



## 2N40

Preliminary

Power MOSFET

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

#### DESCRIPTION

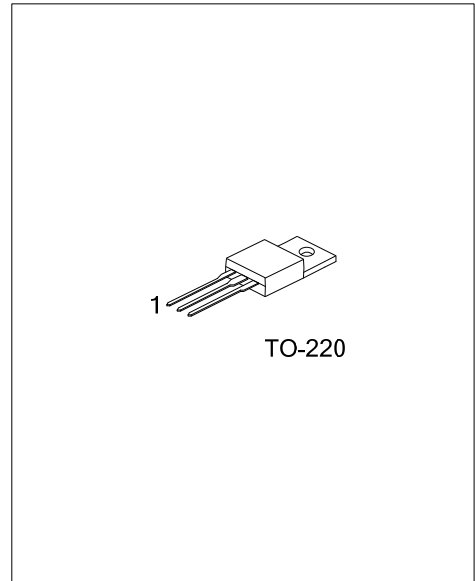
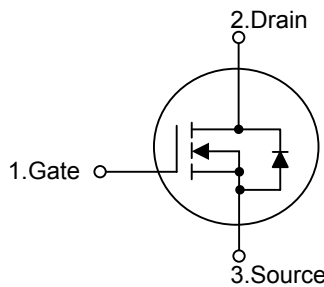
The UTC **2N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, stable off-state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

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

#### FEATURES

- \* High switching speed
- \* 2A, 400V,  $R_{DS(ON)}=3.5\Omega @ V_{GS}=10V$
- \* 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>
--	--

■ ABSOLUTE MAXIMUM RATINGS ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

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
	Pulsed	$I_{DM}$	7
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 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 CHARACTERISTICS

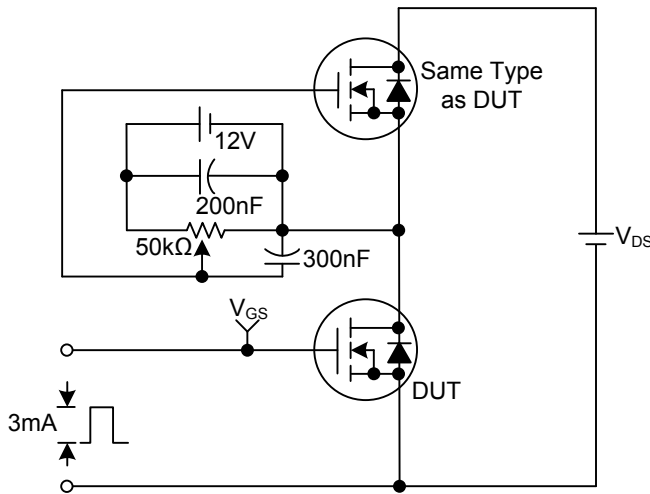
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	5	$^\circ\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

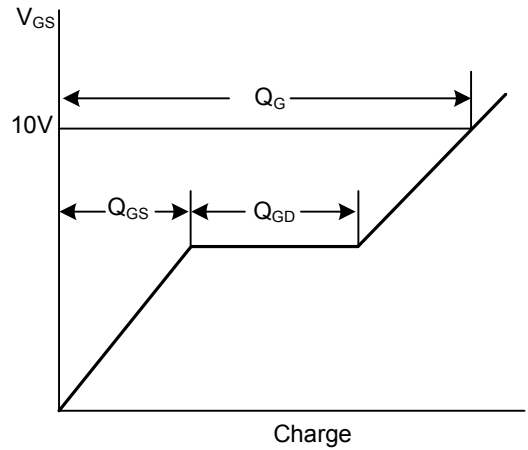
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	400			V
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA		0.45		V/°C
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =400V, V <sub>GS</sub> =0V		1	25	μA
Gate- Source Leakage Current	Forward	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V		+10	+200	nA
	Reverse	V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V		-10	-200	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	3.0	4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.25A		2.0	3.5	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		240		pF
Output Capacitance	C <sub>OSS</sub>			44		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			26		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =320V, I <sub>D</sub> =2.5A		20	25	nC
Gate to Source Charge	Q <sub>GS</sub>			2	3	nC
Gate to Drain Charge	Q <sub>GD</sub>			8	12	nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =200V, I <sub>D</sub> =2.5A, R <sub>G</sub> =24Ω, R <sub>D</sub> =78 Ω		10		ns
Rise Time	t <sub>R</sub>			25		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			46		ns
Fall-Time	t <sub>F</sub>			25		ns
Internal Drain Inductance	L <sub>D</sub>		Measured from drain lead 6 mm from package to centre of die		4.5	
Internal Source Inductance	L <sub>S</sub>	Measured from source lead 6 mm from package to source bond pad		7.5		nH
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>	T <sub>C</sub> =25°C			2.5	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				10	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =2.5A, V <sub>GS</sub> =0V			1.2	V
Body Diode Reverse Recovery Time	t <sub>RR</sub>	I <sub>S</sub> =2.5A, V <sub>GS</sub> =0V, dI/dt=100A/μs		200		ns
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>			2.0		μC

