



2N40

Preliminary

Power MOSFET

2.0A, 400V N-CHANNEL POWER MOSFET

DESCRIPTION

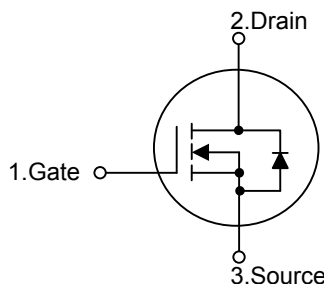
The UTC **2N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, stable off-state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

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

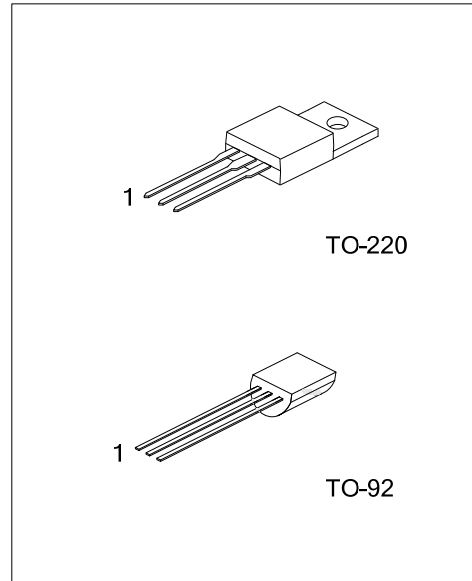


ORDERING INFORMATION

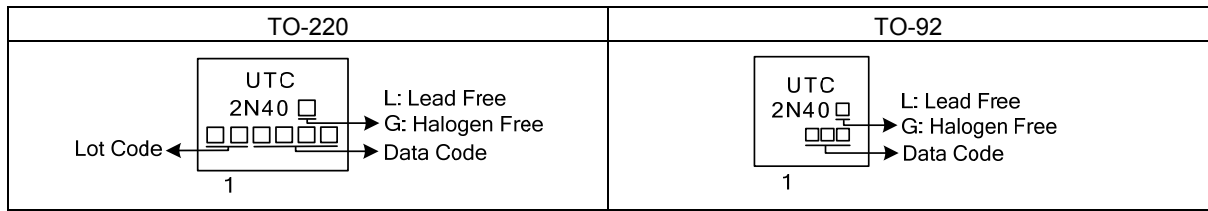
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N40L-TA3-T	2N40G-TA3-T	TO-220	G	D	S	Tube
2N40L-T92-B	2N40G-T92-B	TO-92	G	D	S	Tape Box
2N40L-T92-K	2N40G-T92-K	TO-92	G	D	S	Bulk

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

<p>2N40L-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, B: Tape Box, K: Bulk</p> <p>(2) TA3: TO-220, T92: TO-92</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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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	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

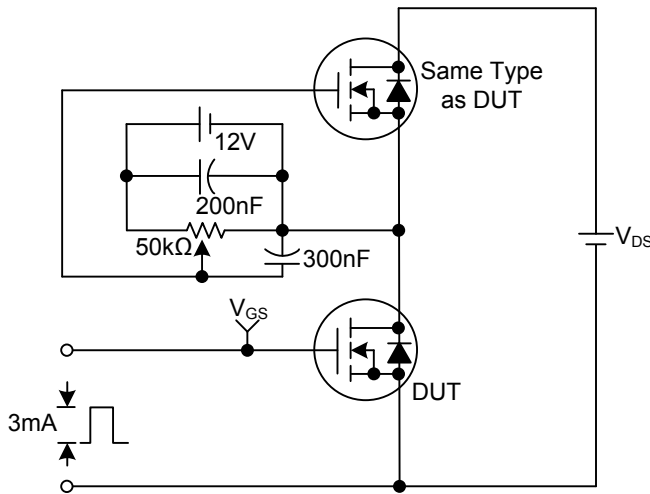
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-92		140	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	5	$^\circ\text{C}/\text{W}$
	TO-92		42	$^\circ\text{C}/\text{W}$

