



1N40

Preliminary

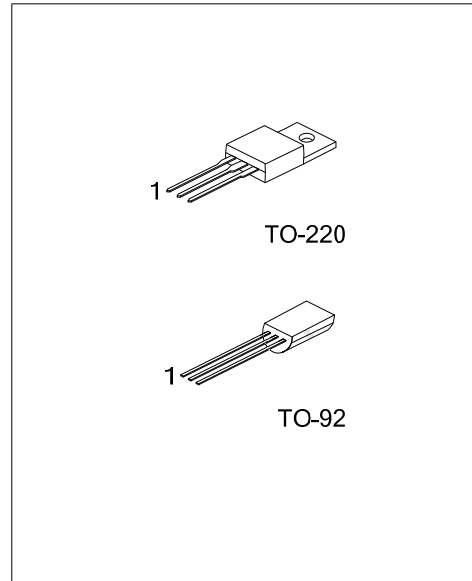
Power MOSFET

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.

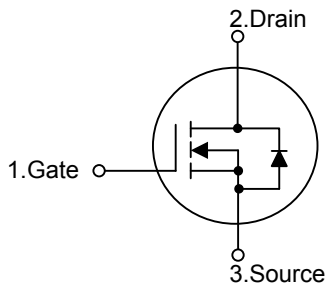
The UTC **1N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.



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}	± 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°C		TO-220	0.2	W/ $^\circ\text{C}$
			TO-92	0.02	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

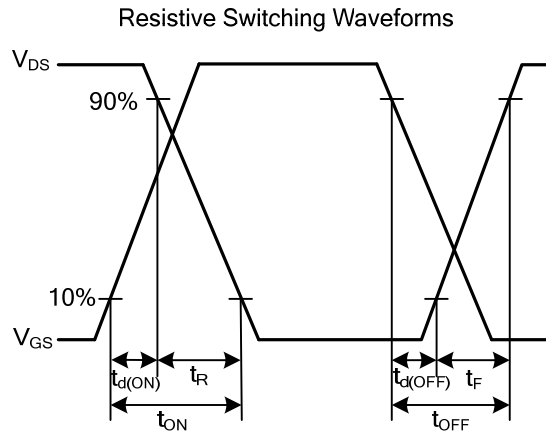
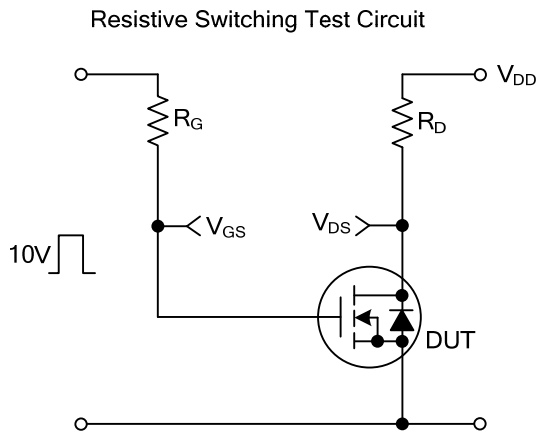
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-92		140	
Junction to Case	TO-220	θ_{JC}	5.0	$^\circ\text{C}/\text{W}$
	TO-92		50	

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
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°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	μA
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
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=0.7\text{A}$		4.5	5.8	Ω
DYNAMIC PARAMETERS						
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
SWITCHING PARAMETERS						
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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
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		μC

- 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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