

**13N40K-MT**

Preliminary

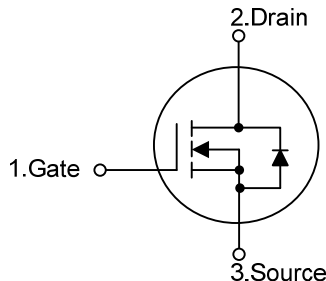
Power MOSFET**13A, 400V N-CHANNEL
POWER MOSFET****DESCRIPTION**

The UTC **13N40K-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 **13N40K-MT** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

FEATURES

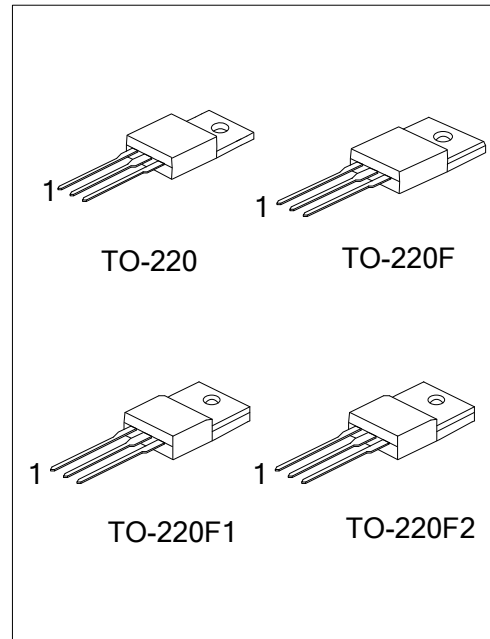
- * $R_{DS(ON)} < 0.35\Omega$ @ $V_{GS} = 10V$, $I_D = 6.5A$
- * High switching speed
- * 100% avalanche tested

SYMBOL**ORDERING INFORMATION**

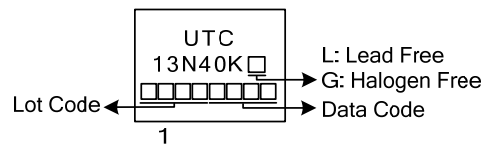
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13N40KL-TA3-T	13N40KG-TA3-T	TO-220	G	D	S	Tube
13N40KL-TF3-T	13N40KG-TF3-T	TO-220F	G	D	S	Tube
13N40KL-TF1-T	13N40KG-TF1-T	TO-220F1	G	D	S	Tube
13N40KL-TF2-T	13N40KG-TF2-T	TO-220F2	G	D	S	Tube

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

13N40KL-TA3-T	(1)Packing Type	(1) T: Tube
	(2)Package Type	(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2
	(3)Green Package	(3) L: Lead Free, G: Halogen Free and Lead Free



■ 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	13	A
	Pulsed (Note 2)	I_{DM}	52	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	507	mJ
Power Dissipation	TO-220	P_D	143	W
	TO-220F/TO-220F1		34	W
	TO-220F2			
Derate above 25°C	TO-220		1.14	$\text{W}/^{\circ}\text{C}$
	TO-220F/TO-220F1		0.272	$\text{W}/^{\circ}\text{C}$
	TO-220F2			
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature Range		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. $L = 6\text{mH}$, $I_{AS} = 13\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 13\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	0.87	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		3.58	$^{\circ}\text{C}/\text{W}$
	TO-220F2			

