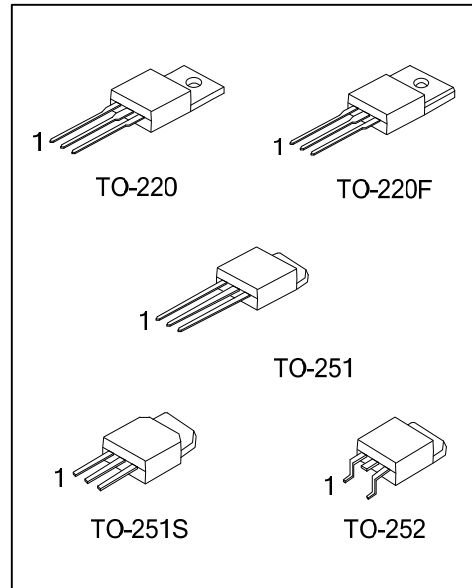
Power MOSFET

4A, 400V N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **4N40** 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.

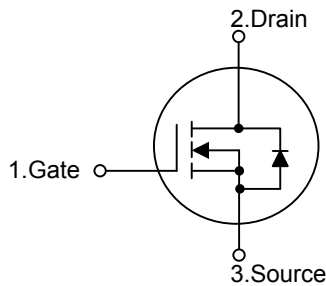
The UTC **4N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.



FEATURES

- * High switching speed
- * $R_{DS(ON)} < 1.5\Omega @ V_{GS}=10V, I_D=2.0A$
- * 100% avalanche tested

SYMBOL



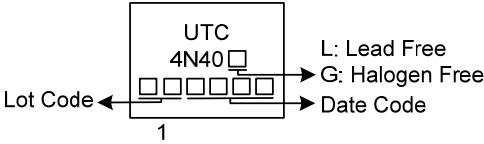
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N40L-TA3-T	4N40G-TA3-T	TO-220	G	D	S	Tube
4N40L-TF3-T	4N40G-TF3-T	TO-220F	G	D	S	Tube
4N40L-TM3-T	4N40G-TM3-T	TO-251	G	D	S	Tube
4N40L-TMS-T	4N40G-TMS-T	TO-251S	G	D	S	Tube
4N40L-TN3-R	4N40G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>4N40G-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TM3: TO-251 TMS: TO-251S, TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ 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	4	A
	Pulsed (Note 1)	I_{DM}	8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	136	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	3	V/ns
Power Dissipation	TO-220	P_D	60	W
	TO-220F		27	W
	TO-251/TO-251S/TO-252		52	W
Derate above 25°C	TO-220		0.48	$\text{W}/^\circ\text{C}$
	TO-220F		0.22	$\text{W}/^\circ\text{C}$
	TO-251/TO-252		0.41	$\text{W}/^\circ\text{C}$
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. $L=18\text{mH}$, $I_{AS}=3.88\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S/TO-252		110	
Junction to Case	TO-220	θ_{JC}	2.08	$^\circ\text{C}/\text{W}$
	TO-220F		4.5	
	TO-251/TO-251S/TO-252		2.4	

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

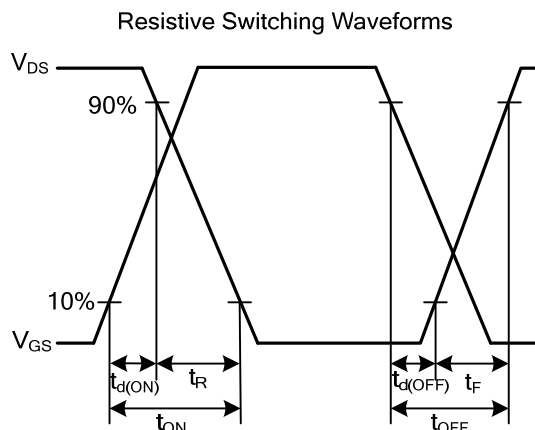
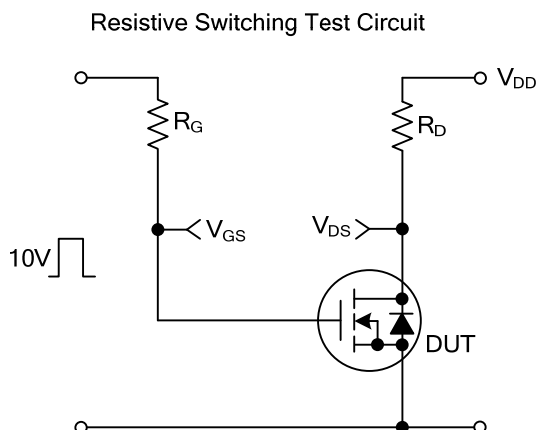
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	400			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$			10	μA
		$V_{DS}=320\text{V}$, $T_c=125^\circ\text{C}$			100	μA
Gate- Source Leakage Current	Forward	I_{GSS}				
	Reverse					
		$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
		$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=2\text{A}$			1.5	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		490		pF
Output Capacitance	C_{OSS}			150		pF
Reverse Transfer Capacitance	C_{RSS}			46		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DD}=100\text{V}$, $I_D=4.0\text{A}$, $V_{GS}=10\text{V}$, $I_G=1\text{mA}$		17		nC
Gate-Source Charge	Q_{GS}			4		nC
Gate-Drain Charge	Q_{GD}			6		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=100\text{V}$, $I_D=4.0\text{A}$, $R_G=25\Omega$ (Note 2, 3)		7		ns
Rise Time	t_R			20		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			56		ns
Fall-Time	t_F			29		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				4	A
Maximum Body-Diode Pulsed Current	I_{SM}				8	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=4\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=4\text{A}$, $V_{GS}=0\text{V}$, $dI_F/dt=100\text{A}/\mu\text{s}$		231		ns
Body Diode Reverse Recovery Charge	Q_{rr}	(Note 2)		1.55		μC

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

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

3. Essentially independent of operating temperature.

■ TEST CIRCUITS AND 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. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.