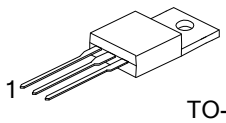
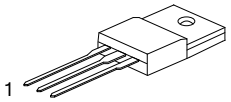
8.5 Amps, 400 Volts
N-CHANNEL POWER MOSFET



TO-220



TO-220F1

■ DESCRIPTION

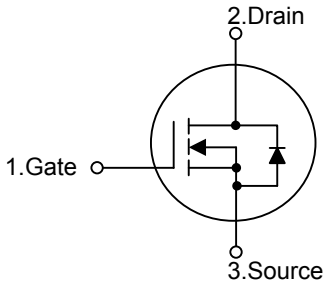
The UTC **9N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche 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, $R_{DS(ON)}$=0.54Ω @ V_{GS}=10V
* 100% avalanche tested

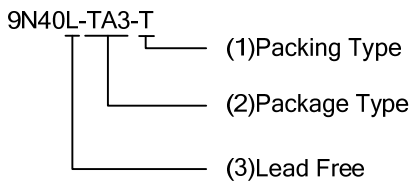
■ SYMBOL



■ 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



(1) T: Tube

(2) TA3: TO-220, TF1: TO-220F1

(3) G: Halogen Free, L: Lead Free

■ 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	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/°C
		TO-220F1		0.32	W/°C
Junction Temperature			T_J	+150	°C
Storage Temperature			T_{STG}	-55~+150	°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 = 4.6mH, I_{AS} = 8.5A, V_{DD} = 90V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 8.5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	°C/W
	TO-220F1		62.5	
Junction to Case	TO-220	θ_{JC}	1.1	°C/W
	TO-220F1		3.125	

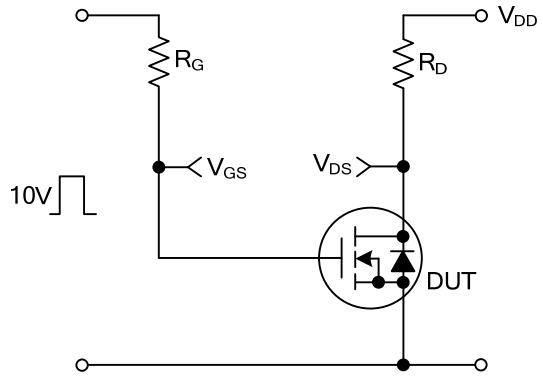
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise noted)

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 (Note 5)		350		ns
Body Diode Reverse Recovery Charge		Q_{RR}			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