■ TEST CIRCUITS AND WAVEFORMS

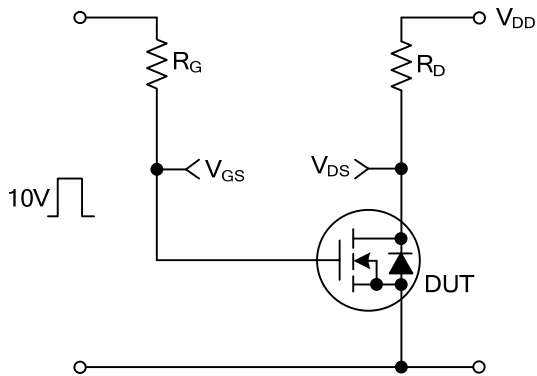
Gate Charge Test Circuit



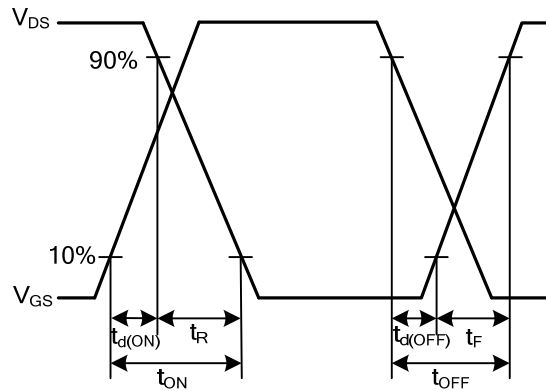
Gate Charge Waveforms



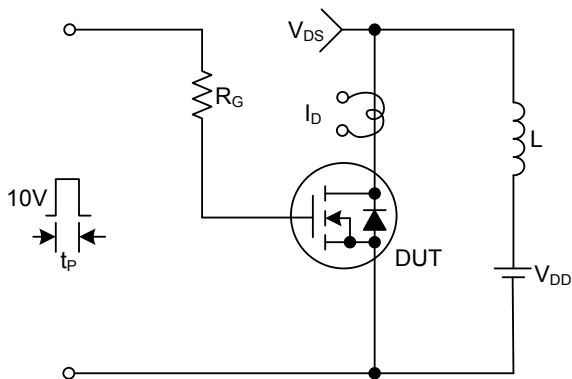
Resistive Switching Test Circuit



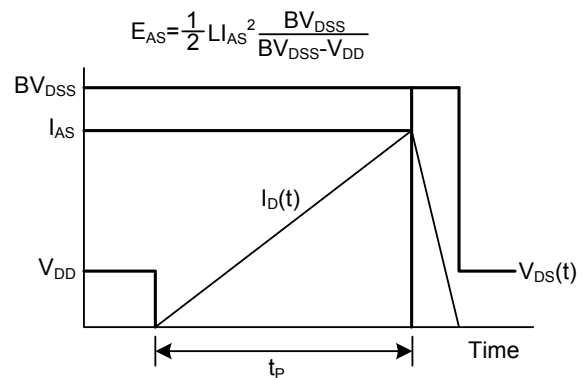
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

