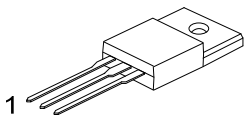
6 Amps, 400 Volts
N-CHANNEL POWER MOSFET



TO-220F

■ DESCRIPTION

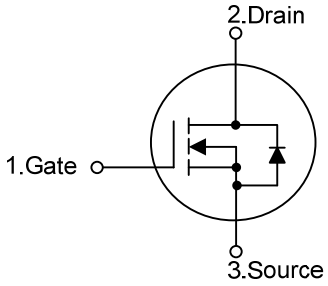
The UTC **6N40** is an N-Channel enhancement mode Power FET using UTC's perfect planar stripe, DMOS technology to provide customers with superior switching performance and minimum on-state resistance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **6N40** is generally used in applications , such as electronic lamp ballasts based on half bridge topology and high efficiency switched mode power supplies.

■ FEATURES

* 6A, 400V, $R_{DS(ON)}$=1.0Ω @ V_{GS}=10V
* Fast switching speed
* Improved dv/dt capability

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N40L-TF3-T	6N40G-TF3-T	TO-220F	G	D	S	Tube

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

6N40L - TF3 - T

(1) Packing Type
(2) Package Type
(3) Lead Free

(1) T: Tube
(2) TF3: TO-220F
(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
Avalanche Current (Note 1)		I_{AR}	6	A
Drain Current	Continuous	I_D	6 (Note 6)	A
	Pulsed (Note 1)	I_{DM}	24(Note 6)	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	270	mJ
	Repetitive (Note 1)	E_{AR}	7.3	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation		P_D	38	W
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}	3.31	°C/W

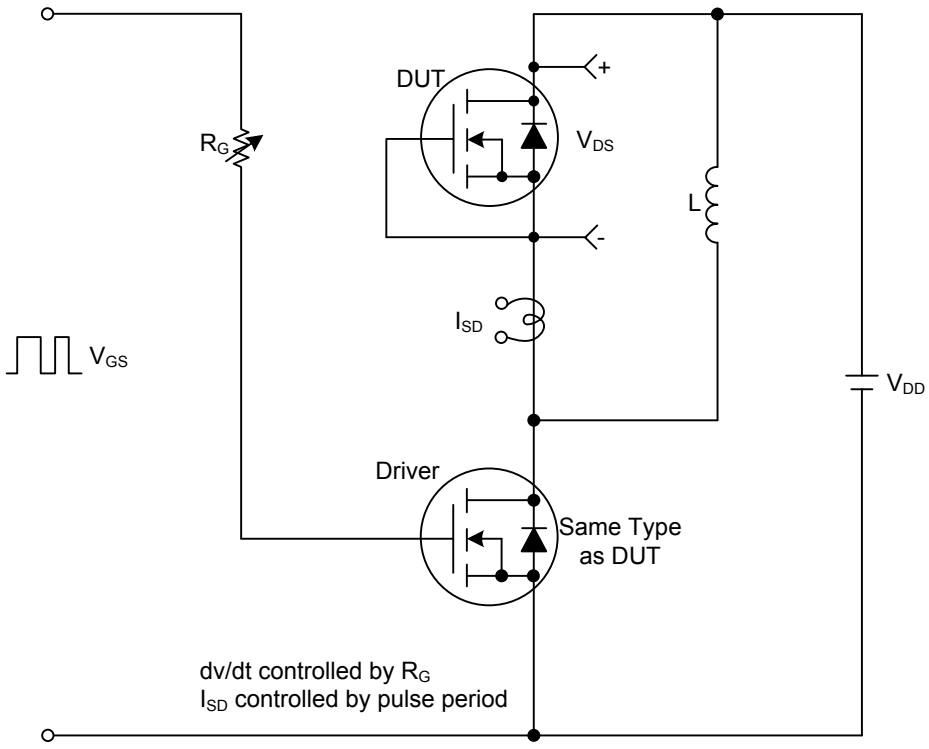
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

