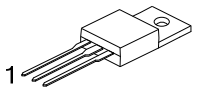
2A, 400V N-CHANNEL POWER MOSFET



TO-220

■ DESCRIPTION

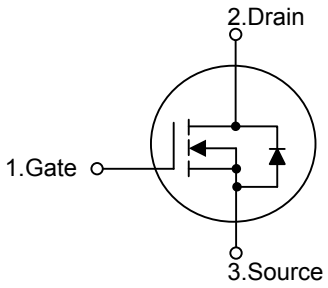
The UTC **2N40** is an N-channel mode power MOSFET using UTC' s advanced technology to provide customers with a minimum on-state resistance, stable off–state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

The UTC **2N40** is usually used in general purpose switching applications, motor control circuits and switched mode power supply.

■ FEATURES

* High switching speed
* $R_{DS(ON)}$=3.4Ω @ V_{GS}=10V
* 100% avalanche tested

■ SYMBOL



■ ORDERING INFORMATION

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

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

2N40L-TA3-T (1)Packing Type (2)Package Type (3)Lead Free	(1) T: Tube (2) TA3: TO-220 (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	I_D	2	A
	Pulsed	I_{DM}	7	A
Avalanche Current		I_{AR}	2.5	A
Single Pulsed Avalanche Energy		E_{AS}	100	mJ
Power Dissipation		P_D	25	W
Linear Derating Factor		$\triangle P_D/\triangle T_{mb}$	0.2	W/°C
Junction Temperature		T_J	150	°C
Storage Temperature		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

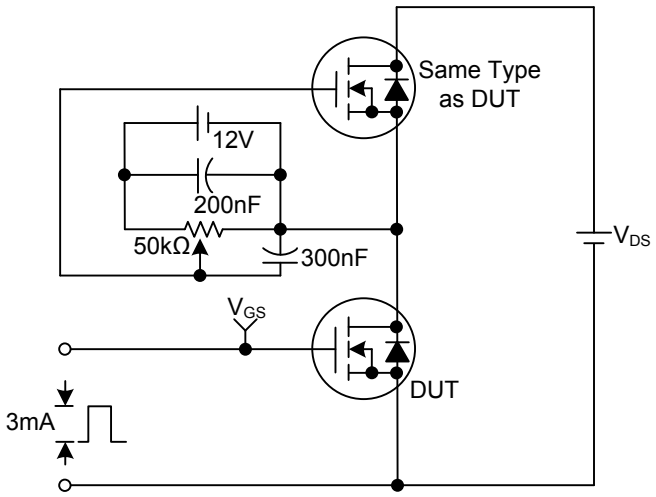
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	5	°C/W

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

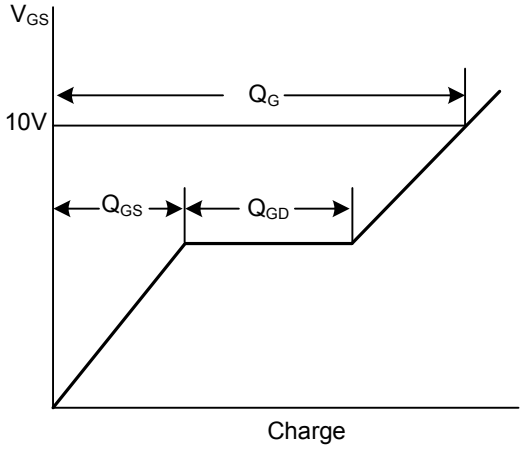
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	400			V
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	V_{DS}=V_{GS}, I_D=250μA		0.45		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=400V, V_{GS}=0V		1	25	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V		+10	+200	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V		-10	-200	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=1.25A		3.0	3.4	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		240		pF
Output Capacitance		C_{OSS}			44		pF
Reverse Transfer Capacitance		C_{RSS}			26		pF
SWITCHING PARAMETERS							
Total Gate Charge		$Q_{G(TOT)}$	V_{GS}=10V, V_{DS}=320V, I_D=2.5A		20	25	nC
Gate to Source Charge		Q_{GS}			2	3	nC
Gate to Drain Charge		Q_{GD}			8	12	nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=200V, I_D=2.5A, R_G=24Ω, R_D=78 Ω		10		ns
Rise Time		t_R			25		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			46		ns
Fall-Time		t_F			25		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S	T_C=25°C			2.5	A
Maximum Body-Diode Pulsed Current		I_{SM}				10	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=2.5A, V_{GS}=0V			1.2	V
Body Diode Reverse Recovery Time		t_{rr}	I_S=2.5A, V_{GS}=0V, dI/dt=100A/μs		200		ns
Body Diode Reverse Recovery Charge		Q_{RR}			2.0		μC

