



## 6N40

Preliminary

Power MOSFET

### 6A, 400V N-CHANNEL POWER MOSFET

#### DESCRIPTION

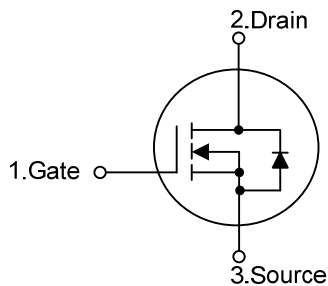
The UTC **6N40** is an N-Channel enhancement mode power MOSFET using UTC's perfect planar stripe, DMOS technology to provide customers with superior switching performance and minimum on-state resistance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **6N40** is generally used in applications, such as electronic lamp ballasts based on half bridge topology and high efficiency switched mode power supplies.

#### FEATURES

- \*  $R_{DS(ON)}=1.0\Omega @ V_{GS}=10V$
- \* Fast switching speed
- \* Improved dv/dt capability

#### SYMBOL

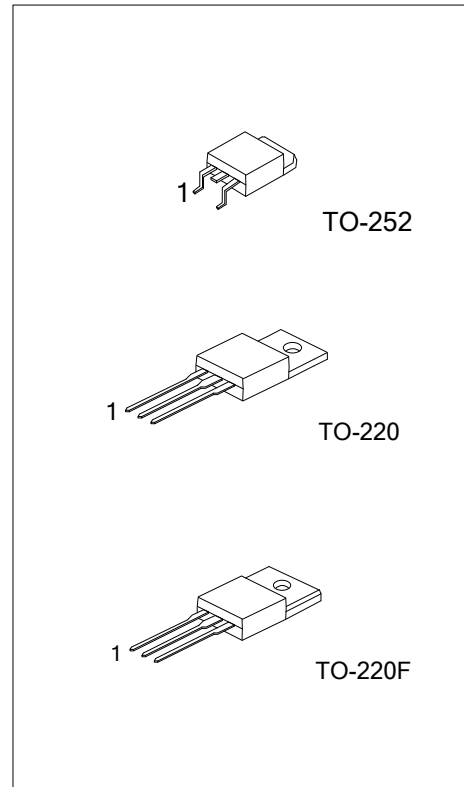


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N40L-TA3-T	6N40G-TA3-T	TO-220	G	D	S	Tube
6N40L-TF3-T	6N40G-TF3-T	TO-220F	G	D	S	Tube
6N40L-TN3-R	6N40G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>6N40L - TA3 - T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TN3: TO-252 (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
Avalanche Current (Note 2)		$I_{AR}$	6	A
Drain Current	Continuous	$I_D$	6 (Note 5)	A
	Pulsed (Note 2)	$I_{DM}$	24 (Note 5)	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	330	mJ
	Repetitive (Note 2)	$E_{AR}$	8.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	$P_D$	73	W
	TO-220F		38	
	TO-252		62.5	
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.  $L=19\text{mH}$ ,  $I_{AS}=5.5\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
4.  $I_{SD} \leq 6\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$
5. Drain current limited by maximum junction temperature

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220 / TO-220F	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-252		110	
Junction to Case	TO-220	$\theta_{JC}$	1.71	$^\circ\text{C}/\text{W}$
	TO-220F		3.31	
	TO-252		2.0	

