



4N40

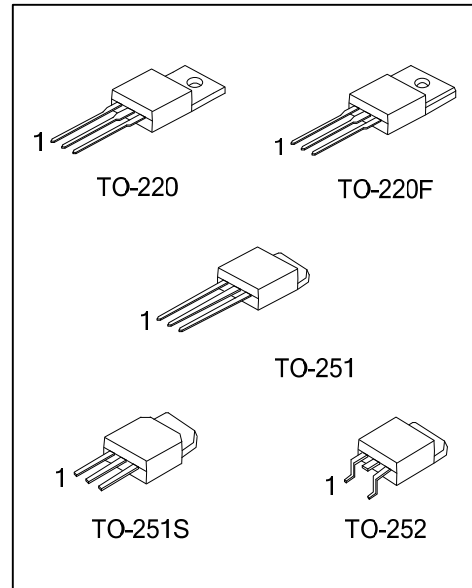
Power MOSFET

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.

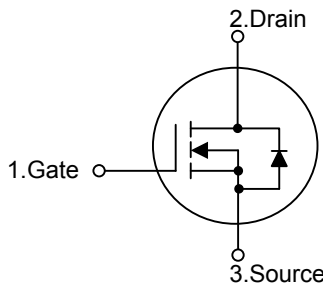
The UTC **4N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.



FEATURES

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

SYMBOL



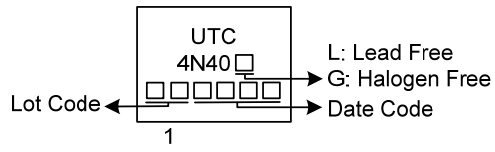
ORDERING INFORMATION

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

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

MARKING



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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	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	W/ $^\circ\text{C}$
	TO-220F		0.22	W/ $^\circ\text{C}$
	TO-251/TO-252		0.41	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	$^\circ\text{C/W}$
	TO-251/TO-251S/TO-252		110	
Junction to Case	TO-220	θ_{JC}	2.08	$^\circ\text{C/W}$
	TO-220F		4.5	
	TO-251/TO-251S/TO-252		2.4	

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

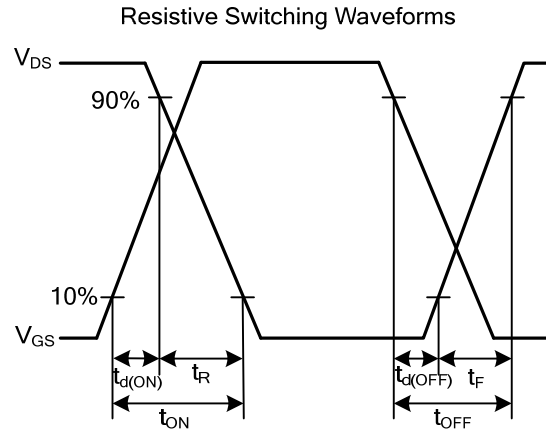
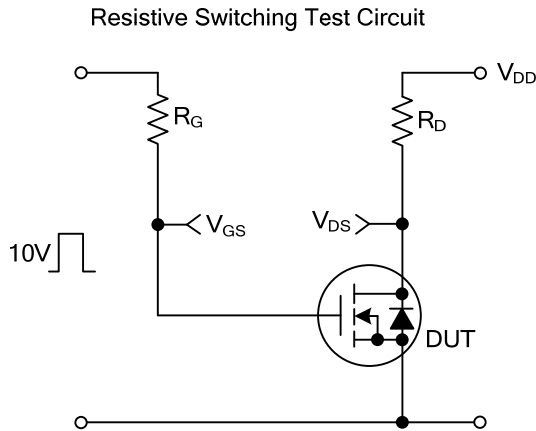
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	400			V	
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$			10	μA	
		$V_{DS}=320\text{V}$, $T_c=125^\circ\text{C}$			100	μA	
Gate- Source Leakage Current	Forward	I_{GSS}					
	Reverse						$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$
						-100	nA
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}	$I_S=4\text{A}$, $V_{GS}=0\text{V}$, $dI_F/dt=100\text{A}/\mu\text{s}$ (Note 2)		231		ns	
Body Diode Reverse Recovery Charge	Q_{rr}				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



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