



5N40K-MT

Power MOSFET

5A, 400V N-CHANNEL POWER MOSFET

DESCRIPTION

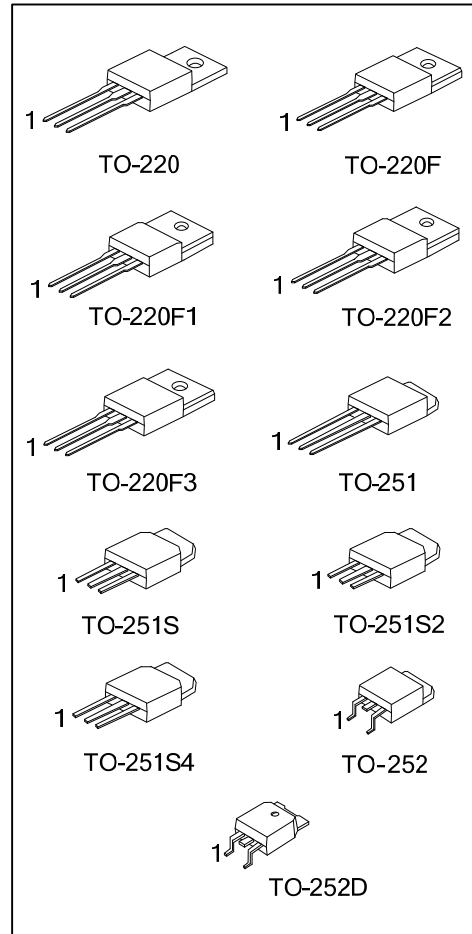
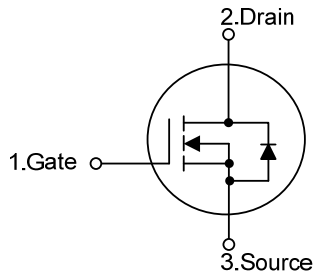
The UTC **5N40K-MT** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **5N40K-MT** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

FEATURES

- * $R_{DS(ON)} < 1.2\Omega @ V_{GS}=10V, I_D=2.5A$
- * High switching speed
- * 100% avalanche tested

SYMBOL



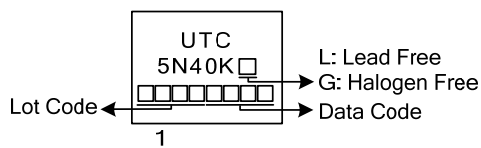
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N40KL-TA3-T	5N40KG-TA3-T	TO-220	G	D	S	Tube
5N40KL-TF3-T	5N40KG-TF3-T	TO-220F	G	D	S	Tube
5N40KL-TF1-T	5N40KG-TF1-T	TO-220F1	G	D	S	Tube
5N40KL-TF2-T	5N40KG-TF2-T	TO-220F2	G	D	S	Tube
5N40KL-TF3-T	5N40KG-TF3-T	TO-220F3	G	D	S	Tube
5N40KL-TM3-T	5N40KG-TM3-T	TO-251	G	D	S	Tube
5N40KL-TMS-T	5N40KG-TMS-T	TO-251S	G	D	S	Tube
5N40KL-TMS2-T	5N40KG-TMS2-T	TO-251S2	G	D	S	Tube
5N40KL-TMS4-T	5N40KG-TMS4-T	TO-251S4	G	D	S	Tube
5N40KL-TN3-R	5N40KG-TN3-R	TO-252	G	D	S	Tape Reel
5N40KL-TND-R	5N40KG-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>5N40KL-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, TF3: 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



■ 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 ($T_c=25^\circ\text{C}$)	I_D	5	A
	Pulsed (Note 2)	I_{DM}	20	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	210	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	69	W
	TO-220F/TO-220F1		38	W
	TO-220F3			
	TO-220F2		39	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		58	W
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. $L = 16.8\text{mH}$, $I_{AS} = 5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 5\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

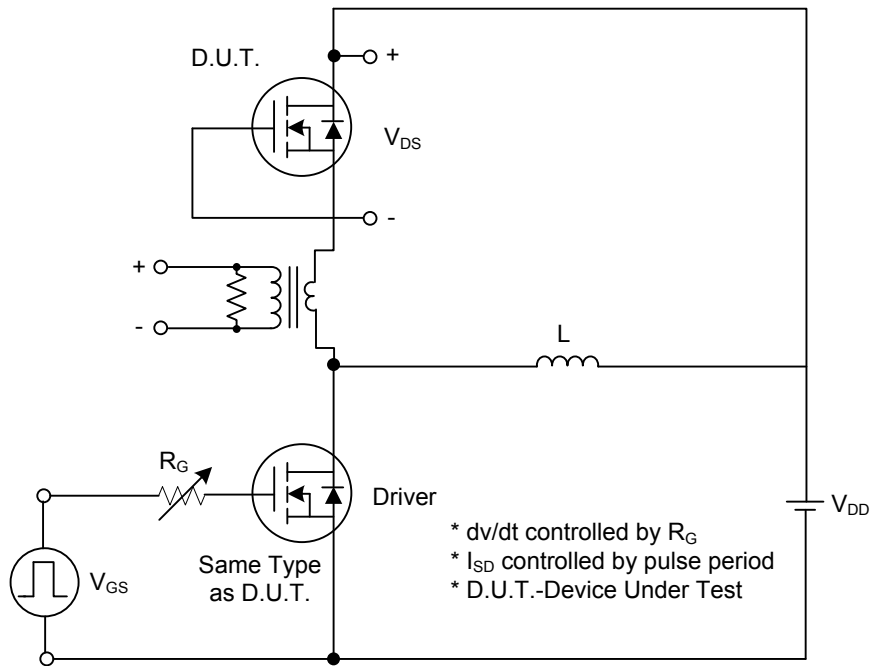
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	1.8	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F3		3.25	$^\circ\text{C}/\text{W}$
	TO-220F2		3.15	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.13	$^\circ\text{C}/\text{W}$

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

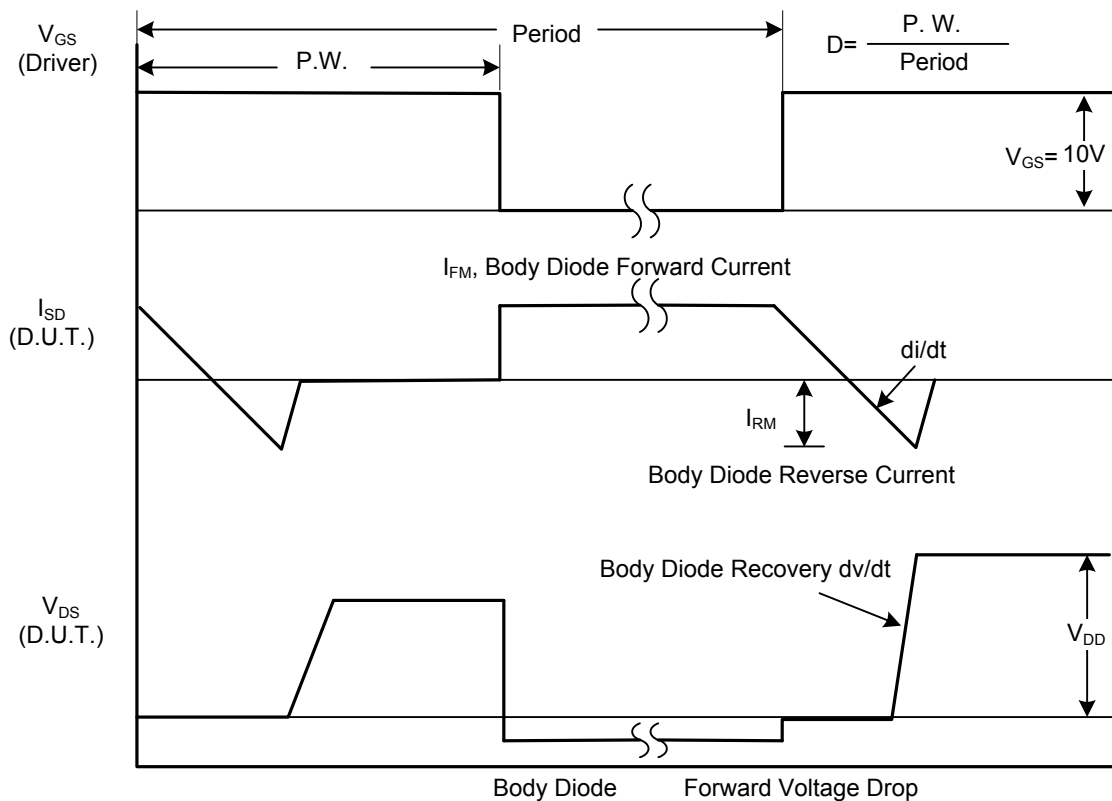
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	400			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C , $I_D=250\mu\text{A}$		0.4		$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$ $V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse				-100	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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=2.5\text{A}$		0.65	1.2	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		710	910	pF
Output Capacitance	C_{OSS}			88	118	pF
Reverse Transfer Capacitance	C_{RSS}			65	75	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)		48	60	ns
Rise Time	t_R			54	100	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			135	110	ns
Fall-Time	t_F			48	105	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)		22	26	nC
Gate to Source Charge	Q_{GS}			8		nC
Gate to Drain Charge	Q_{GD}			6		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				5	A
Maximum Body-Diode Pulsed Current	I_{SM}				20	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=5\text{A}$, $V_{GS}=0\text{V}$			1.4	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

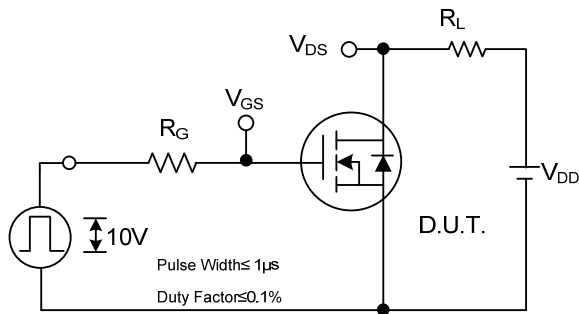


Peak Diode Recovery dv/dt Test Circuit

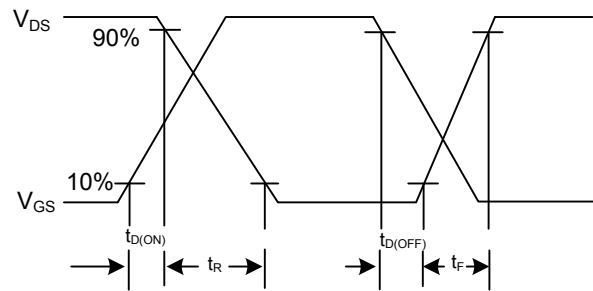


Peak Diode Recovery dv/dt Waveforms

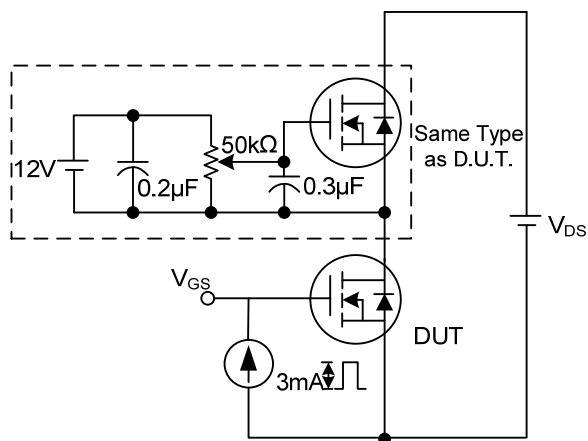
TEST CIRCUITS AND WAVEFORMS (Cont.)



