



## 2N40

Preliminary

Power MOSFET

### 2A, 400V N-CHANNEL POWER MOSFET

#### DESCRIPTION

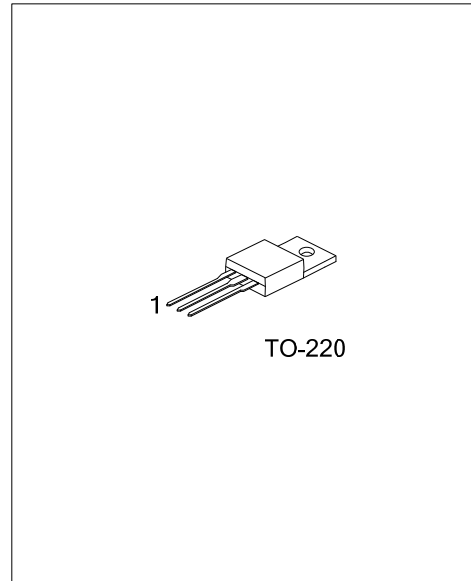
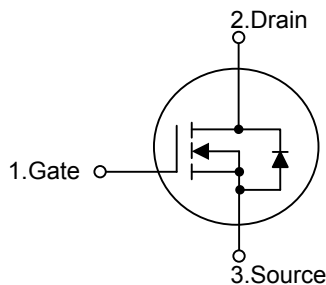
The UTC **2N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, stable off-state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

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

#### FEATURES

- \* High switching speed
- \*  $R_{DS(ON)}=3.4\Omega @ V_{GS}=10V$
- \* 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

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)Lead Free</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220</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	$I_D$	2	A
	Pulsed	$I_{DM}$	7	A
Avalanche Current		$I_{AR}$	2.5	A
Single Pulsed Avalanche Energy		$E_{AS}$	100	mJ
Power Dissipation		$P_D$	25	W
Linear Derating Factor		$\Delta P_D/\Delta T_{mb}$	0.2	W/ $^\circ\text{C}$
Junction Temperature		$T_J$	150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-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

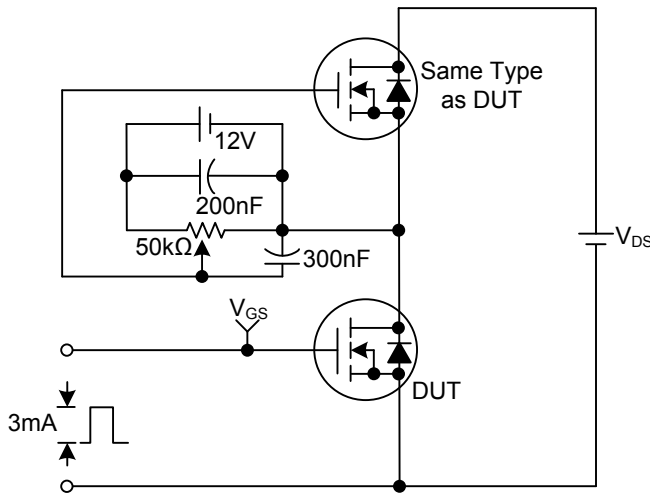
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	5	$^\circ\text{C}/\text{W}$

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

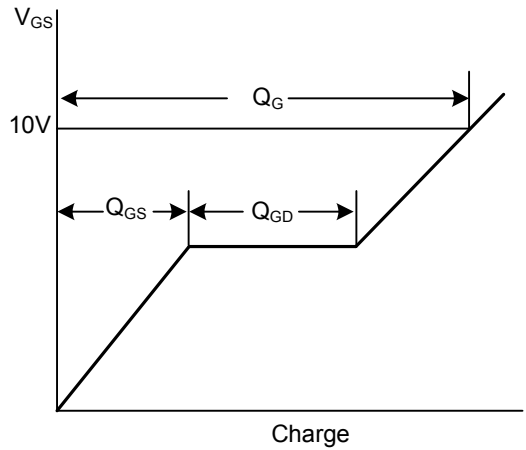
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	400			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$		0.45		V/ $^\circ\text{C}$
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=400\text{V}$ , $V_{GS}=0\text{V}$		1	25	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$		+10	+200	nA
	Reverse		$V_{GS}=-30\text{V}$ , $V_{DS}=0\text{V}$		-10	-200	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		$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=1.25\text{A}$		3.0	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		$Q_{G(TOT)}$	$V_{GS}=10\text{V}$ , $V_{DS}=320\text{V}$ , $I_D=2.5\text{A}$		20	25	nC
Gate to Source Charge		$Q_{GS}$			2	3	nC
Gate to Drain Charge		$Q_{GD}$			8	12	nC
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=200\text{V}$ , $I_D=2.5\text{A}$ , $R_G=24\Omega$ , $R_D=78\Omega$		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		$t_{rr}$	$I_S=2.5\text{A}$ , $V_{GS}=0\text{V}$ , $di/dt=100\text{A}/\mu\text{s}$		200		ns
Body Diode Reverse Recovery Charge		$Q_{RR}$			2.0		$\mu\text{C}$

