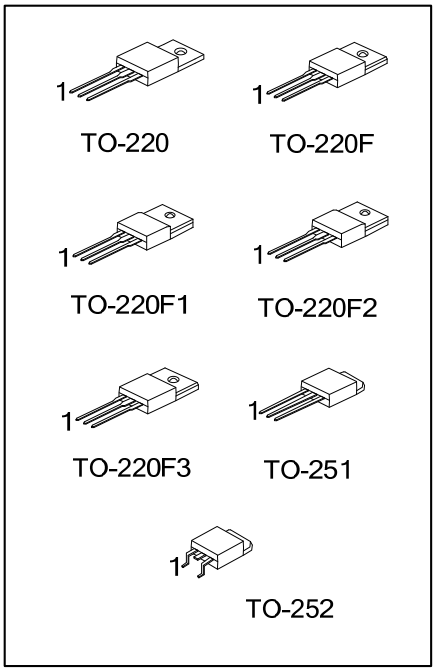
3A, 400V N-CHANNEL POWER MOSFET



■ DESCRIPTION

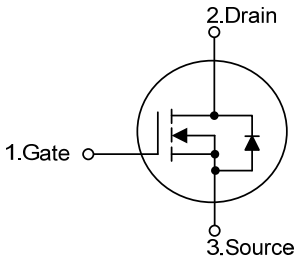
The UTC **3N40K-MT** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **3N40K-MT** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

■ FEATURES

* $R_{DS(ON)}$ < 2.0Ω @ V_{GS} = 10 V, I_D = 1.5 A
* High switching speed
* 100% avalanche tested

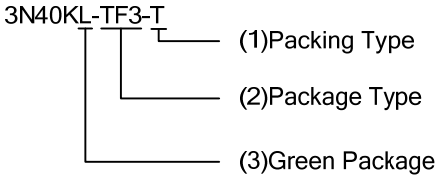
■ SYMBOL



■ ORDERING INFORMATION

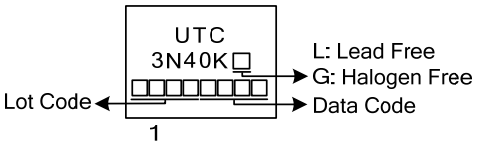
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N40KL-TA3-T	3N40KG-TA3-T	TO-220	G	D	S	Tube
3N40KL-TF3-T	3N40KG-TF3-T	TO-220F	G	D	S	Tube
3N40KL-TF1-T	3N40KG-TF1-T	TO-220F1	G	D	S	Tube
3N40KL-TF2-T	3N40KG-TF2-T	TO-220F2	G	D	S	Tube
3N40KL-TF3T-T	3N40KG-TF3T-T	TO-220F3	G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

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



(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF1: TO-220F2, TF3T: TO-220F3, TM3: TO-251, TN3: TO-252
(3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°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°C)	I_D	3	A
	Pulsed (Note 2)	I_{DM}	12	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	290	mJ
	Repetitive (Note 2)	E_{AR}	3	mJ
Power Dissipation	TO-220	P_D	54	W
	TO-220F/TO-220F1 TO-220F3		25	W
	TO-220F2		26	W
	TO-251/TO-252		50	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55~+150	°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=56mH, I_{AS}=3.0 A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤4.4A, di/dt ≤200A/μs, V_{DD}≤BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

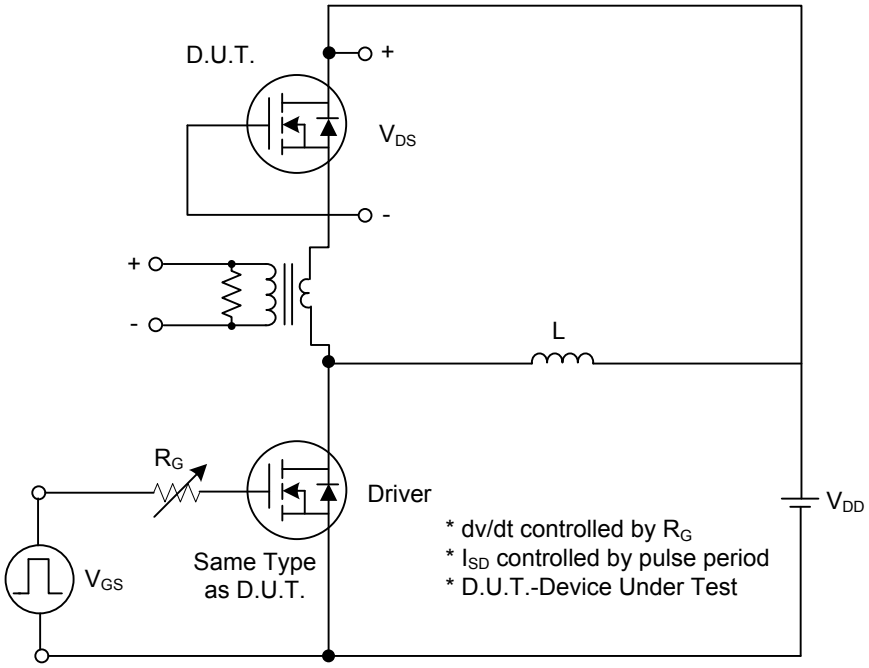
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	θ_{JA}	62.5	°C/W
	TO-251/TO-252		110	°C/W
Junction to Case	TO-220	θ_{JC}	2.28	°C/W
	TO-220F/TO-220F1 TO-220F3		4.9	°C/W
	TO-220F2		4.8	°C/W
	TO-251/TO-252		2.5	°C/W

■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

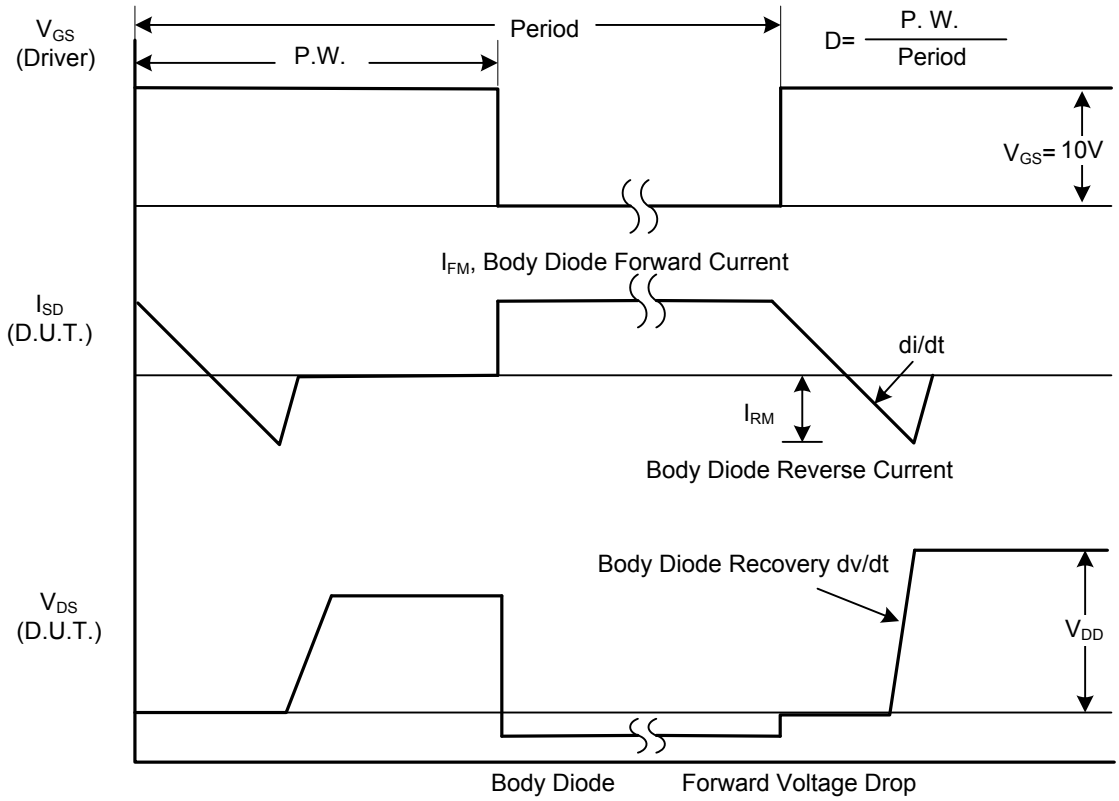
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	400			V
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	Reference to 25°C, I_D=250μA		0.38		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=400V, V_{GS}=0V			10	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	3.0		5.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=1.5A			2.0	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		248	350	pF
Output Capacitance		C_{OSS}			40	80	pF
Reverse Transfer Capacitance		C_{RSS}			5	9	pF
SWITCHING PARAMETERS							
Turn-ON Delay Time		$t_{D(ON)}$	V_{DS}=30V, I_D=0.5A, R_G=25Ω (Note 1, 2)		40		ns
Rise Time		t_R			48		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			48		ns
Fall-Time		t_F			27		ns
Total Gate Charge		Q_G	V_{GS}=10V, V_{DS}=50V, I_D=1.3A (Note 1, 2)		12.3	15	nC
Gate to Source Charge		Q_{GS}			4.48		nC
Gate to Drain Charge		Q_{GD}			2.2		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_{SD}				3.0	A
Maximum Body-Diode Pulsed Current		I_{SM}				12	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=3A, V_{GS}=0V			1.5	V