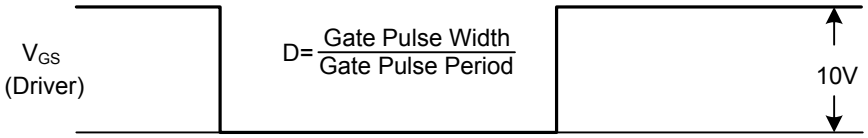
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	400			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, Referenced to 25°C		0.54		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=400V, V_{GS}=0V			1	μA
			V_{DS}=320V, T_J=125°C			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V ,V_{GS}=+30V			+100	nA
	Reverse		V_{DS}=0V ,V_{GS}=-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.0		4.0	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=3A		0.83	1	Ω
Forward Transconductance		g_{FS}	V_{DS}=40V, I_D=3A (Note 4)		4.7		S
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V,f=1.0MHz		480	625	pF
Output Capacitance		C_{OSS}			80	105	pF
Reverse Transfer Capacitance		C_{RSS}			15	20	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=320V, V_{GS}=10V, I_D=6A (Note 4,5)		16	20	nC
Gate-Source Charge		Q_{GS}			2.3		nC
Gate-Drain Charge		Q_{GD}			8.2		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=200V, I_D=6A, R_G=25Ω (Note 4,5)		13	35	ns
Turn-ON Rise Time		t_R			65	140	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			21	55	ns
Turn-OFF Fall Time		t_F			38	85	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				6	A
Maximum Body-Diode Pulsed Current		I_{SM}				24	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S =6A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{RR}	V_{GS}=0V, I_S=6A, dI_F/dt=100A/μs (Note 4)		230		ns
Body Diode Reverse Recovery Charge		Q_{RR}			1.7		μC

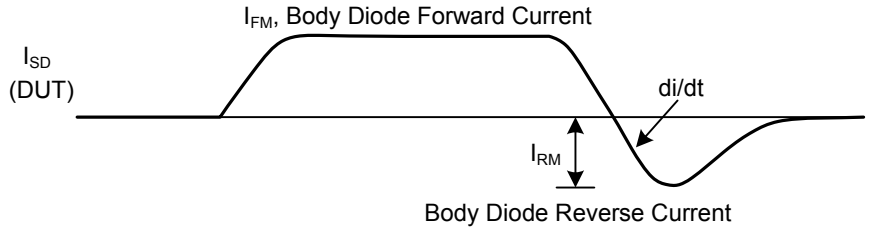
Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=13.7mH, I_{AS}=6A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C
3. I_{SD} ≤6A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature
6. Drain current limited by maximum junction temperature

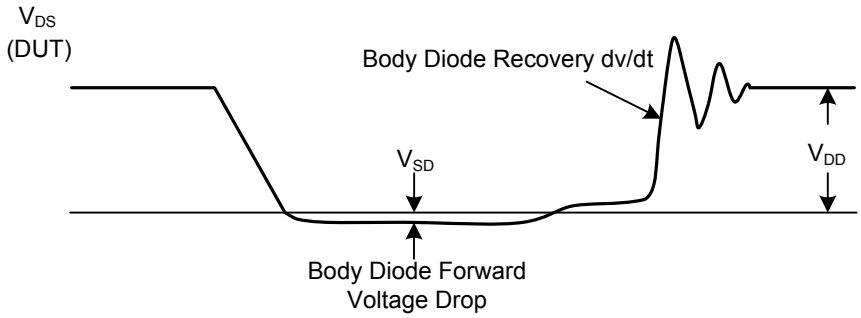
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test Circuit & Waveforms

