

# UNISONIC TECHNOLOGIES CO., LTD

6N60-CQ **Preliminary** 

**Power MOSFET** 

# 6A, 600V N-CHANNEL **POWER MOSFET**

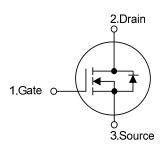
#### DESCRIPTION

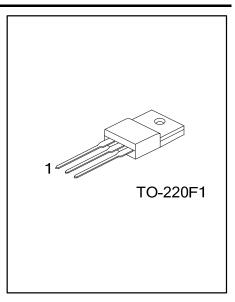
The UTC 6N60-CQ is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

#### **FEATURES**

- \*  $R_{DS(ON)}$  < 1.2  $\Omega$  @  $V_{GS}$  = 10 V,  $I_D$  = 3.0 A
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### **SYMBOL**

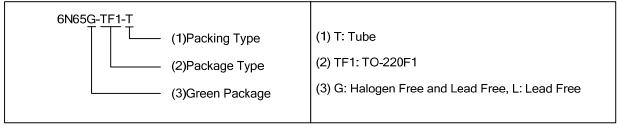




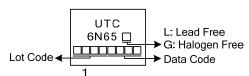
#### **ORDERING INFORMATION**

Ordering Number		Dooksons	Pin	Assignm	Doolsing		
Lead Free	Halogen Free	Package	1	2	3	Packing	
6N60L-TF1-T	6N60G-TF1-T	TO-220F1	G	D	S	Tube	

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



#### **MARKING**



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# ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT	
Drain-Source Voltage	$V_{DSS}$	600	V	
Gate-Source Voltage	$V_{GSS}$	±30	V	
Continuous Drain Current	I <sub>D</sub>	6	Α	
Pulsed Drain Current (Note 2)	I <sub>DM</sub>	24	Α	
Avalanche Energy Single Pulsed (Note 3)	E <sub>AS</sub>	216	mJ	
Peak Diode Recovery dv/dt (Note 4)	dv/dt	3	V/ns	
Power Dissipation	$P_{D}$	40	W	
Junction Temperature	$T_J$	+150	°C	
Storage Temperature	T <sub>STG</sub>	-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 = 12mH,  $I_{AS}$  = 6.0A,  $V_{DD}$  = 50V,  $R_{G}$  = 25  $\Omega$ , Starting  $T_{J}$  = 25°C
- 4.  $I_{SD} \le 6.0 \text{A}$ , di/dt  $\le 200 \text{A}/\mu \text{s}$ ,  $V_{DD} \le BV_{DSS}$ , Starting  $T_J = 25 ^{\circ}\text{C}$

## ■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT	
Junction to Ambient	$\theta_{JA}$	62.5	°C/W	
Junction to Case	$\theta_{ m JC}$	3.2	°C/W	

## ■ **ELECTRICAL CHARACTERISTICS** (T<sub>J</sub> =25°C, unless otherwise specified)

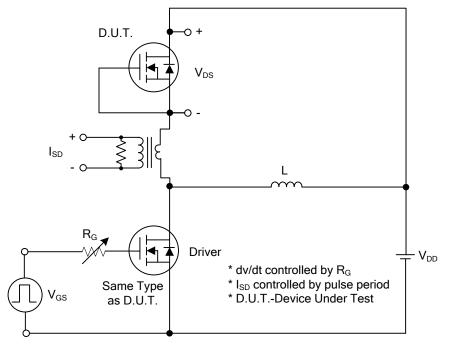
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	LINIT
OFF CHARACTERISTICS		OTWIDOL	TEGT CONDITIONS	101114		I IVI/ UX	01411
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Drain-Source Leakage Current		I <sub>DSS</sub>	$V_{DS} = 600V, V_{GS} = 0V$			10	μA
Gate- Source Leakage Current	Forward		$V_{GS} = 30V, V_{DS} = 0V$			100	nA
	Reverse	I <sub>GSS</sub>	$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
ON CHARACTERISTICS		· L	, 60 - 1 - 7 - 20 - 1	1			ı
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	$V_{GS} = 10V, I_D = 3.0A$			1.2	Ω
DYNAMIC CHARACTERISTICS		,				•	
Input Capacitance		C <sub>ISS</sub>			940		pF
Output Capacitance		Coss	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz		250		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			85		pF
SWITCHING CHARACTERISTIC	S						
Total Gate Charge (Note 1)		$Q_G$	\( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		97		nC
Gate-Source Charge		$Q_GS$	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =1.3A, I <sub>D</sub> =100μA (Note 1, 2)		8		nC
Gate-Drain Charge		$Q_GD$	1 <sub>D</sub> -100μA (Note 1, 2)		21		nC
Turn-On Delay Time (Note 1)		t <sub>D(ON)</sub>			54		ns
Turn-On Rise Time		$t_R$	$V_{DD}$ =30V, $V_{GS}$ =10V, $I_{D}$ =0.5A,		128		ns
Turn-Off Delay Time		t <sub>D(OFF)</sub>	R <sub>G</sub> =25Ω (Note 1, 2)		272		ns
Turn-Off Fall Time		$t_{F}$			178		ns
DRAIN-SOURCE DIODE CHARA	ACTERISTI	CS AND MA	XIMUM RATINGS				
Maximum Continuous Drain-Source Diode		Is				6	Α
Forward Current						0	А
Maximum Pulsed Drain-Source Diode		I <sub>SM</sub>				24	Α
Forward Current		ISM				4	^
Drain-Source Diode Forward Voltage		$V_{SD}$	I <sub>S</sub> =6.0A , V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time		t <sub>rr</sub>	I <sub>S</sub> =6.0A , V <sub>GS</sub> =0V		320		ns
Body Diode Reverse Recovery Charge		$Q_{rr}$	di/dt=100A/µs		2.27		μC

Notes: 1. Pulse Test: Pulse width ≤ 300µs, Duty cycle ≤ 2%

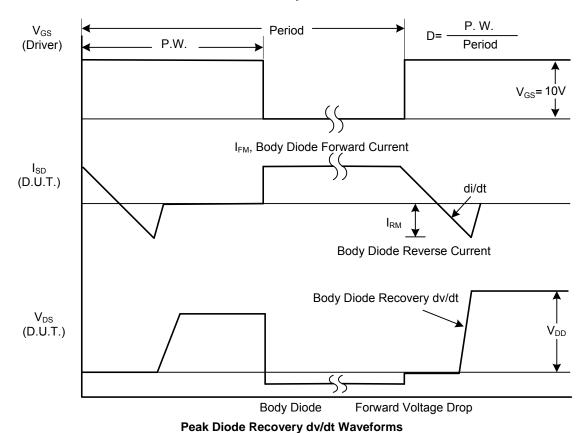
2. Essentially independent of operating temperature



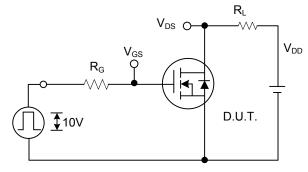
#### **■ TEST CIRCUITS AND WAVEFORMS**



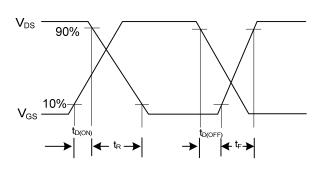
Peak Diode Recovery dv/dt Test Circuit



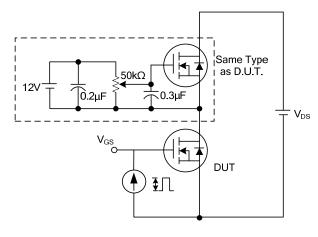
# ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



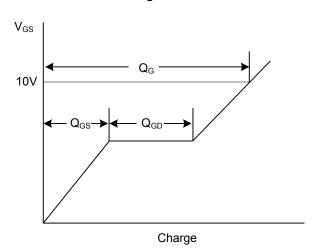
**Switching Test Circuit** 



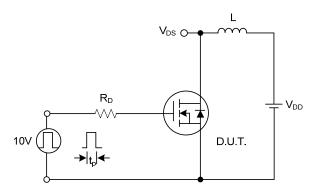
**Switching Waveforms** 



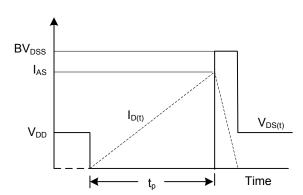
**Gate Charge Test Circuit** 



**Gate Charge Waveform** 



**Unclamped Inductive Switching Test Circuit** 



**Unclamped Inductive Switching Waveforms** 

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