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

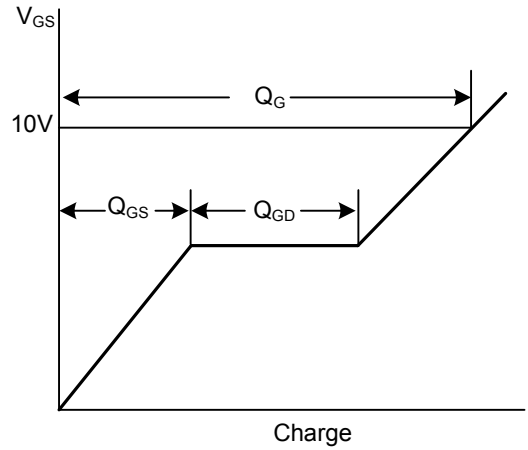
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	400			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse		$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-100	nA
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		$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=1.25\text{A}$			3.4	Ω
DYNAMIC PARAMETERS							
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
SWITCHING PARAMETERS							
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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
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		μC

■ TEST CIRCUITS AND WAVEFORMS

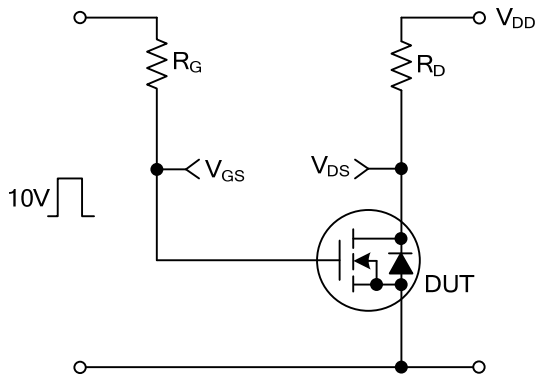
Gate Charge Test Circuit



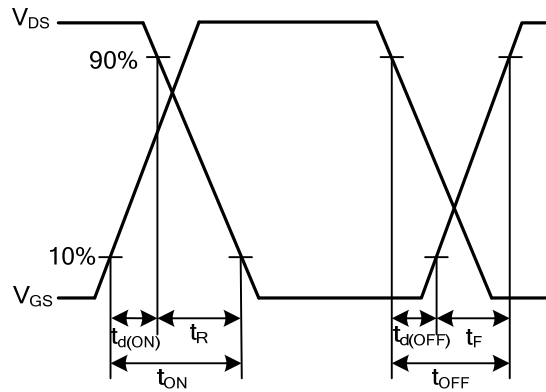
Gate Charge Waveforms



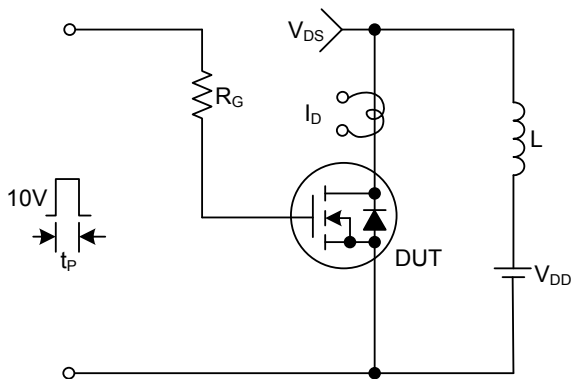
Resistive Switching Test Circuit



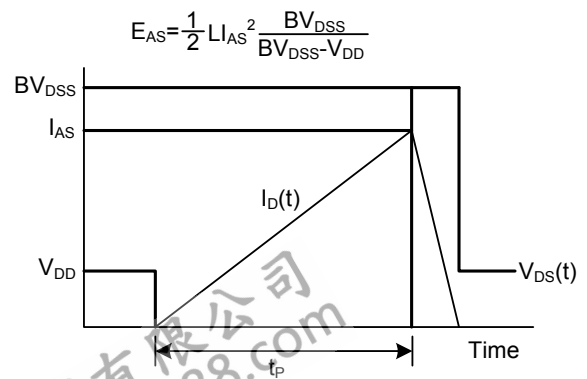
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

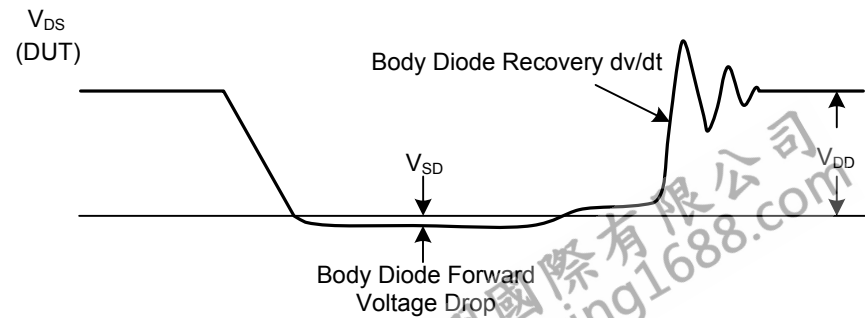
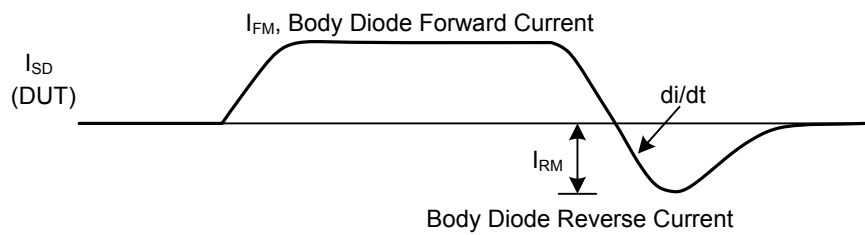
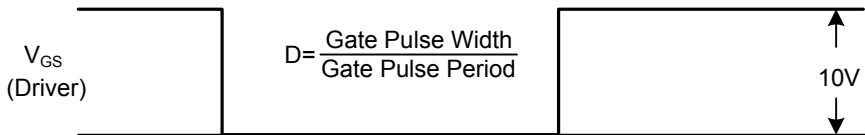
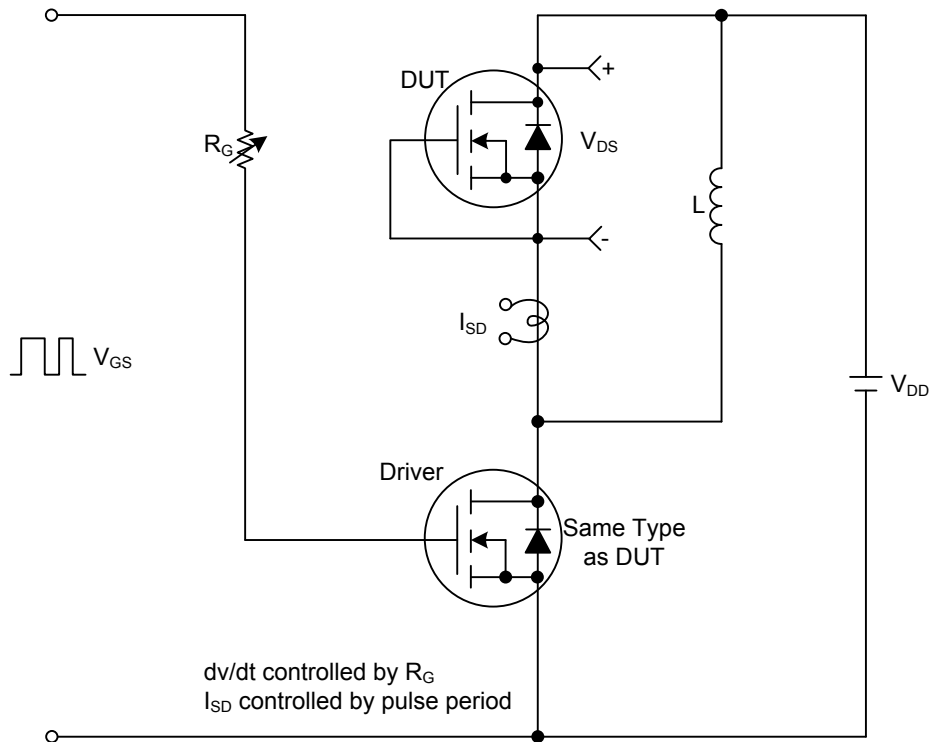


Unclamped Inductive Switching Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



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