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

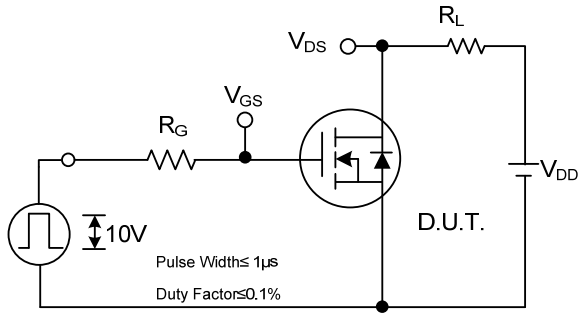


Peak Diode Recovery dv/dt Test Circuit

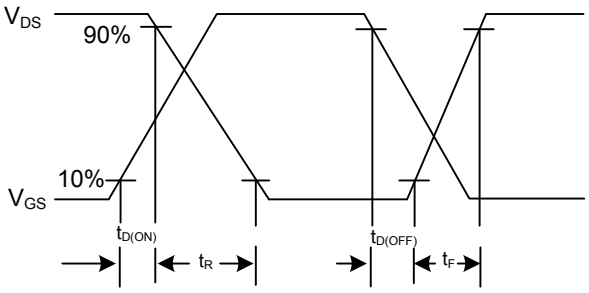


Peak Diode Recovery dv/dt Waveforms

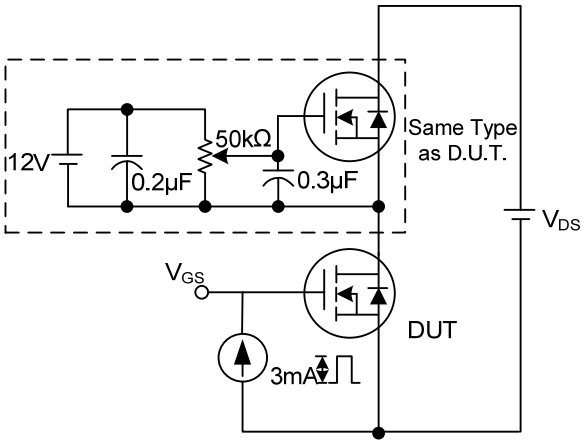
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



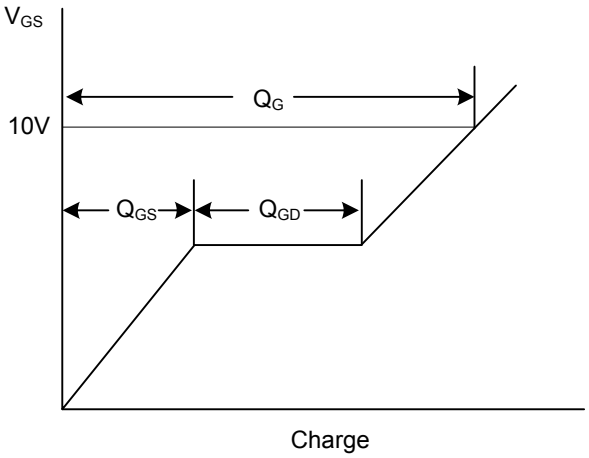
Switching Test Circuit



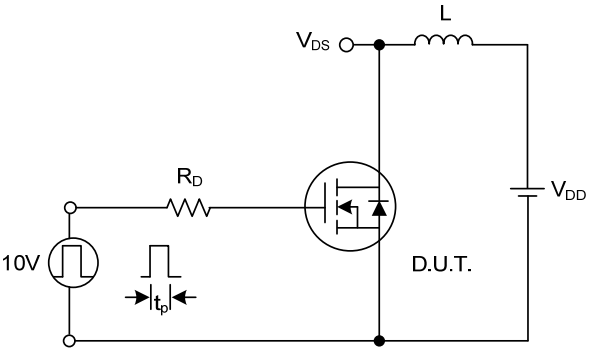
Switching Waveforms



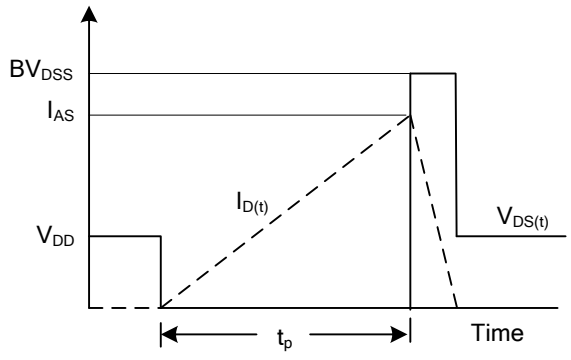
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms