



## 6N60Z

Preliminary

Power MOSFET

### 6.2A, 600V N-CHANNEL POWER MOSFET

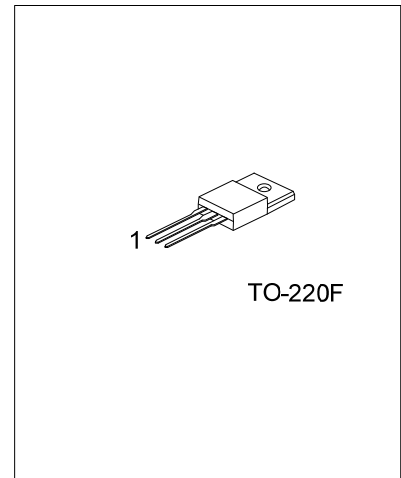
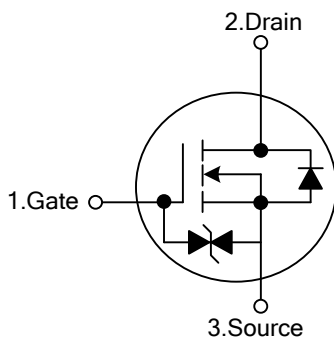
#### DESCRIPTION

The UTC **6N60Z** is a high voltage power MOSFET and is 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 at high speed switching applications in switching power supplies and adaptors.

#### FEATURES

- \*  $R_{DS(ON)} = 1.5\Omega$  @  $V_{GS} = 10V$
- \* Ultra low gate charge (typical 20 nC )
- \* Low reverse transfer Capacitance (  $C_{RSS}$  = typical 10pF )
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL



#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N60ZL-TF3-T	6N60ZG-TF3-T	TO-220F	G	D	S	Tube

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

<p>6N60ZL-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>		<p>(1) T: Tube (2) TF3: TO-220F (3) G: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	600	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)	$I_{AR}$	6.2	A
Continuous Drain Current	$I_D$	6.2	A
Pulsed Drain Current (Note 2)	$I_{DM}$	24.8	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	440
	Repetitive (Note 2)	$E_{AR}$	13
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	ns
Power Dissipation	$P_D$	40	W
Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operating Temperature	$T_{OPR}$	-55 ~ +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

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  $T_J$

3.  $L = 14\text{mH}$ ,  $I_{AS} = 6\text{A}$ ,  $V_{DD} = 90\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 6.2\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

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

■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	600			V
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V			10	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> = 20V, V <sub>DS</sub> = 0V			5	μA
	Reverse		V <sub>GS</sub> = -20V, V <sub>DS</sub> = 0V			-5	μA
Breakdown Voltage Temperature Coefficient		ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.53		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.1A		1.0	1.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz		770	1000	pF
Output Capacitance		C <sub>OSS</sub>			95	120	pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			10	13	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		t <sub>D(ON)</sub>	V <sub>DD</sub> =300V, I <sub>D</sub> =6.2A, R <sub>G</sub> =25Ω (Note 1, 2)		20	50	ns
Turn-On Rise Time		t <sub>R</sub>			70	150	ns
Turn-Off Delay Time		t <sub>D(OFF)</sub>			40	90	ns
Turn-Off Fall Time		t <sub>F</sub>			45	100	ns
Total Gate Charge		Q <sub>G</sub>	V <sub>DS</sub> =480V, I <sub>D</sub> =6.2A, V <sub>GS</sub> =10 V (Note 1, 2)		20	25	nC
Gate-Source Charge		Q <sub>GS</sub>			4.9		nC
Gate-Drain Charge		Q <sub>GD</sub>			9.4		nC

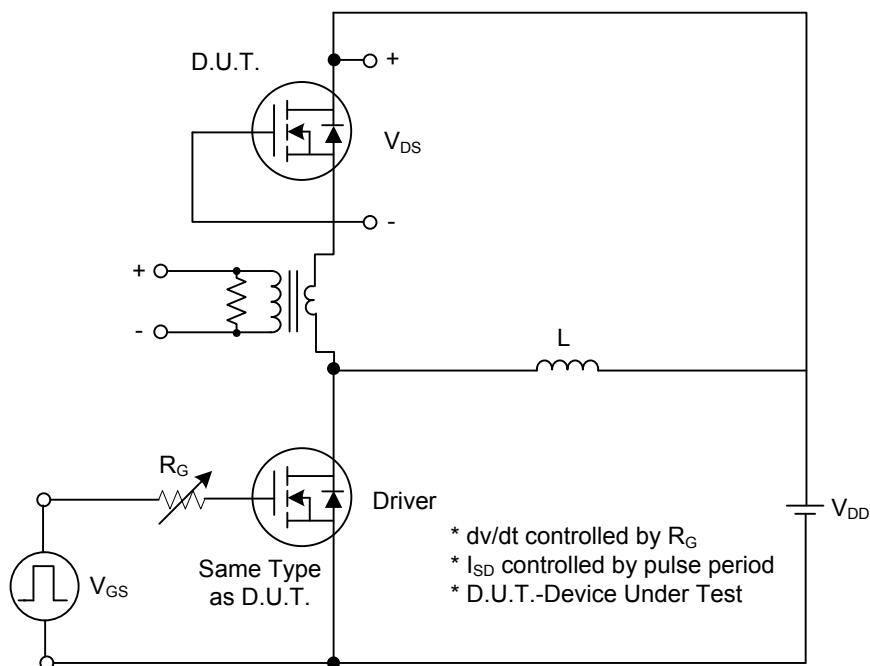
## ■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}$ , $I_S = 6.2\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				6.2	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				24.8	A
Reverse Recovery Time	$t_{rr}$	$V_{GS} = 0\text{ V}$ , $I_S = 6.2\text{ A}$ ,		290		ns
Reverse Recovery Charge	$Q_{RR}$	$dI_F/dt = 100\text{ A}/\mu\text{s}$ (Note 1)		2.35		$\mu\text{C}$

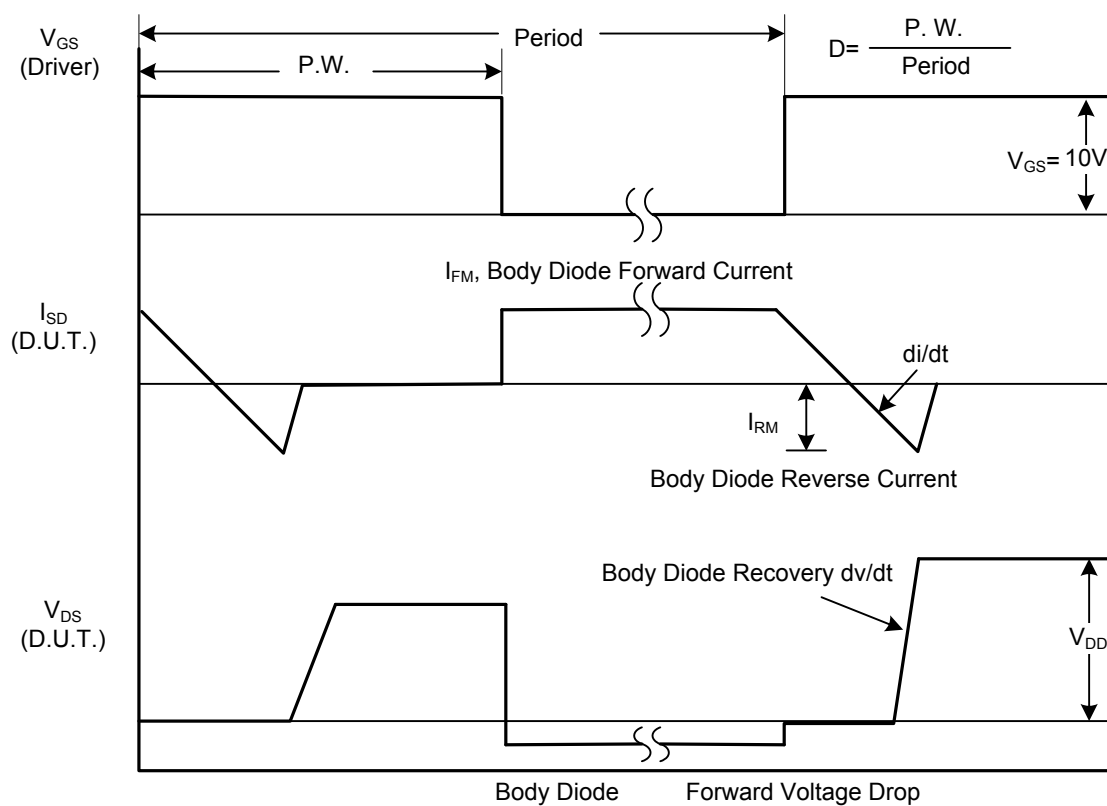
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ 

2. Essentially independent of operating temperature

# ■ TEST CIRCUITS AND WAVEFORMS

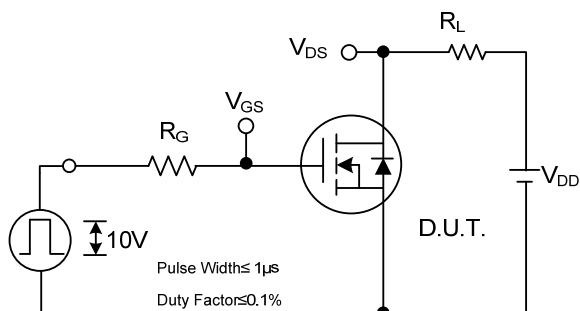


Peak Diode Recovery  $dv/dt$  Test Circuit

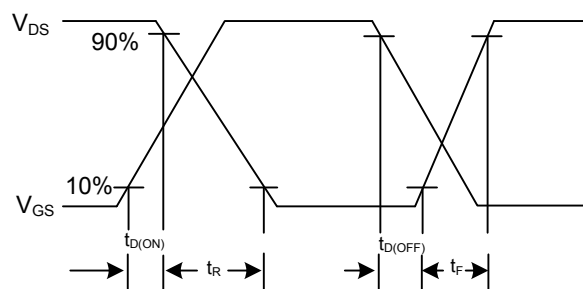


Peak Diode Recovery  $dv/dt$  Waveforms

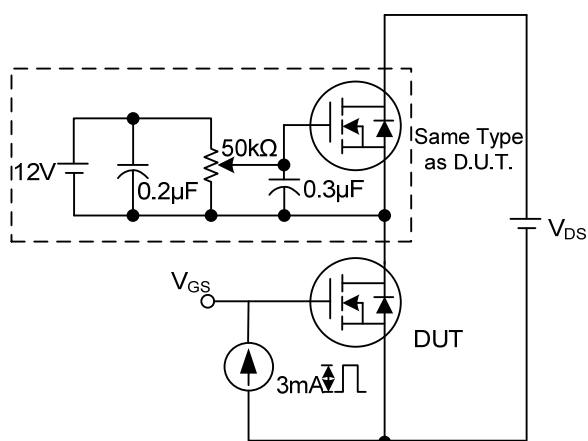
# ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



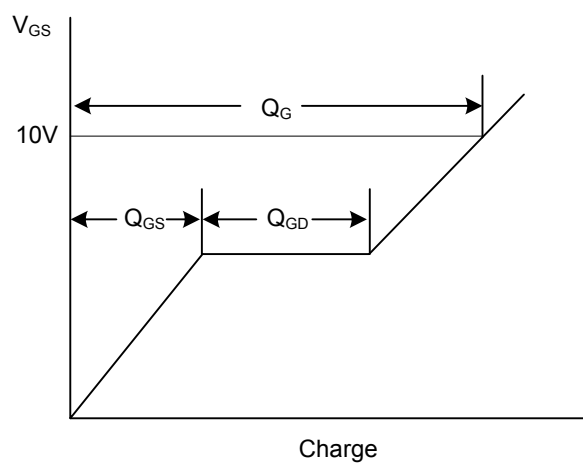
Switching Test Circuit



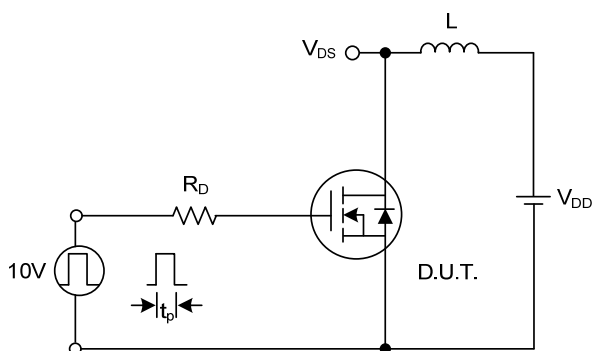
Switching Waveforms



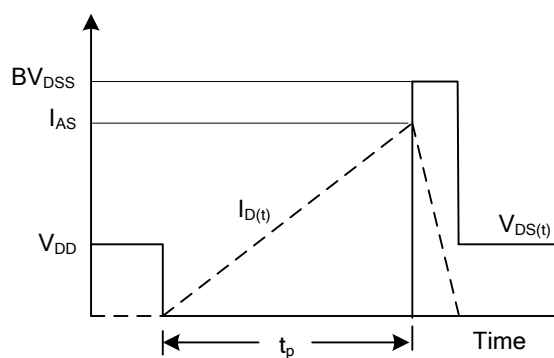
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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