■ TEST CIRCUITS AND WAVEFORMS

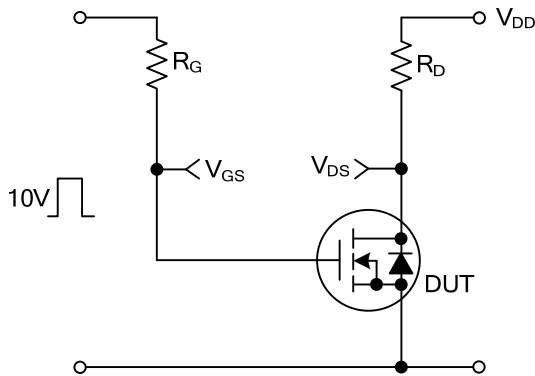
Gate Charge Test Circuit



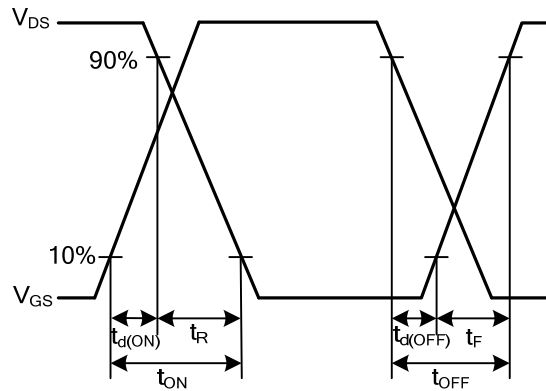
Gate Charge Waveforms



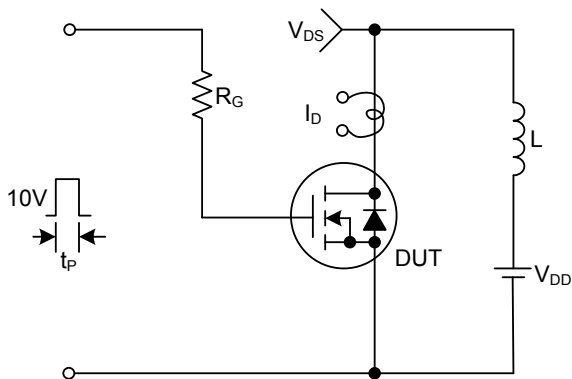
Resistive Switching Test Circuit



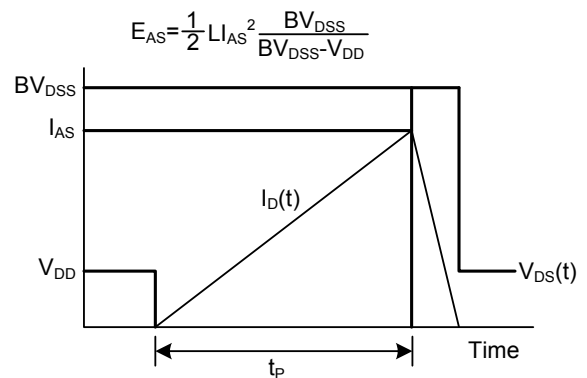
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