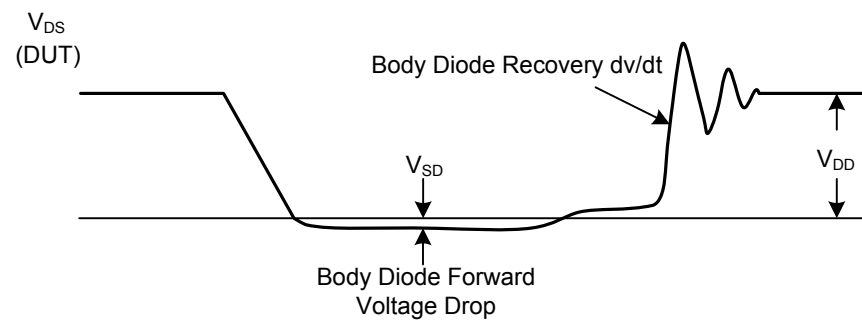
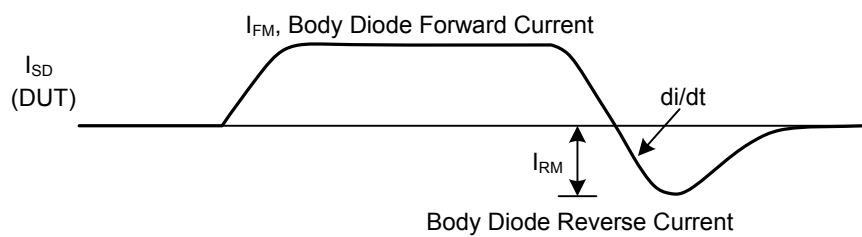
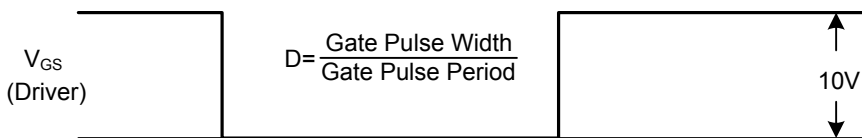
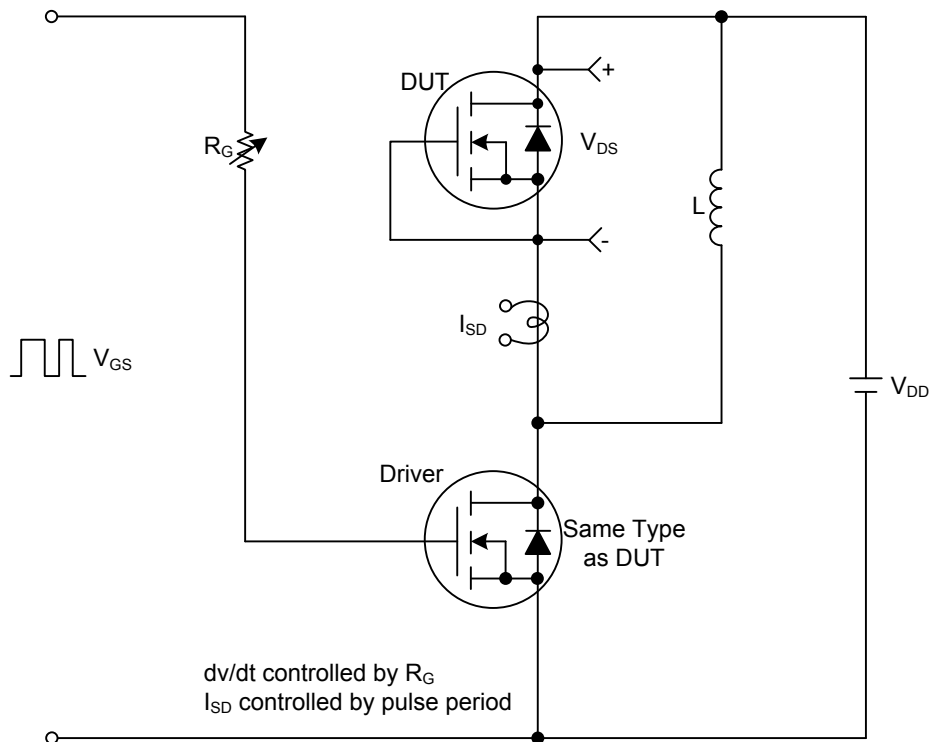


Unclamped Inductive Switching Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.