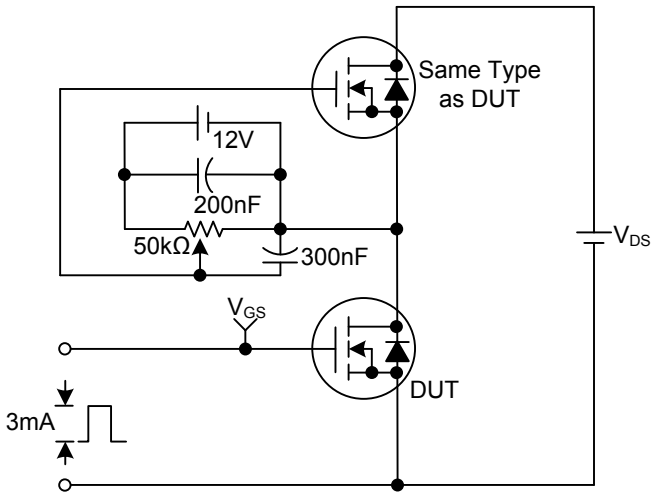




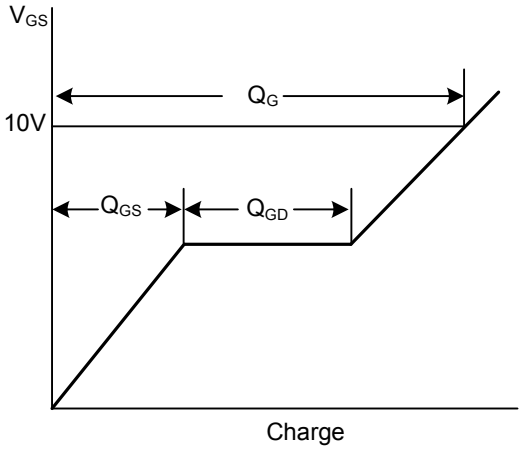




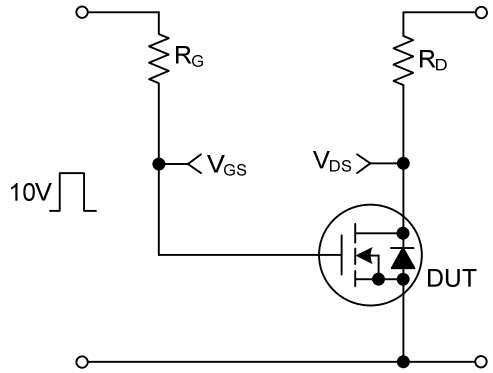
Gate Charge Test Circuit



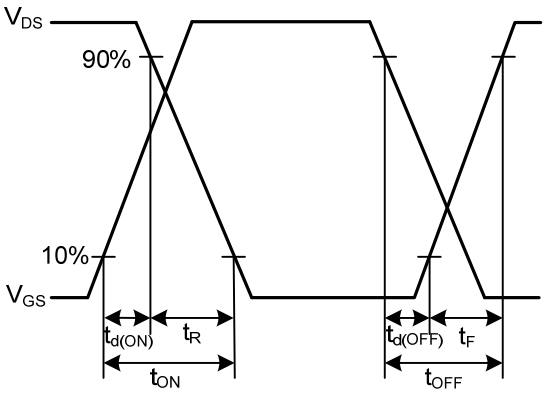
Gate Charge Waveforms



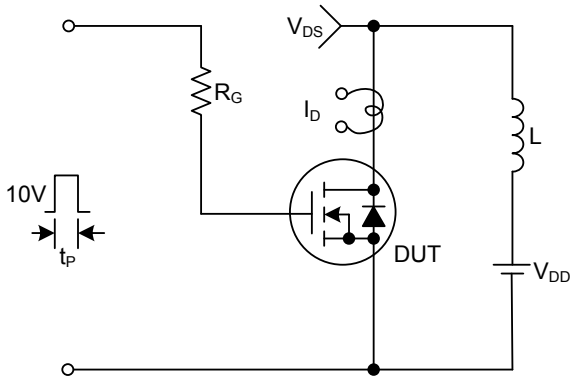
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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