



## 1N40

Preliminary

Power MOSFET

### 1 Amps, 400 Volts N-CHANNEL POWER MOSFET

#### DESCRIPTION

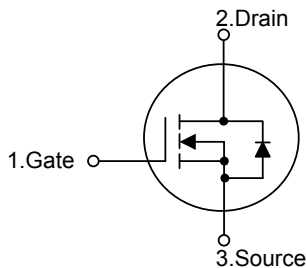
The UTC **1N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **1N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

#### FEATURES

- \* High switching speed
- \* 1.4A, 400V,  $R_{DS(ON)}=5.8\Omega @ V_{GS}=10V$
- \* 100% avalanche tested

#### SYMBOL

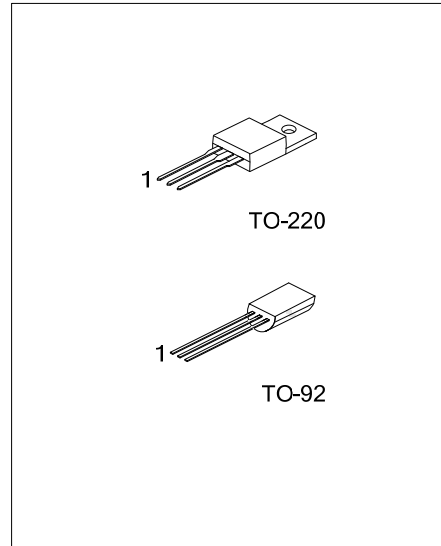


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N40L-TA3-T	1N40G-TA3-T	TO-220	G	D	S	Tube
1N40L-T92-B	1N40G-T92-B	TO-92	G	D	S	Tape Box
1N40L-T92-K	1N40G-T92-K	TO-92	G	D	S	Bulk
1N40L-T92-TR	1N40G-T92-TR	TO-92	G	D	S	Tape Reel

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

<p>1N40L-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p>	<p>(1) T: Tube, B: Tape Box, K: Bulk, TR: Tape Reel</p> <p>(2) TA3: TO-220, T92: TO-92</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		$V_{GSS}$	$\pm 30$	V	
Drain Current	Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	1.4	A	
	Pulsed (Note 1)	$I_{DM}$	5.6	A	
Avalanche Current (Note 1)		$I_{AR}$	1.4	A	
Avalanche Energy	Single Pulsed (Note 2)	$E_{AS}$	85	mJ	
	Repetitive (Note 1)	$E_{AR}$	2.5	mJ	
Peak Diode Recovery $dv/dt$ (Note 3)		$dv/dt$	4.5	V/ns	
Power Dissipation		$P_D$	25	W	
			2.5	W	
	Derate above $25^\circ\text{C}$		TO-220	0.2	$\text{W}/^\circ\text{C}$
			TO-92	0.02	$\text{W}/^\circ\text{C}$
Junction Temperature		$T_J$	+150	$^\circ\text{C}$	
Storage Temperature Range		$T_{STG}$	-55~+150	$^\circ\text{C}$	

Note: 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.

■ THERMAL DATA

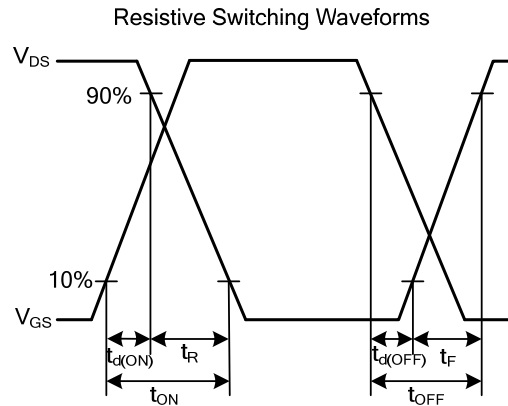
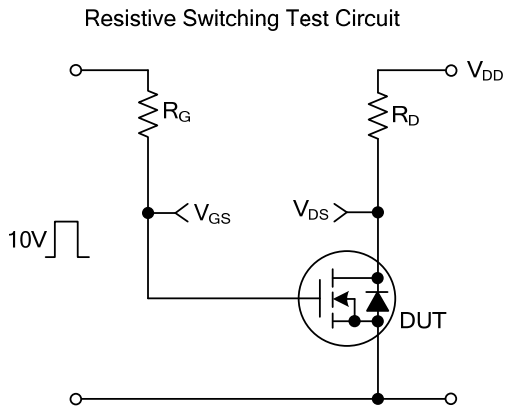
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-92		140	
Junction to Case	TO-220	$\theta_{JC}$	5.0	$^\circ\text{C}/\text{W}$
	TO-92		50	

■ 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
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}$ , $I_D=250\mu\text{A}$		0.4		$\text{V}/^\circ\text{C}$
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	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$			+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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=0.7\text{A}$		4.5	5.8	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		115	150	pF
Output Capacitance	$C_{OSS}$			20	30	pF
Reverse Transfer Capacitance	$C_{RSS}$			3	4	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=320\text{V}$ , $I_D=1.8\text{A}$ (Note 4, 5)		4.0	5.5	nC
Gate to Source Charge	$Q_{GS}$			1.1		nC
Gate to Drain Charge	$Q_{GD}$			2.1		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=200\text{V}$ , $I_D=1.8\text{A}$ , $R_G=25\Omega$ (Note 4, 5)		7	25	ns
Rise Time	$t_R$			30	70	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			7	25	ns
Fall-Time	$t_F$			25	60	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				1.4	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				5.6	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=1.4\text{A}$ , $V_{GS}=0\text{V}$			1.5	V
Body Diode Reverse Recovery Time	$t_{RR}$	$I_S=1.8\text{A}$ , $V_{GS}=0\text{V}$ , $dI_F/dt=100\text{A}/\mu\text{s}$		160		ns
Body Diode Reverse Recovery Charge	$Q_{RR}$	(Note 4)		0.4		$\mu\text{C}$

- Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature  
 2.  $L = 75\text{mH}$ ,  $I_{AS} = 1.4\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$   
 3.  $I_{SD} \leq 1.8\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$   
 4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$   
 5. Essentially independent of operating temperature

## ■ TEST CIRCUITS AND WAVEFORMS



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