■ TEST CIRCUITS AND WAVEFORMS

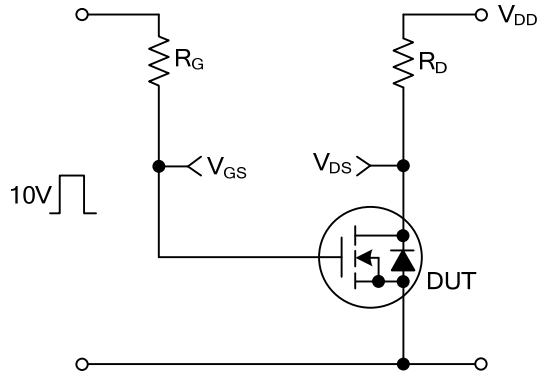
Gate Charge Test Circuit



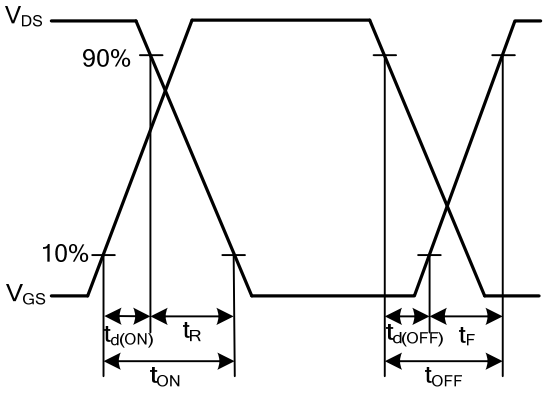
Gate Charge Waveforms



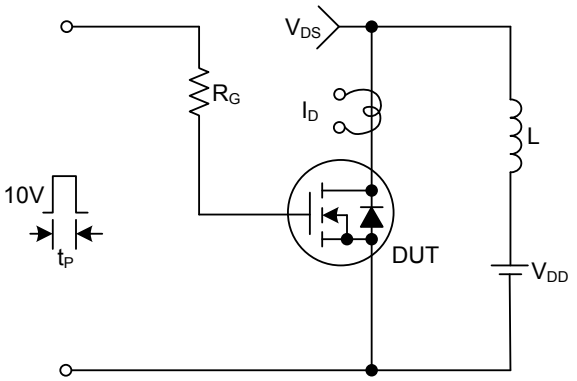
Resistive Switching Test Circuit



Resistive Switching Waveforms

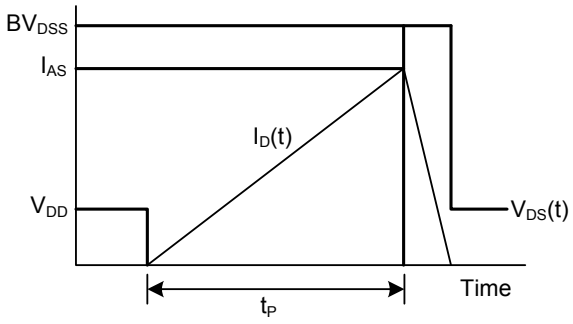


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms