



**2N40**

Preliminary

*Power MOSFET*

**2.0A, 400V N-CHANNEL  
POWER MOSFET**

■ DESCRIPTION

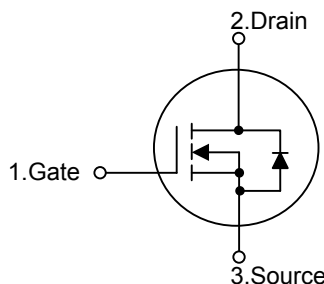
The UTC **2N40** is an N-channel mode power MOSFET using UTC' s advanced technology to provide customers with a minimum on-state resistance, stable off-state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

The UTC **2N40** is usually used in general purpose switching applications, motor control circuits and switched mode power supply.

■ FEATURES

- \* High switching speed
- \*  $R_{DS(ON)} < 3.4\Omega @ V_{GS}=10V, I_D=1.25A$
- \* 100% avalanche tested

■ SYMBOL

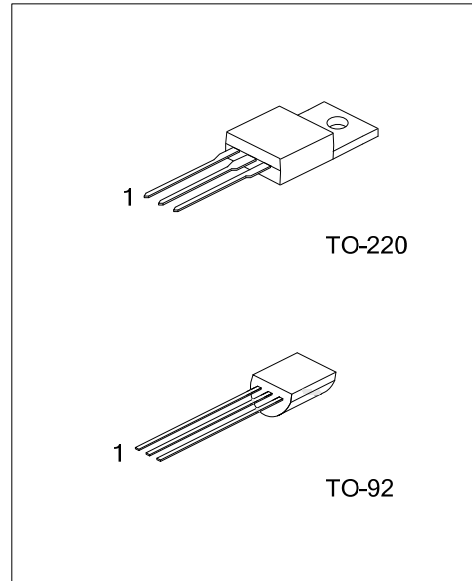


■ ORDERING INFORMATION

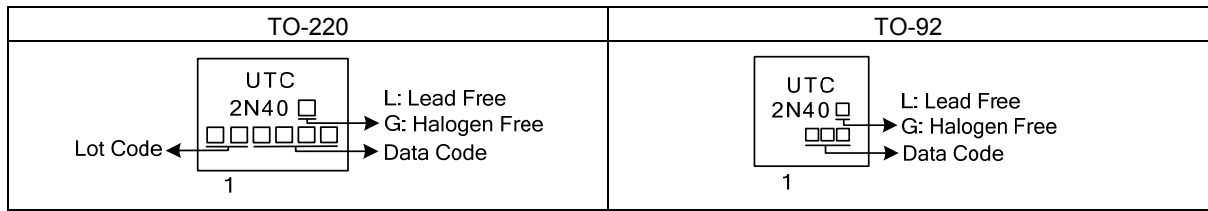
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N40L-TA3-T	2N40G-TA3-T	TO-220	G	D	S	Tube
2N40L-T92-B	2N40G-T92-B	TO-92	G	D	S	Tape Box
2N40L-T92-K	2N40G-T92-K	TO-92	G	D	S	Bulk

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

<p>2N40L-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, B: Tape Box, K: Bulk (2) TA3: TO-220, T92: TO-92 (3) L: Lead Free, G: Halogen Free and 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	2.5	A
	Pulsed	$I_{DM}$	10	A
Avalanche Current		$I_{AR}$	2.5	A
Single Pulsed Avalanche Energy		$E_{AS}$	100	mJ
Power Dissipation	TO-220	$P_D$	25	W
	TO-92		3	W
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. Repetitive Rating: Pulse width limited by maximum junction temperature

3.  $L = 75\text{mH}$ ,  $I_{AS} = 1.4\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 1.8\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

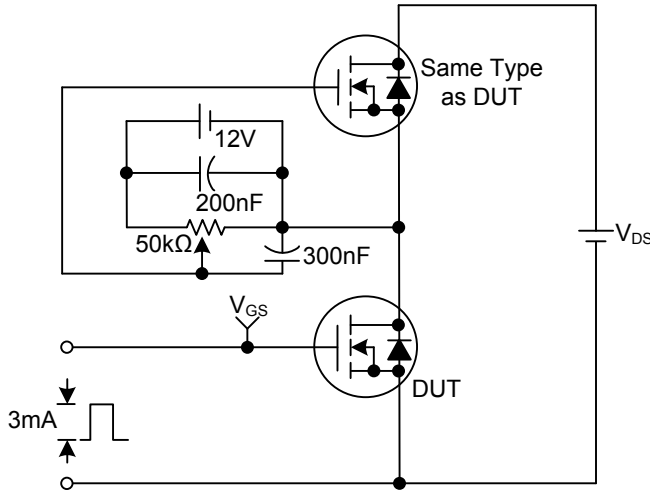
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-92		140	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	5	$^\circ\text{C}/\text{W}$
	TO-92		42	$^\circ\text{C}/\text{W}$

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

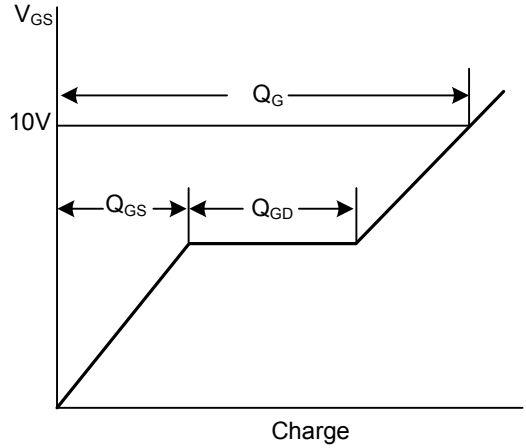
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	400			V
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=400\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$			+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		$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=1.25\text{A}$			3.4	$\Omega$
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance		$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		240		pF
Output Capacitance		$C_{OSS}$			44		pF
Reverse Transfer Capacitance		$C_{RSS}$			26		pF
<b>SWITCHING PARAMETERS</b>							
Total Gate Charge		$Q_{G(TOT)}$	$V_{DS}=50\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=1.3\text{A}$ , $I_G=100\mu\text{A}$ (Note 1, 2)		20		nC
Gate to Source Charge		$Q_{GS}$			2		nC
Gate to Drain Charge		$Q_{GD}$			8		nC
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=30\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=0.5\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		10		ns
Rise Time		$t_R$			25		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			46		ns
Fall-Time		$t_F$			25		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
Maximum Body-Diode Continuous Current		$I_S$	$T_C=25^\circ\text{C}$			2.5	A
Maximum Body-Diode Pulsed Current		$I_{SM}$				10	A
Drain-Source Diode Forward Voltage		$V_{SD}$	$I_S=2.5\text{A}$ , $V_{GS}=0\text{V}$			1.2	V
Body Diode Reverse Recovery Time		$t_{rr}$	$I_S=2.5\text{A}$ , $V_{GS}=0\text{V}$ ,		200		ns
Body Diode Reverse Recovery Charge		$Q_{rr}$	$di/dt=100\text{A}/\mu\text{s}$		2.0		$\mu\text{C}$

■ TEST CIRCUITS AND WAVEFORMS

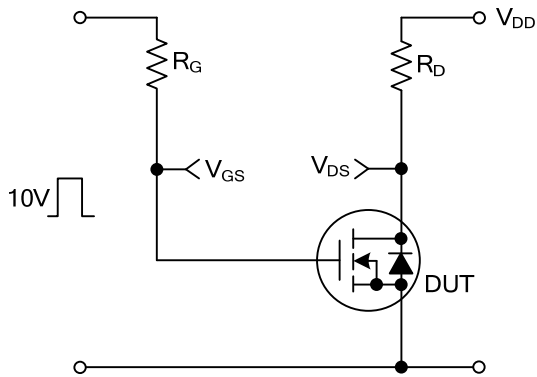
Gate Charge Test Circuit



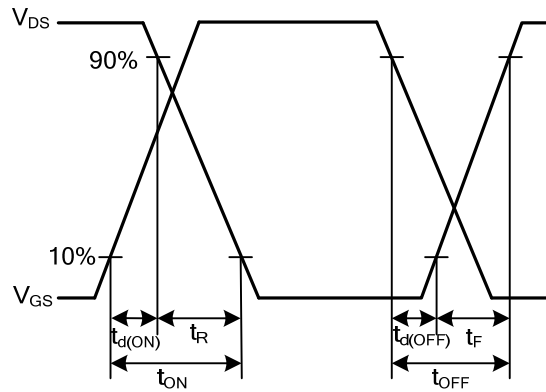
Gate Charge Waveforms



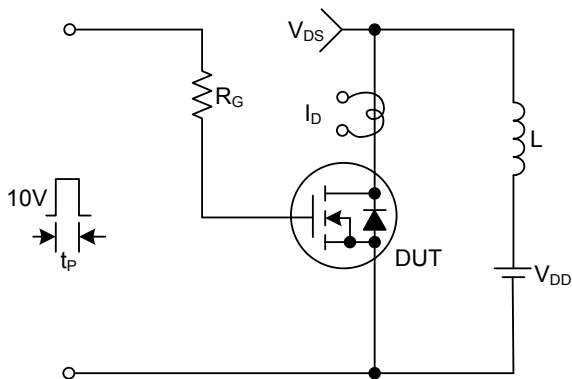
Resistive Switching Test Circuit



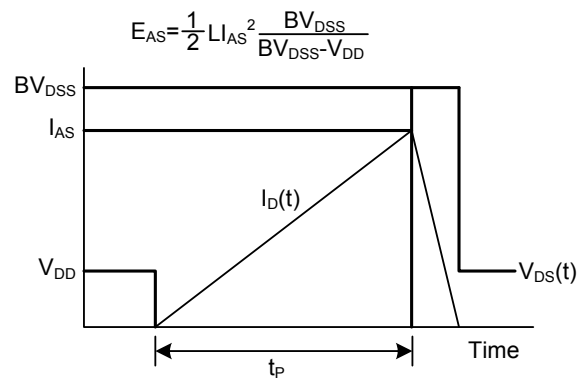
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

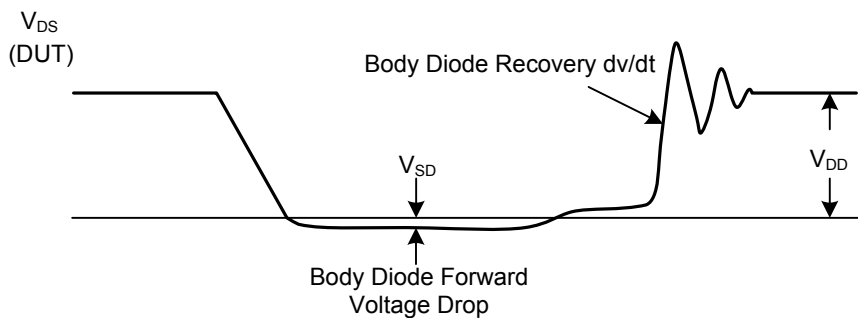
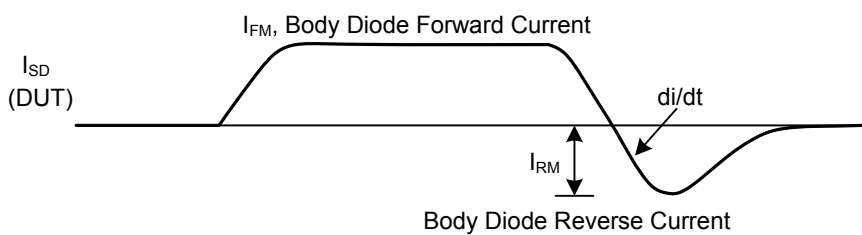
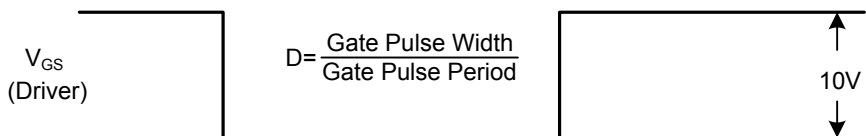
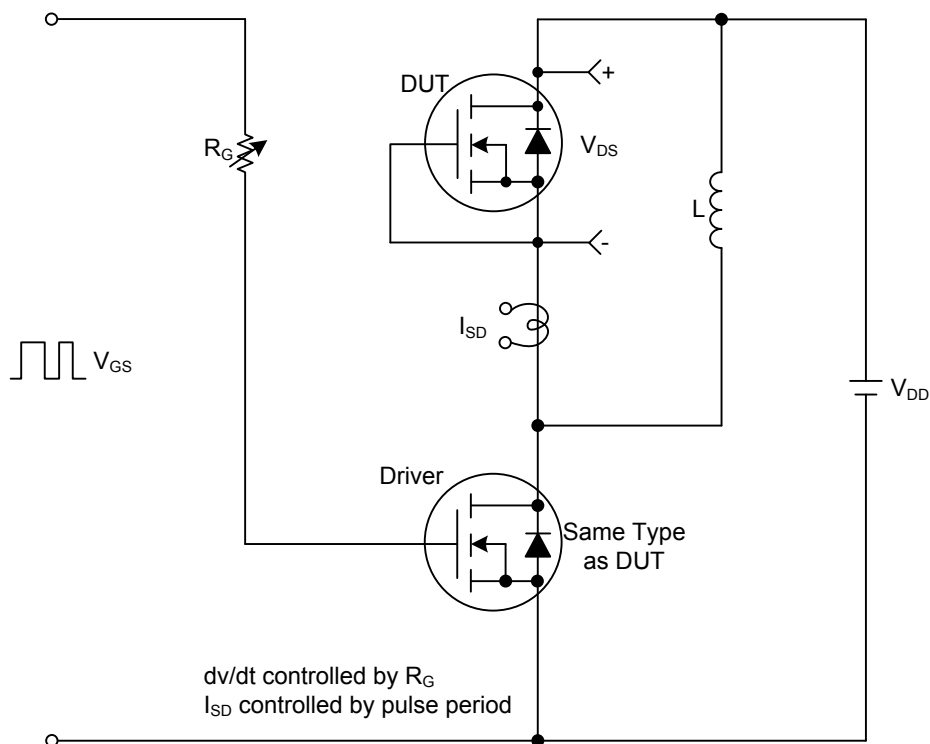


Unclamped Inductive Switching Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



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