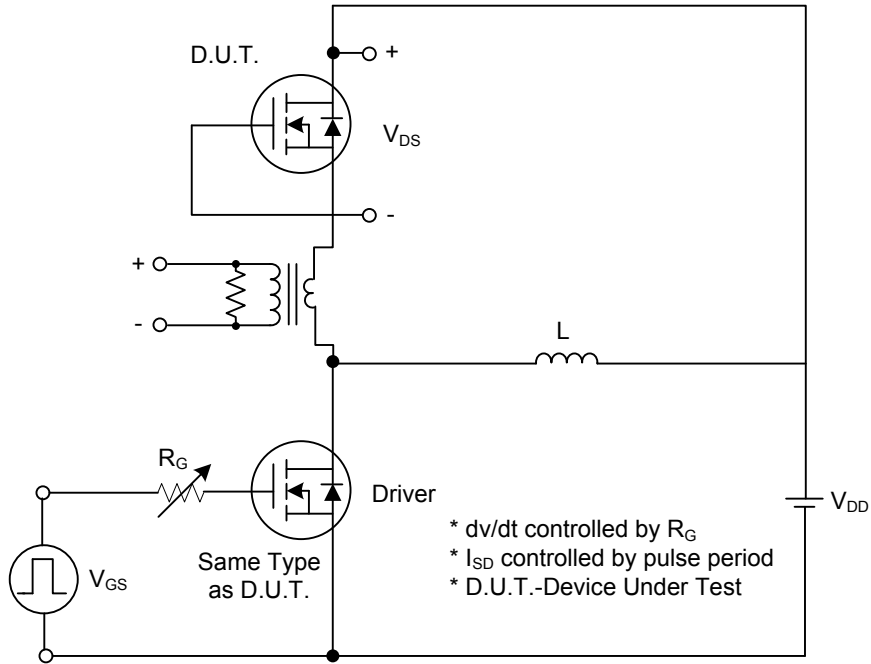
■ ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>								
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	400			V	
Breakdown Voltage Temperature Coefficient		ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.54		V/°C	
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> =400V, V <sub>GS</sub> =0V			1	μA	
			V <sub>DS</sub> =320V, T <sub>J</sub> =125°C			10	μA	
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =+30V			+100	nA	
	Reverse		V <sub>DS</sub> =0V, V <sub>GS</sub> =-30V			-100	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		4.0	V	
Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =3A		0.8	1	Ω	
<b>DYNAMIC PARAMETERS</b>								
Input Capacitance		C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		480	625	pF	
Output Capacitance		C <sub>OSS</sub>				80	105	pF
Reverse Transfer Capacitance		C <sub>RSS</sub>				15	20	pF
<b>SWITCHING PARAMETERS</b>								
Total Gate Charge		Q <sub>G</sub>	V <sub>DS</sub> =320V, V <sub>GS</sub> =10V, I <sub>D</sub> =6A (Note 1,2)		16	20	nC	
Gate-Source Charge		Q <sub>GS</sub>				2.3		nC
Gate-Drain Charge		Q <sub>GD</sub>				8.2		nC
Turn-ON Delay Time		t <sub>D(ON)</sub>	V <sub>DD</sub> =200V, I <sub>D</sub> =6A, R <sub>G</sub> =25Ω (Note 1,2)		13	35	ns	
Turn-ON Rise Time		t <sub>R</sub>				65	140	ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>				21	55	ns
Turn-OFF Fall Time		t <sub>F</sub>				38	85	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>								
Maximum Body-Diode Continuous Current		I <sub>S</sub>				6	A	
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				24	A	
Drain-Source Diode Forward Voltage		V <sub>SD</sub>	I <sub>S</sub> =6A, V <sub>GS</sub> =0V			1.4	V	
Body Diode Reverse Recovery Time		t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =6A,			230	ns	
Body Diode Reverse Recovery Charge		Q <sub>RR</sub>	di <sub>F</sub> /dt=100A/μs (Note 1)			1.7	μC	

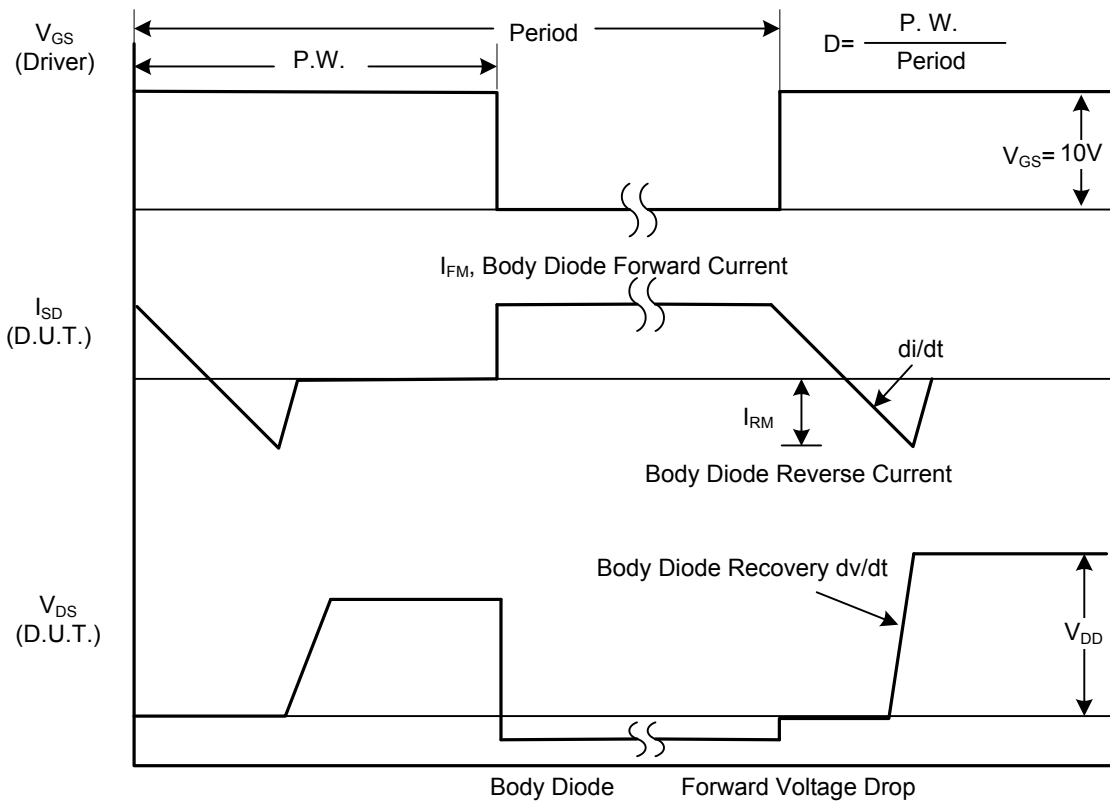
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

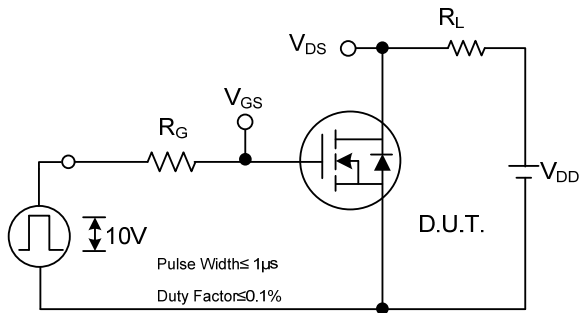


Peak Diode Recovery  $dv/dt$  Test Circuit

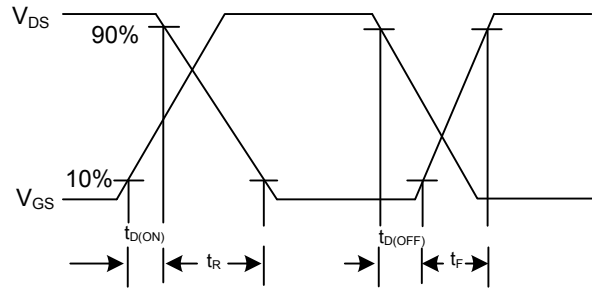


Peak Diode Recovery  $dv/dt$  Waveforms

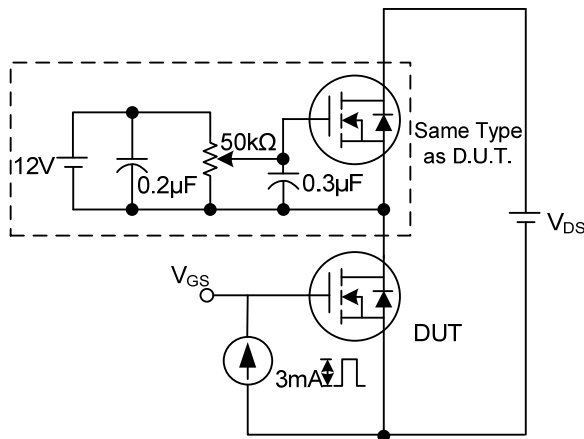
■ TEST CIRCUITS AND WAVEFORMS(Cont.)



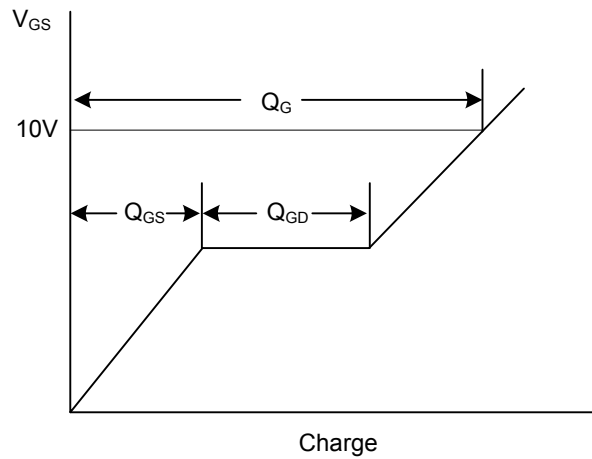
Switching Test Circuit



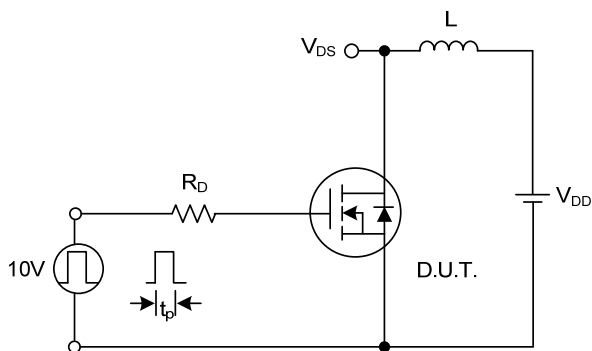
Switching Waveforms



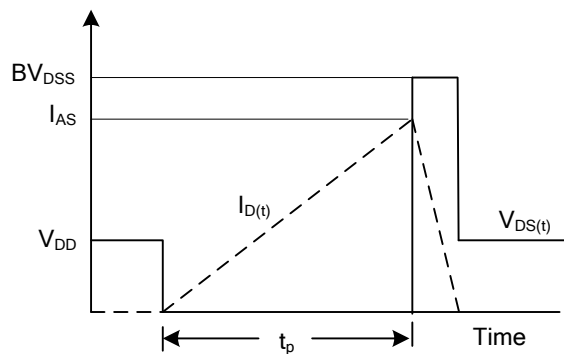
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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