



2N40K-TA

Power MOSFET

2A, 400V N-CHANNEL POWER MOSFET

DESCRIPTION

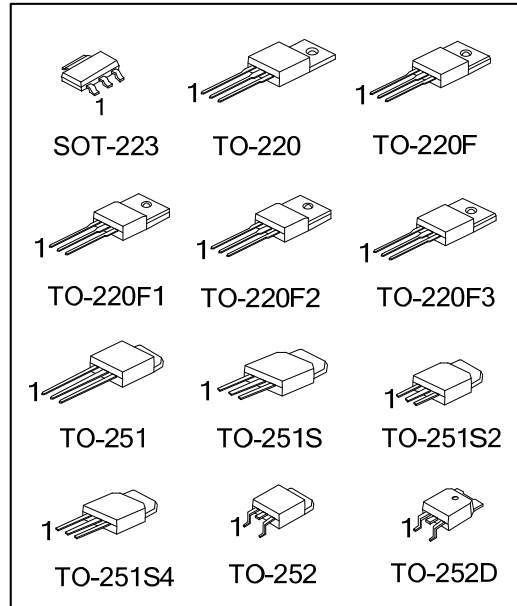
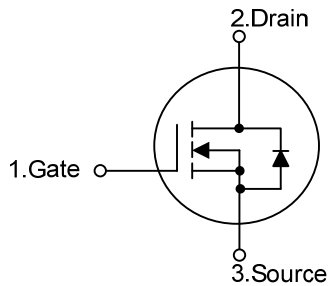
The UTC **2N40K-TA** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, stable off-state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

The UTC **2N40K-TA** is usually used in general purpose switching applications, motor control circuits and switched mode power supply.

FEATURES

- * High switching speed
- * $R_{DS(ON)} < 2.5\Omega @ V_{GS}=10V, I_D=1.25A$
- * 100% avalanche tested

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	2N40KG-AA3-R	SOT-223	G	D	S	Tape Reel
2N40KL-TA3-T	2N40KG-TA3-T	TO-220	G	D	S	Tube
2N40KL-TF3-T	2N40KG-TF3-T	TO-220F	G	D	S	Tube
2N40KL-TF1-T	2N40KG-TF1-T	TO-220F1	G	D	S	Tube
2N40KL-TF2-T	2N40KG-TF2-T	TO-220F2	G	D	S	Tube
2N40KL-TF3T-T	2N40KG-TF3T-T	TO-220F3	G	D	S	Tube
2N40KL-TM3-T	2N40KG-TM3-T	TO-251	G	D	S	Tube
2N40KL-TMS-T	2N40KG-TMS-T	TO-251S	G	D	S	Tube
2N40KL-TMS2-T	2N40KG-TMS2-T	TO-251S2	G	D	S	Tube
2N40KL-TMS4-T	2N40KG-TMS4-T	TO-251S4	G	D	S	Tube
2N40KL-TN3-R	2N40KG-TN3-R	TO-252	G	D	S	Tape Reel
2N40KL-TND-R	2N40KG-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>2N40KL-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF1: TO-220F2, TF3T: TO-220F3, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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MARKING

TO-220 TO-220F TO-220F1 TO-220F2 TO-220F3 TO-251	TO-251S TO-251S2 TO-251S4 TO-252 TO-252D	SOT-223
<p>UTC 2N40K</p> <p>Lot Code ← → Data Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p>	<p>2N40KG</p> <p>Lot Code ← → Data Code</p> <p>1</p>	

■ 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	A
	Pulsed	I_{DM}	7	A
Avalanche Current		I_{AR}	2.5	A
Single Pulsed Avalanche Energy		E_{AS}	85	mJ
Power Dissipation	SOT-223	P_D	1	W
	TO-220		54	W
	TO-220F/TO-220F1		23	W
	TO-220F3			
	TO-220F2		24	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		44	W
Linear Derating Factor		$\Delta P_D / \Delta T_A$	0.2	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. Pulse width limited by $T_{J(MAX)}$

3. $L = 42.5\text{mH}$, $I_{AS} = 2\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 2\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT		
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$		
	TO-220/TO-220F TO-220F1/ TO-220F2 TO-220F3		62.5	$^\circ\text{C}/\text{W}$		
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	$^\circ\text{C}/\text{W}$		
	Junction to Case		SOT-223	θ_{JC}	14	$^\circ\text{C}/\text{W}$
			TO-220		2.32	$^\circ\text{C}/\text{W}$
TO-220F/TO-220F1 TO-220F3		5.4	$^\circ\text{C}/\text{W}$			
TO-220F2		5.3	$^\circ\text{C}/\text{W}$			
TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.8	$^\circ\text{C}/\text{W}$			

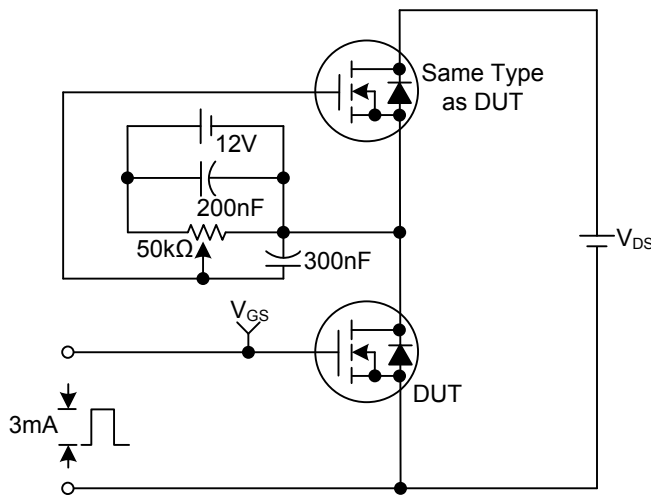
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

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
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	μA
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$		+10	+200	nA
	Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$		-10	-200	nA
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=1.25\text{A}$			2.5	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		218		pF
Output Capacitance	C_{OSS}			37		pF
Reverse Transfer Capacitance	C_{RSS}			5		pF
SWITCHING PARAMETERS						
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=30\text{V}$, $I_D=0.5\text{A}$, $R_G=25\Omega$ (Note 1, 2)		42		ns
Rise Time	t_R			32		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			57		ns
Fall-Time	t_F			23		ns
Total Gate Charge	Q_G	$V_{DS}=50\text{V}$, $I_D=1.3\text{A}$, $V_{GS}=10\text{V}$ (Note 1, 2)		11		nC
Gate-Source Charge	Q_{GS}			4.3		nC
Gate-Drain Charge	Q_{GD}			1.35		nC
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

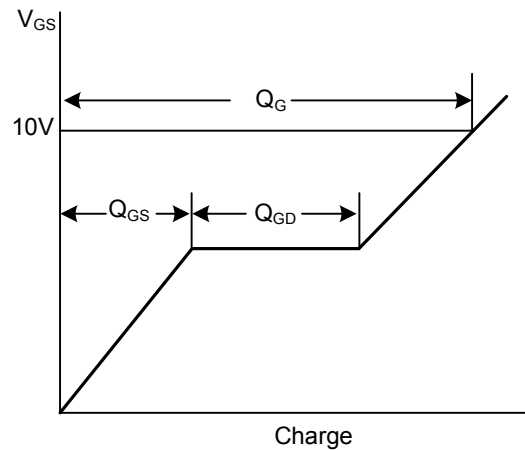
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
 2. Essentially independent of operating temperature

TEST CIRCUITS AND WAVEFORMS

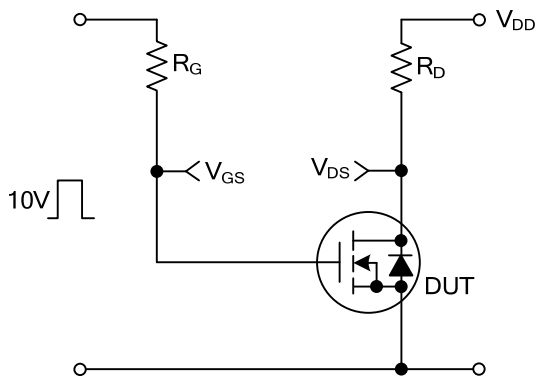
Gate Charge Test Circuit



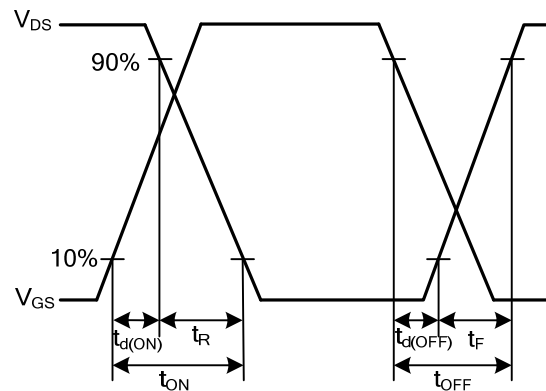
Gate Charge Waveforms



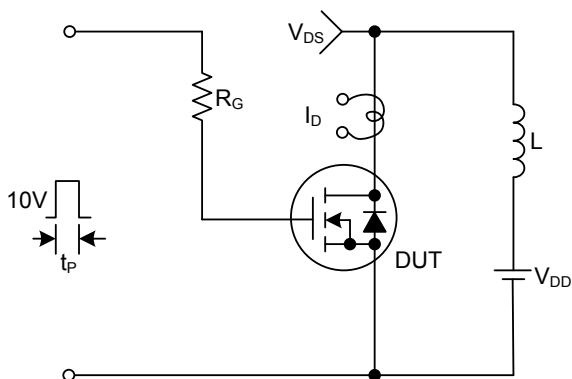
Resistive Switching Test Circuit



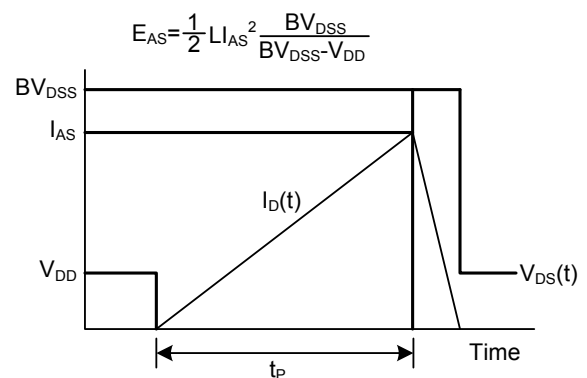
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

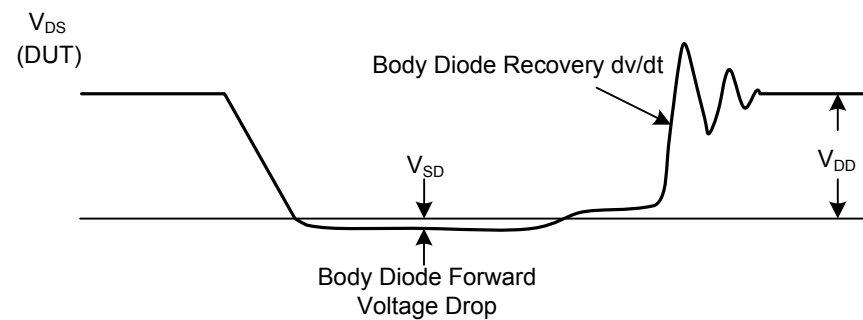
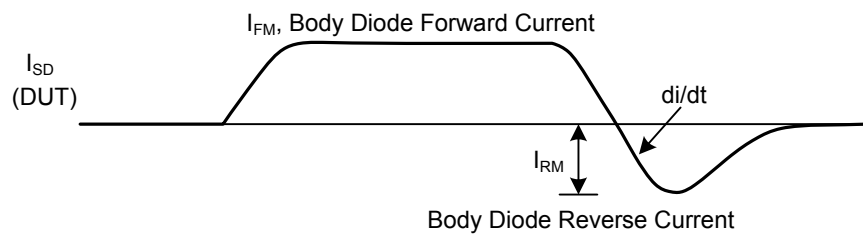
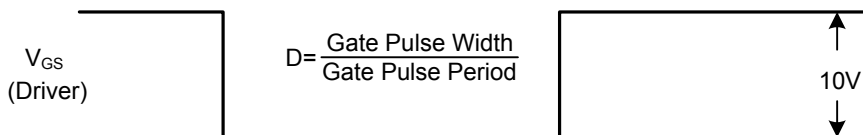
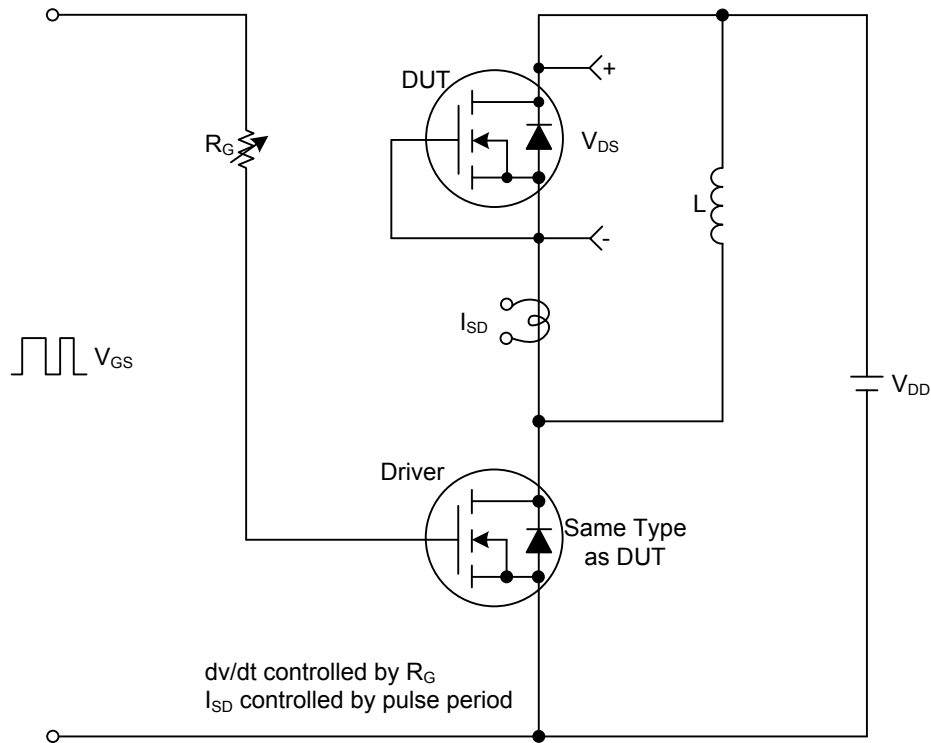


Unclamped Inductive Switching Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



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