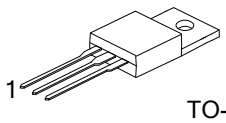
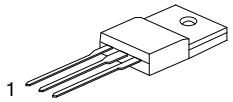
10.5 Amps, 400 Volts
N-CHANNEL POWER MOSFET



TO-220



TO-220F1

■ DESCRIPTION

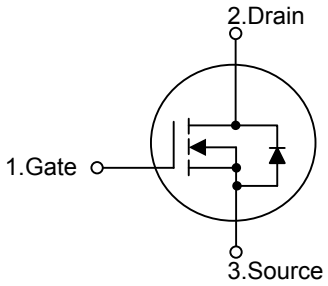
The UTC **10N40** is an N-channel mode power MOSFET using UTC' s advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **10N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

■ FEATURES

* High switching speed
* 10.5A, 400V, $R_{DS(ON)}$=0.53Ω @ V_{GS}=10V
* 100% avalanche tested

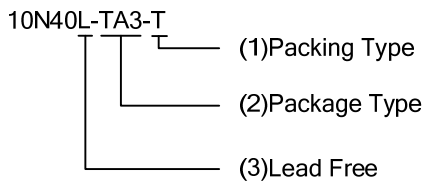
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10N40L-TA3-T	10N40G-TA3-T	TO-220	G	D	S	Tube
10N40L-TF1-T	10N40G-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	10.5	A
	Pulsed (Note 1)		I_{DM}	42	A
Avalanche Current (Note 1)			I_{AR}	11	A
Avalanche Energy	Single Pulsed (Note 2)		E_{AS}	360	mJ
	Repetitive (Note 1		E_{AR}	13.5	mJ
Peak Diode Recovery dv/dt (Note 3)			dv/dt	4.5	V/ns
Power Dissipation		TO-220	P_D	135	W
		TO-220F1		44	W
Derate above 25°C		TO-220		1.07	W/°C
		TO-220F1		0.35	W/°C
Junction Temperature			T_J	+150	°C
Storage Temperature Range			T_{STG}	-55~+150	°C

Note: 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.

■ 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}	0.93	°C/W
	TO-220F1		2.86	

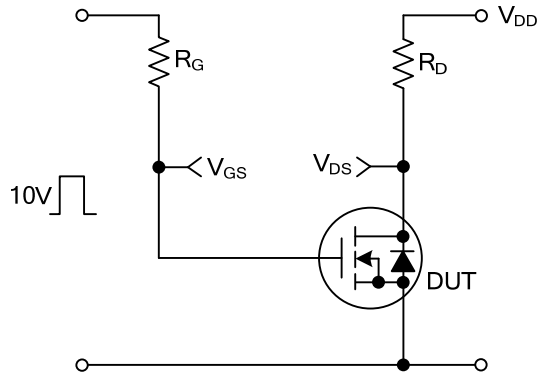
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	400			V
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	Reference to 25°C, I_D=250μA		0.54		V/°C
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=5.25A		0.43	0.53	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		840	1090	pF
Output Capacitance		C_{OSS}			250	325	pF
Reverse Transfer Capacitance		C_{RSS}			80	110	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{GS}=10V, V_{DS}=320V, I_D=10.5A (Note 4, 5)		28	35	nC
Gate to Source Charge		Q_{GS}			4		nC
Gate to Drain Charge		Q_{GD}			15		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=200V, I_D=10.5A, R_G=25Ω (Note 4, 5)		14	40	ns
Rise Time		t_R			89	190	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			81	170	ns
Fall-Time		t_F			81	170	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				10.5	A
Maximum Body-Diode Pulsed Current		I_{SM}				42	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=10.5A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{RR}	I_S=10.5A, V_{GS}=0V, dI_F/dt=100A/μs (Note 4)		290		ns
Body Diode Reverse Recovery Charge		Q_{RR}			2.4		μC

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 5.7mH, I_{AS} = 10.5A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 10.5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

Resistive Switching Test Circuit



Resistive Switching Waveforms