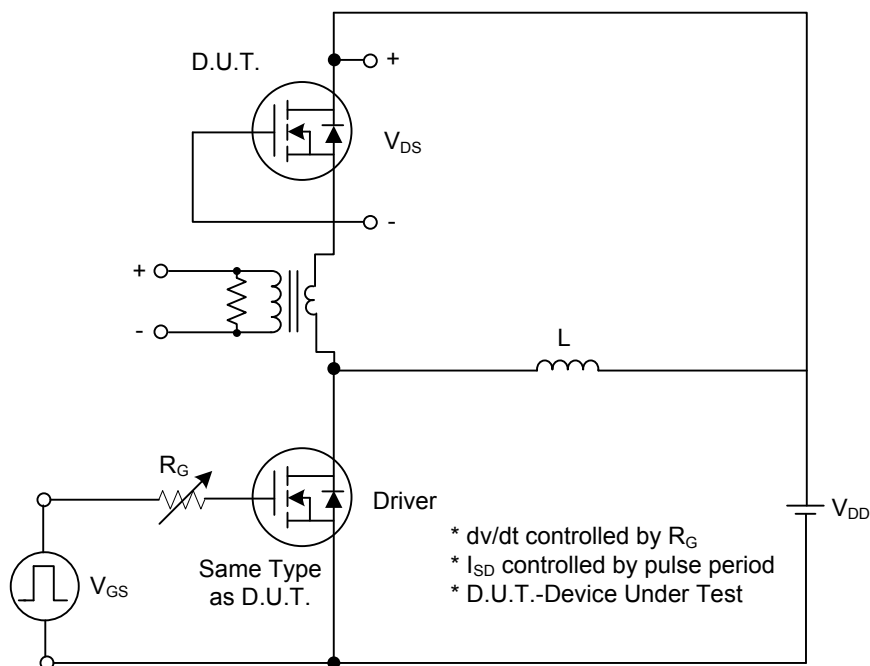
■ **ELECTRICAL CHARACTERISTICS** ($T_C=25^\circ\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	400			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =400V, V _{GS} =0V			1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =6.5A		0.29	0.35	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		775		pF
Output Capacitance		C _{OSS}			165		pF
Reverse Transfer Capacitance		C _{RSS}			11.5		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} = 50V, V _{GS} = 10V, I _D = 0.3A, I _D =100μA (Note 1, 2)		32	100	nC
Gate-Source Charge		Q _{GS}			9.4	12	nC
Gate-Drain Charge		Q _{GD}			8.3	55	nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} = 30V, V _{GS} = 10V, I _D = 0.3A, R _G = 25Ω (Note 1, 2)		64		ns
Rise Time		t _R			87		ns
Turn-OFF Delay Time		t _{D(OFF)}			160		ns
Fall-Time		t _F			89		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V _{SD}	I _S =13A, V _{GS} =0V			1.4	V
Maximum Body-Diode Continuous Current		I _S				13	A
Maximum Body-Diode Pulsed Current		I _{SM}				52	A

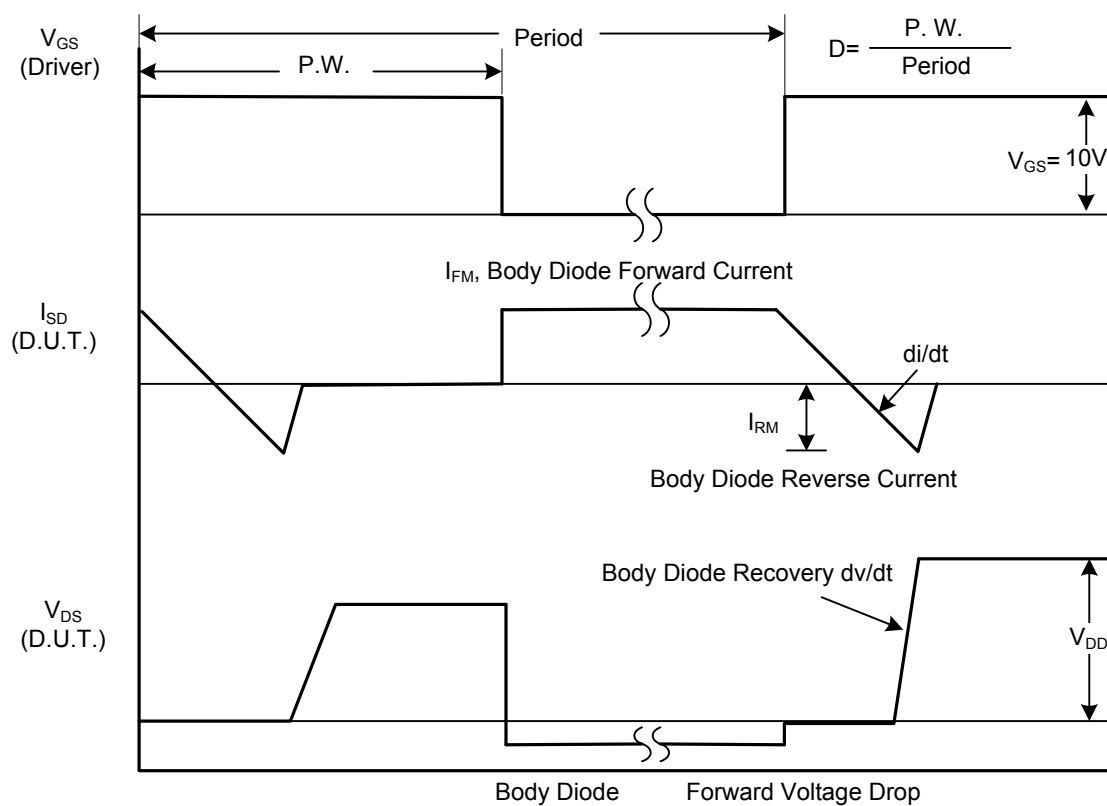
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

