



## 8N40K-MTQ

Power MOSFET

### 8A, 400V N-CHANNEL POWER MOSFET

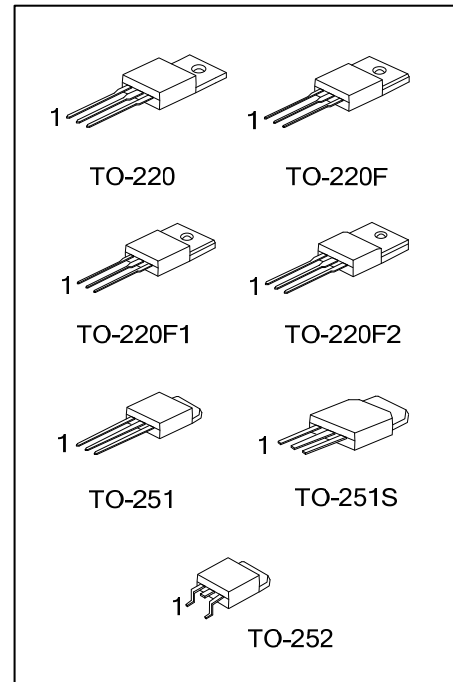
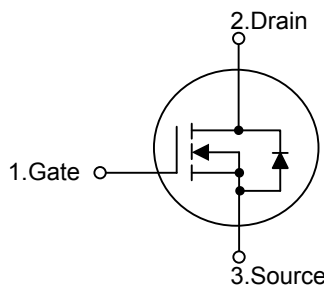
#### DESCRIPTION

The UTC **8N40K-MTQ** is an N-channel power MOSFET using UTC's advanced technology to provide the customers with minimum on-state resistance, superior switching performance and withstand high energy pulse in the avalanche and commutation mode.

#### FEATURES

- \*  $R_{DS(ON)} < 0.75\Omega @ V_{GS}=10V, I_D=4A$
- \* High switching speed
- \* 100% avalanche tested

#### SYMBOL



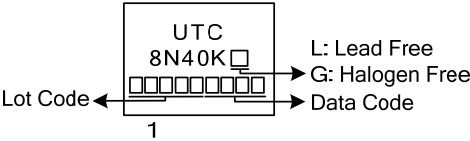
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
8N40KL-TA3-T	8N40KG-TA3-T	TO-220	G	D	S	Tube
8N40KL-TF1-T	8N40KG-TF1-T	TO-220F1	G	D	S	Tube
8N40KL-TF2-T	8N40KG-TF2-T	TO-220F2	G	D	S	Tube
8N40KL-TF3-T	8N40KG-TF3-T	TO-220F	G	D	S	Tube
8N40KL-TM3-T	8N40KG-TM3-T	TO-251	G	D	S	Tube
8N40KL-TMS-T	8N40KG-TMS-T	TO-251S	G	D	S	Tube
8N40KL-TN3-R	8N40KG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>8N40KL-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TMS: TO-251S, TN3: TO-252 (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		$V_{GSS}$	$\pm 30$	V	
Drain Current	Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	8	A	
	Pulsed (Note 2)	$I_{DM}$	32	A	
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	210	mJ	
	Repetitive (Note 2)	$E_{AR}$	2.5	mJ	
Peak Diode Recovery $dv/dt$ (Note 4)		$dv/dt$	4.4	V/ns	
Power Dissipation	TO-220	$P_D$	104	W	
	TO-220F/TO-220F1 TO-220F2		39	W	
	TO-251/TO-251S TO-252		75	W	
	Derate above $25^\circ\text{C}$				
Derate above $25^\circ\text{C}$	TO-220		0.832	$\text{W}/^\circ\text{C}$	
	TO-220F/TO-220F1 TO-220F2		0.312	$\text{W}/^\circ\text{C}$	
	TO-251/TO-251S TO-252		0.6	$\text{W}/^\circ\text{C}$	
	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.  $L = 6.6\text{mH}$ ,  $I_{AS} = 8.0\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 8.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-252		110	
	Junction to Case	TO-220	$\theta_{JC}$	1.2
TO-220F/TO-220F1 TO-220F2		3.18		
TO-251/TO-251S TO-252		2		

