



**14N40K-MT**

Preliminary

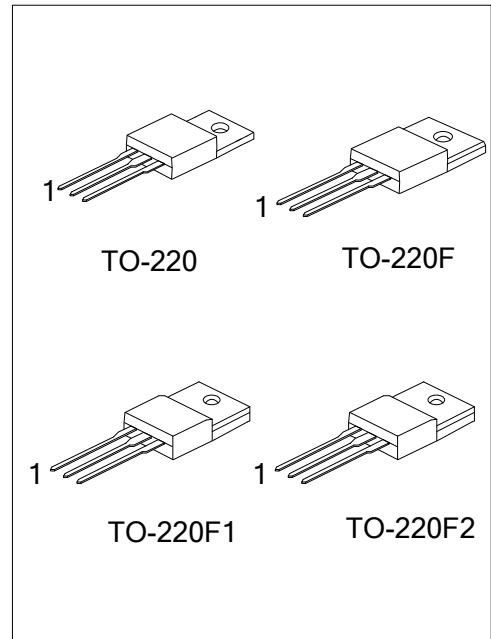
*Power MOSFET*

**14A, 400V N-CHANNEL  
POWER MOSFET**

■ DESCRIPTION

The UTC **14N40K-MT** is an N-Channel enhancement mode power MOSFET. The device adopts planar stripe and uses DMOS technology to minimize and provide lower on-state resistance and faster switching speed. It can also withstand high energy pulse under the avalanche and commutation mode conditions.

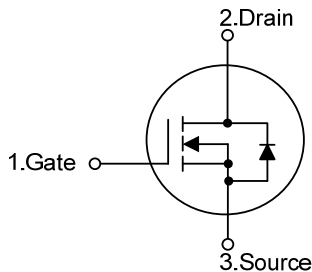
The UTC **14N40K-MT** is ideally suitable for high efficiency switch mode power supply, power factor correction and electronic lamp ballast based on half bridge topology.



■ FEATURES

- \*  $R_{DS(ON)} < 0.34\Omega @ V_{GS} = 10V, I_D = 7A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL



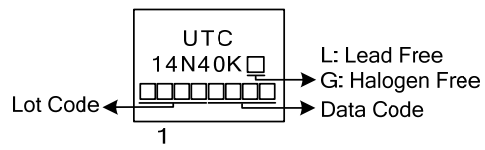
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
14N40KL-TA3-T	14N40KG-TA3-T	TO-220	G	D	S	Tube
14N40KL-TF3-T	14N40KG-TF3-T	TO-220F	G	D	S	Tube
14N40KL-TF1-T	14N40KG-TF1-T	TO-220F1	G	D	S	Tube
14N40KL-TF2-T	14N40KG-TF2-T	TO-220F2	G	D	S	Tube

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

<p>14N40KL-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2</p> <p>(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		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current		$I_D$	14	A
Pulsed Drain Current (Note 2)		$I_{DM}$	48	A
Avalanche Current (Note 2)		$I_{AR}$	14	A
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	535	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	TO-220	$P_D$	150	W
	TO-220F/TO-220F1		40	W
	TO-220F2			
Derate above $25^\circ\text{C}$	TO-220		1.2	$\text{W}/^\circ\text{C}$
	TO-220F/TO-220F1		0.32	$\text{W}/^\circ\text{C}$
	TO-220F2			
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.  $L = 5.46\text{mH}$ ,  $I_{AS} = 14\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 14\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	0.83	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.125	$^\circ\text{C}/\text{W}$
	TO-220F2			

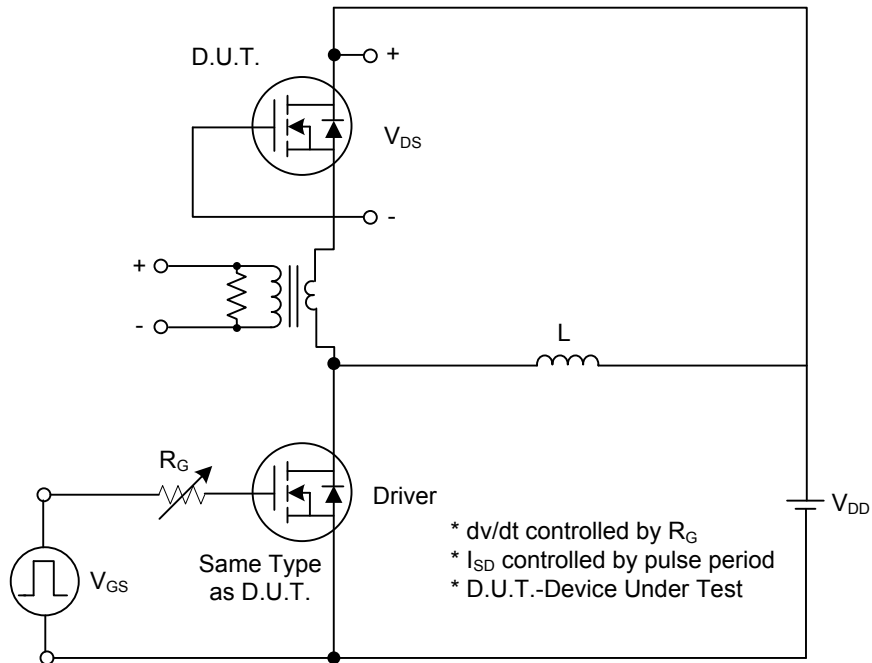
■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