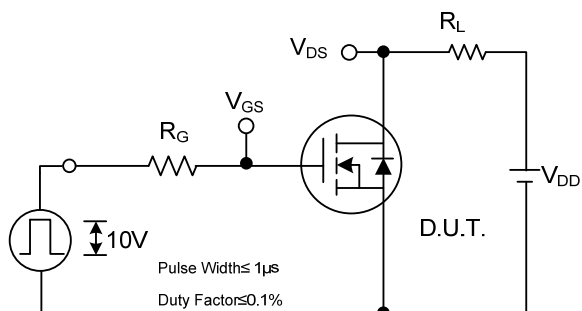


Peak Diode Recovery dv/dt Test Circuit

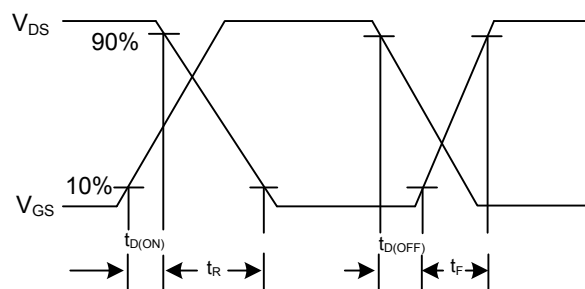


Peak Diode Recovery dv/dt Waveforms

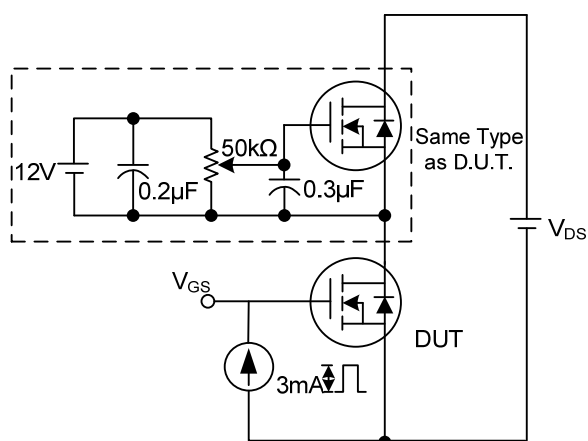
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



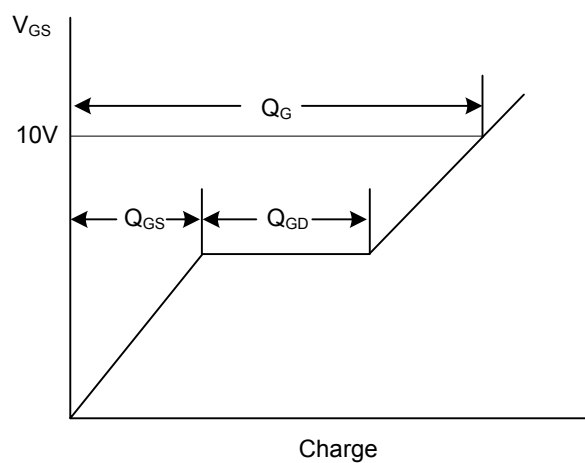
Switching Test Circuit



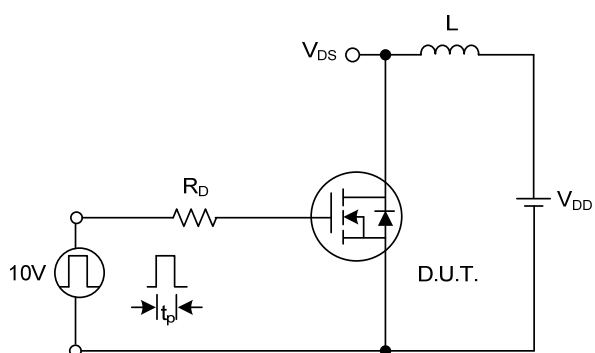
Switching Waveforms



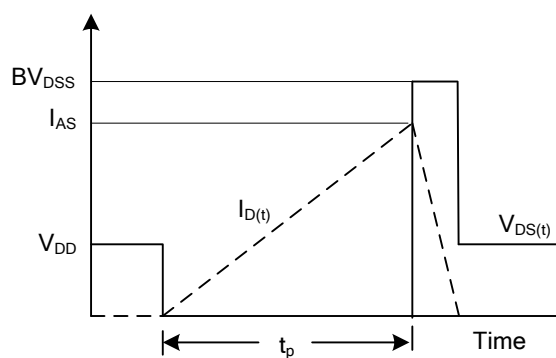
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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