



9N40

Preliminary

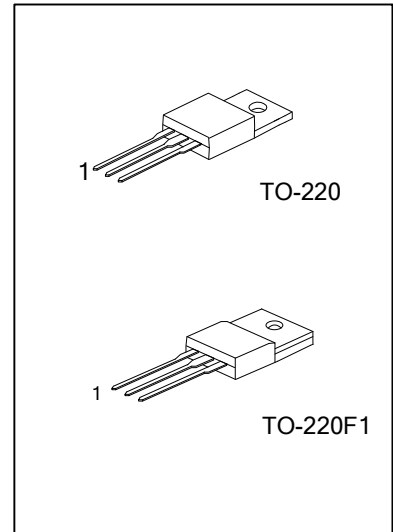
Power MOSFET

8.5 Amps, 400 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **9N40** 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.

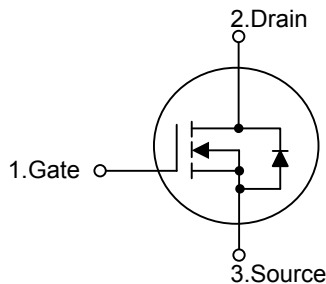
The UTC **9N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.



FEATURES

- * High switching speed
- * 8.5A, 400V, $R_{DS(ON)}=0.54\Omega$ @ $V_{GS}=10V$
- * 100% avalanche tested

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N40L-TA3-T	9N40G-TA3-T	TO-220	G	D	S	Tube
9N40L-TF1-T	9N40G-TF1-T	TO-220F1	G	D	S	Tube

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

9N40L-TA3-T	(1)Packing Type	(1) T: Tube
	(2)Package Type	(2) TA3: TO-220, TF1: TO-220F1
	(3)Lead Free	(3) G: Halogen Free, L: Lead Free

■ 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	8.5	A
	Pulsed (Note 2)	I_{DM}	34	A
Avalanche Current (Note 1)		I_{AR}	8.5	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	427	mJ
	Repetitive (Note 2)	E_{AR}	4.0	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	113	W
	TO-220F1		40	W
Derate above 25°C	TO-220		0.9	W/ $^\circ\text{C}$
	TO-220F1		0.32	W/ $^\circ\text{C}$
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55~+150	$^\circ\text{C}$

Note: 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. $L = 4.6\text{mH}$, $I_{AS} = 8.5\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 8.5\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1		62.5	
Junction to Case	TO-220	θ_{JC}	1.1	$^\circ\text{C}/\text{W}$
	TO-220F1		3.125	

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

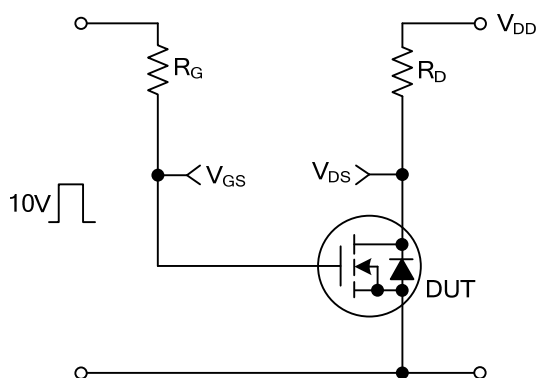
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	400			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =400V, V _{GS} =0V			1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+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 =5A			0.55	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		1340		pF
Output Capacitance		C _{OSS}			160		pF
Reverse Transfer Capacitance		C _{RSS}			490		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{GS} =10V, V _{DS} =320V, I _D =8.5A (Note 5, 6)		34		nC
Gate to Source Charge		Q _{GS}			18		nC
Gate to Drain Charge		Q _{GD}			16		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =200V, I _D =8.5A, R _G =25Ω (Note 5, 6)		22		ns
Rise Time		t _R			60		ns
Turn-OFF Delay Time		t _{D(OFF)}			32		ns
Fall-Time		t _F			140		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				8.5	A
Maximum Body-Diode Pulsed Current		I _{SM}				34	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =8.5A, V _{GS} =0V			1.7	V
Body Diode Reverse Recovery Time		t _{RR}	I _S =8.5A, V _{GS} =0V, dI _F /dt=100A/μs		350		ns
Body Diode Reverse Recovery Charge		Q _{RR}	(Note 5)		2.6		μC

Notes: 5. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%

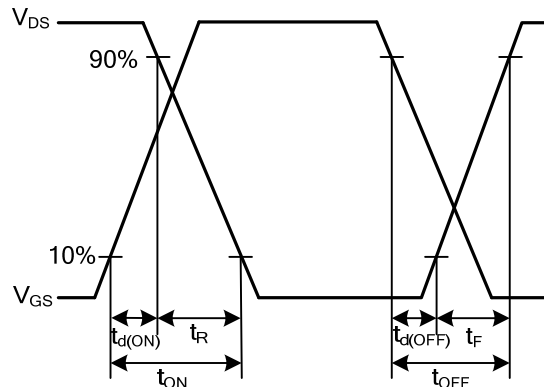
6. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

Resistive Switching Test Circuit



Resistive Switching Waveforms



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