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> = 1mA	400			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V			10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = 20V, V <sub>DS</sub> = 0V			100	nA
		V <sub>GS</sub> = -20V, V <sub>DS</sub> = 0V			-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250mA, Referenced to 25°C		0.5		V/°C
<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
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7A		0.26	0.34	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		810		pF
Output Capacitance	C <sub>OSS</sub>			190		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			10.5		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> = 50V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.3A, I <sub>D</sub> =100μA (Note 1, 2)		34.9		nC
Gate-Source Charge	Q <sub>GS</sub>			9.1		nC
Gate-Drain Charge	Q <sub>GD</sub>			8.8		nC
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.3A, R <sub>G</sub> = 25Ω (Note 1, 2)		66		nS
Turn-On Rise Time	t <sub>R</sub>			96		nS
Turn-Off Delay Time	t <sub>D(OFF)</sub>			200		nS
Turn-Off Fall Time	t <sub>F</sub>			112		nS
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 14A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				14	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				56	A

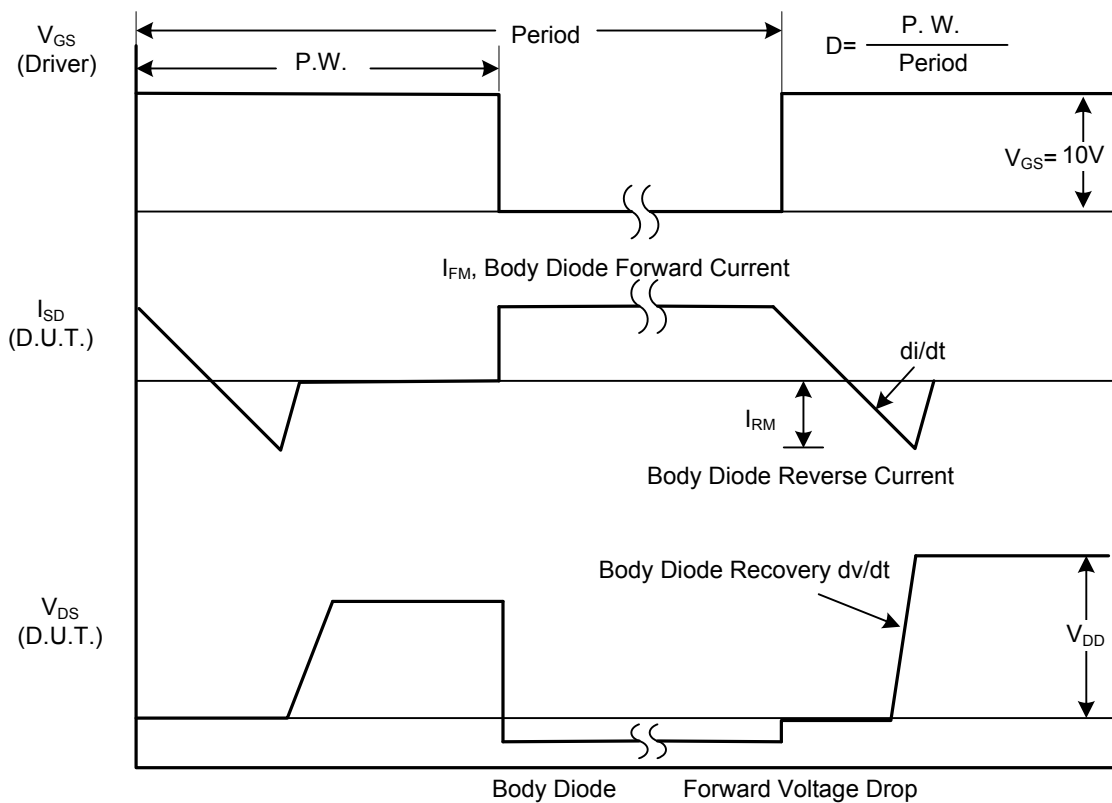
Notes: 1. Pulse Test : Pulse width≤300μs, Duty cycle≤2%.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

