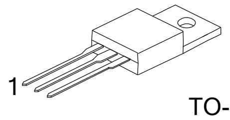
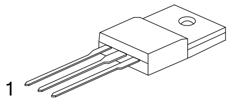
7A, 400V N-CHANNEL POWER MOSFET



TO-220



TO-220F1

■ DESCRIPTION

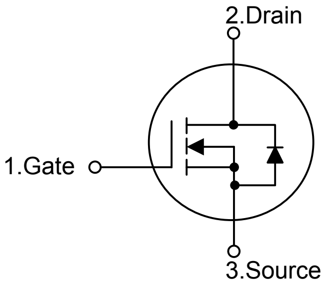
The UTC **7N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **7N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

■ FEATURES

* High switching speed
* $R_{DS(ON)}$=0.9Ω @ V_{GS}=10V
* 100% avalanche tested

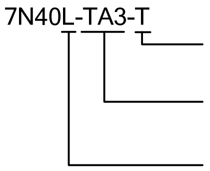
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N40L-TA3-T	7N40G-TA3-T	TO-220	G	D	S	Tube
7N40L-TF1-T	7N40G-TF1-T	TO-220F1	G	D	S	Tube

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



(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°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	7	A
	Pulsed (Note 2)	I_{DM}	28	A
Avalanche Current (Note 2)		I_{AR}	7.0	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	360	mJ
	Repetitive (Note 2)	E_{AR}	9.8	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	98	W
	TO-220F1		39	W
Derate above 25°C	TO-220		0.78	W/°C
	TO-220F1		0.315	W/°C
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 = 13mH, I_{AS} = 7A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C

4. $I_{SD} \leq$ 7A, di/dt ≤ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220	θ_{JC}	1.28	°C/W
	TO-220F1		3.2	

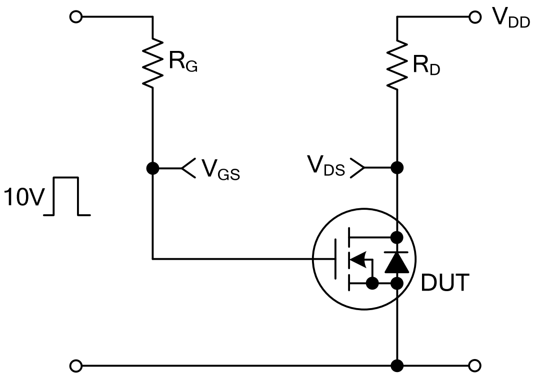
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

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		0.43		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=3.5A		0.75	0.9	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		600	780	pF
Output Capacitance		C_{OSS}			105	135	pF
Reverse Transfer Capacitance		C_{RSS}			13	17	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{GS}=10V, V_{DS}=320V, I_D=7A (Note 1, 2)		16.5	22	nC
Gate to Source Charge		Q_{GS}			4.5		nC
Gate to Drain Charge		Q_{GD}			8.5		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=200V, I_D=7A, R_G=25Ω (Note 1, 2)		20	50	ns
Rise Time		t_R			75	160	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			35	80	ns
Fall-Time		t_F			50	110	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				7	A
Maximum Body-Diode Pulsed Current		I_{SM}				28	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=7A, V_{GS}=0V			1.5	V
Body Diode Reverse Recovery Time		t_{rr}	I_S=7A, V_{GS}=0V, dI_F/dt=100A/μs (Note 1)		220		ns
Body Diode Reverse Recovery Charge		Q_{RR}			1.3		μC

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

■ TEST CIRCUITS AND WAVEFORMS

Resistive Switching Test Circuit



Resistive Switching Waveforms