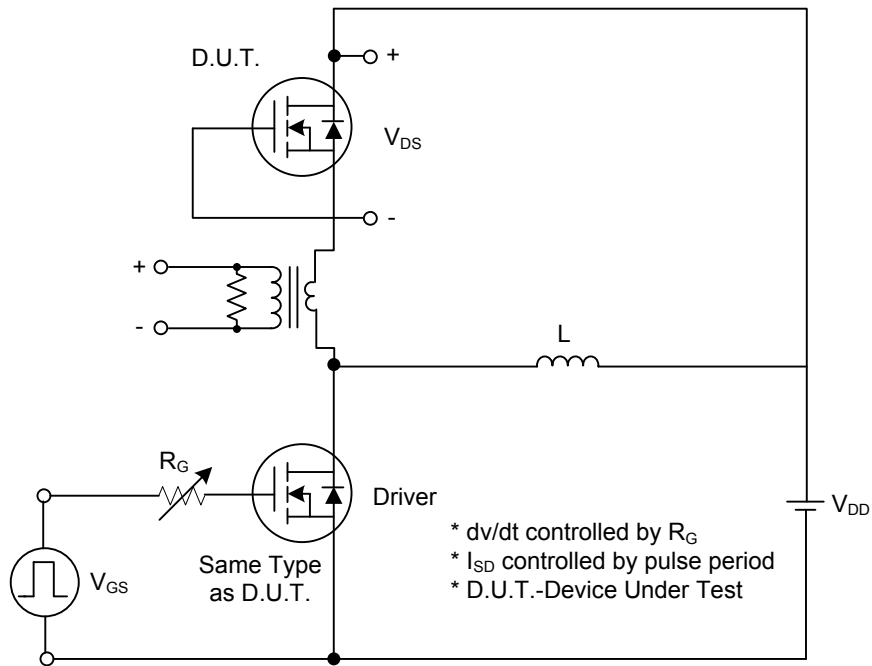
■ ELECTRICAL CHARACTERISTICS ( $T_c=25^\circ\text{C}$ , unless otherwise specified)

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	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}$ , $I_D=250\mu\text{A}$		0.4		V/ $^\circ\text{C}$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=400\text{V}$ , $V_{GS}=0\text{V}$			10	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$ , $V_{DS}=0\text{V}$			+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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=4\text{A}$			0.75	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		786		pF
Output Capacitance	$C_{OSS}$			88		pF
Reverse Transfer Capacitance	$C_{RSS}$			7.8		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=50\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=1.3\text{A}$ $I_G=100\mu\text{A}$ (Note 1, 2)		60		nC
Gate to Source Charge	$Q_{GS}$			4.2		nC
Gate to Drain Charge	$Q_{GD}$			6.4		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)		40		ns
Rise Time	$t_R$			34		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			172		ns
Fall-Time	$t_F$			38		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				8	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				32	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=8\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time	$t_{RR}$	$V_{GS}=0\text{V}$ , $I_S=8\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$		270		ns
Reverse Recovery Charge	$Q_{RR}$			2.1		$\mu\text{C}$

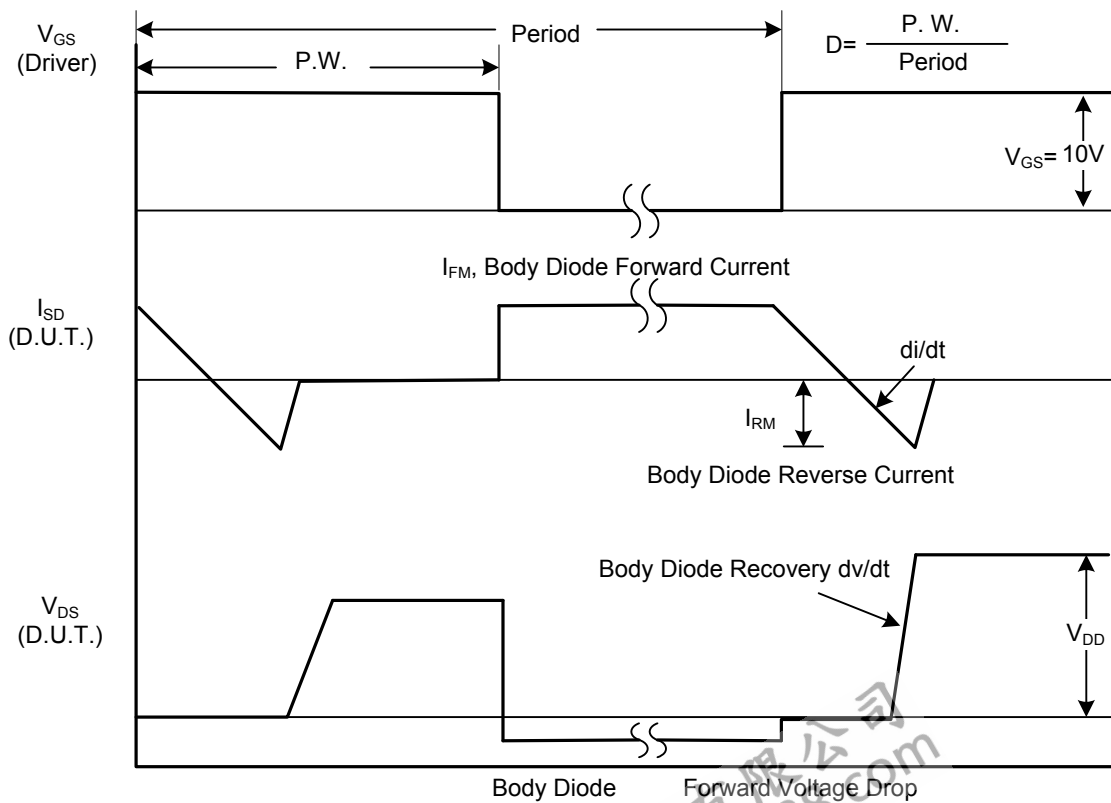
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

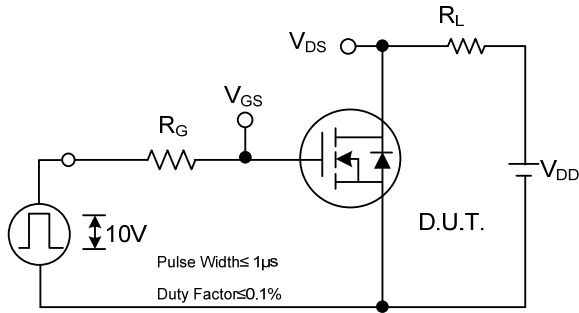


Peak Diode Recovery dv/dt Test Circuit

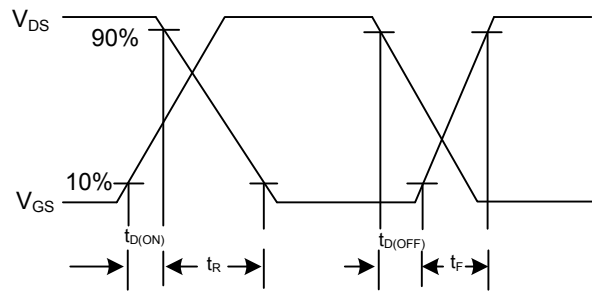


Peak Diode Recovery dv/dt Waveforms

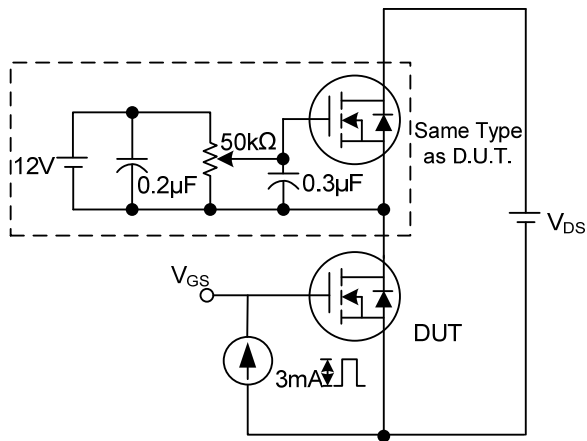
TEST CIRCUITS AND WAVEFORMS (Cont.)



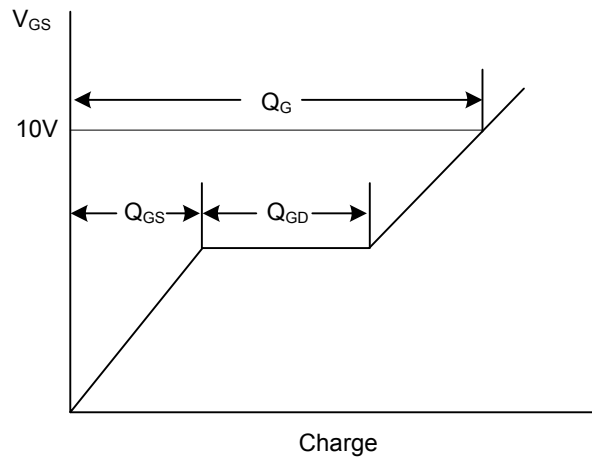
Switching Test Circuit



Switching Waveforms

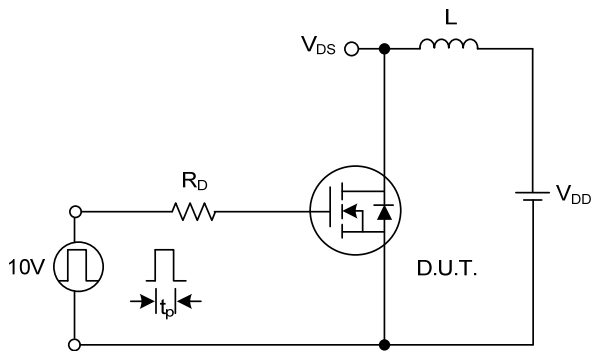


Gate Charge Test Circuit

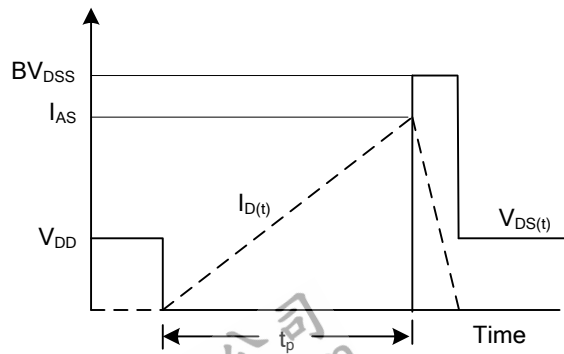


Charge

Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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