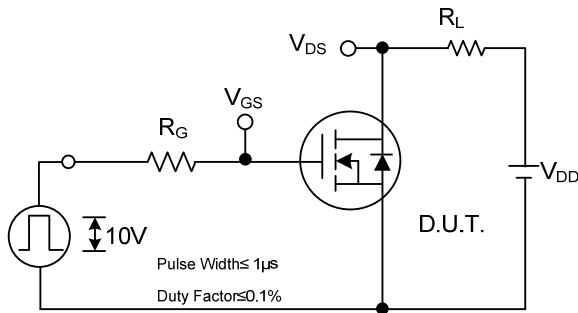


Peak Diode Recovery  $dv/dt$  Test Circuit

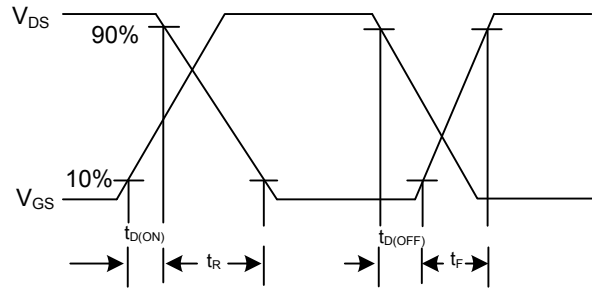


Peak Diode Recovery  $dv/dt$  Waveforms

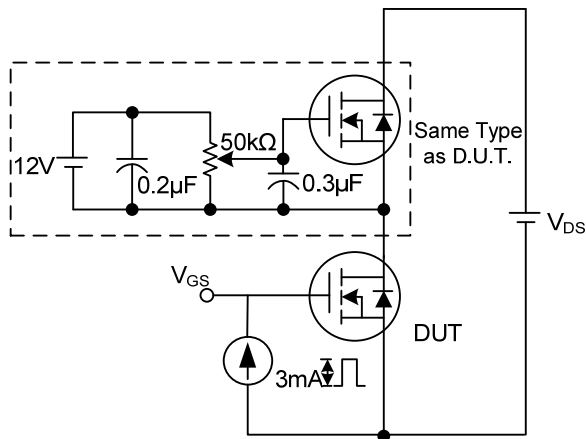
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



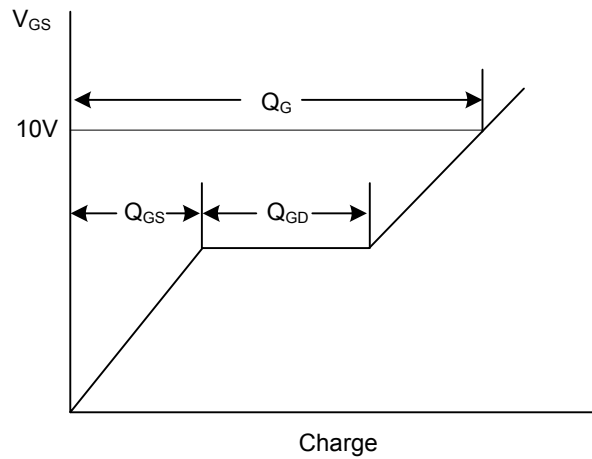
Switching Test Circuit



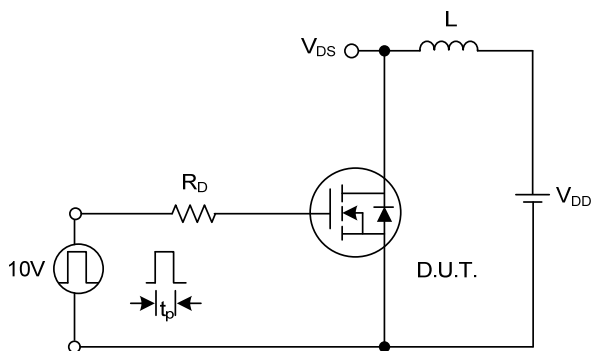
Switching Waveforms



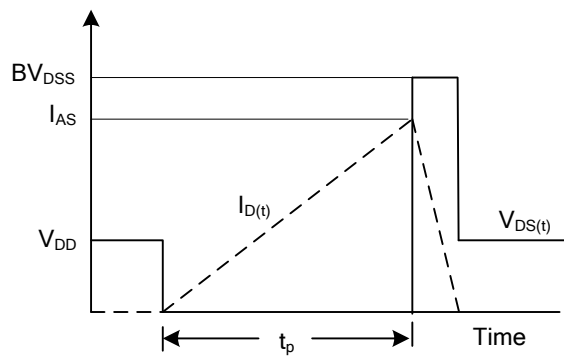
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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