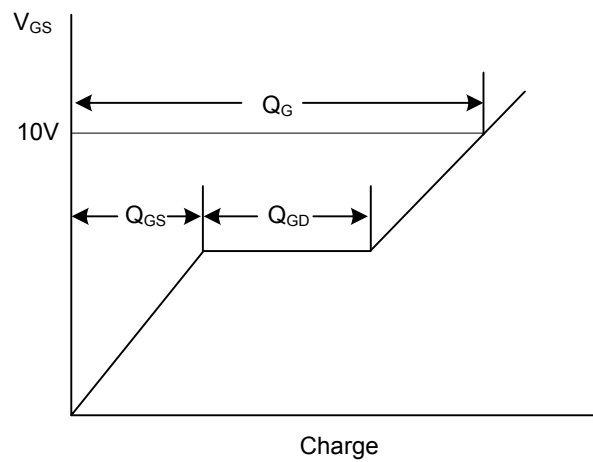
Switching Test Circuit



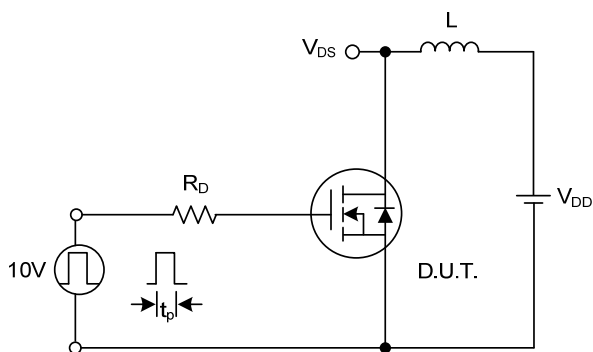
Switching Waveforms



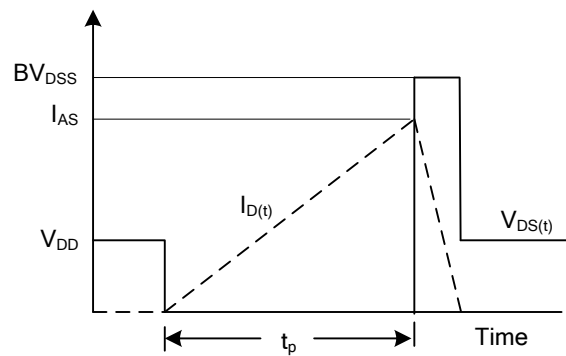
Gate Charge Test Circuit



Gate Charge Waveform

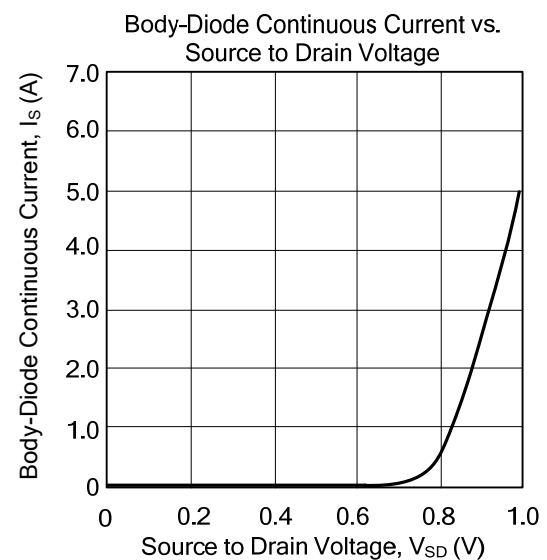
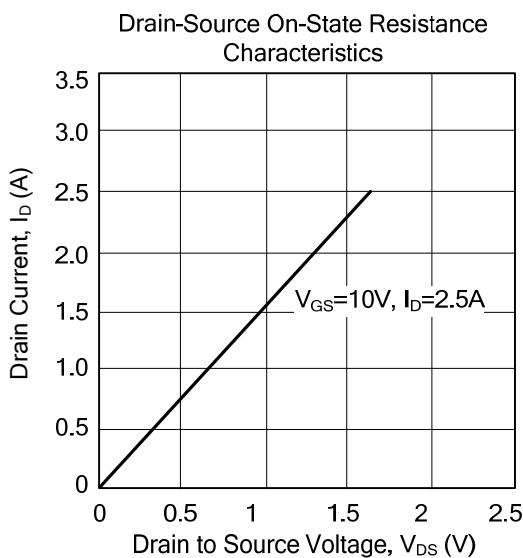
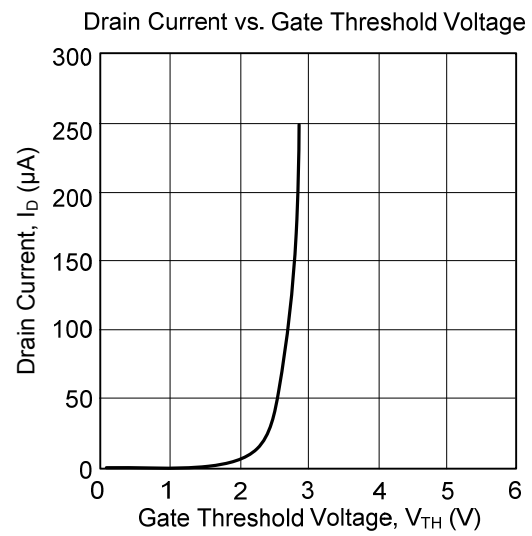
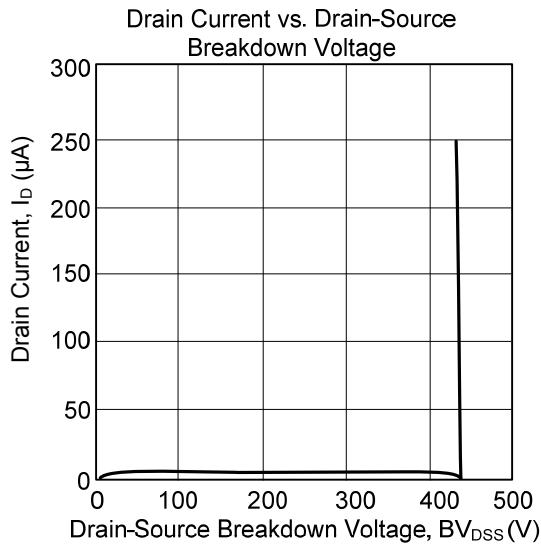


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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