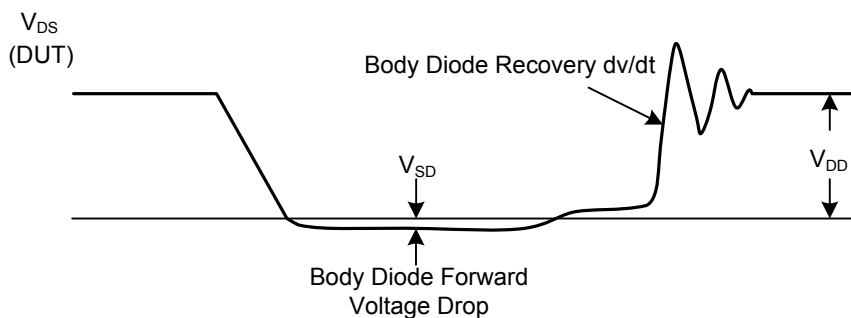
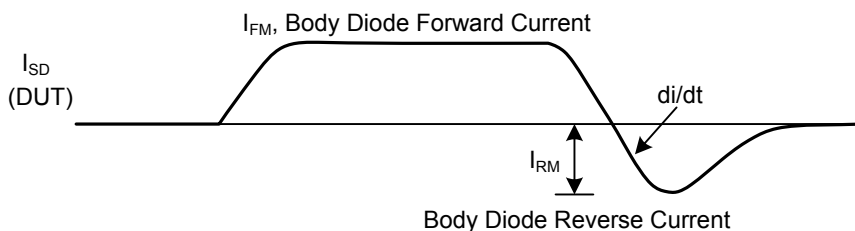
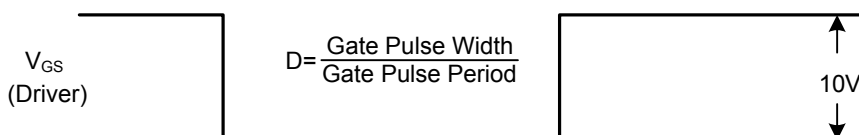
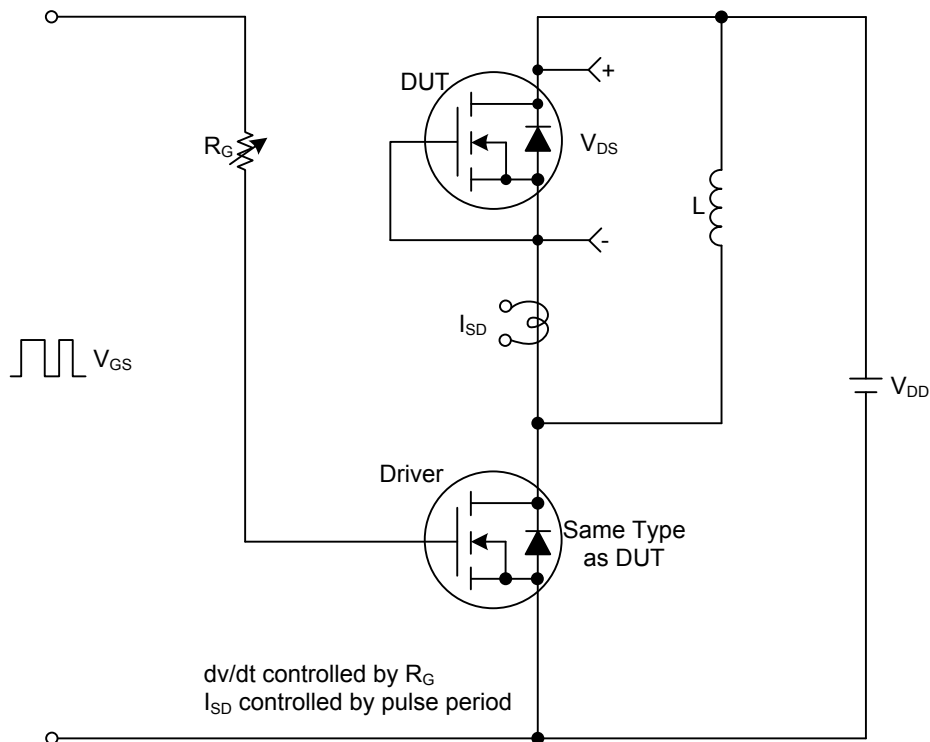


Unclamped Inductive Switching Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



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