



## 6N60

Power MOSFET

### 6.2 Amps, 600/650 Volts N-CHANNEL MOSFET

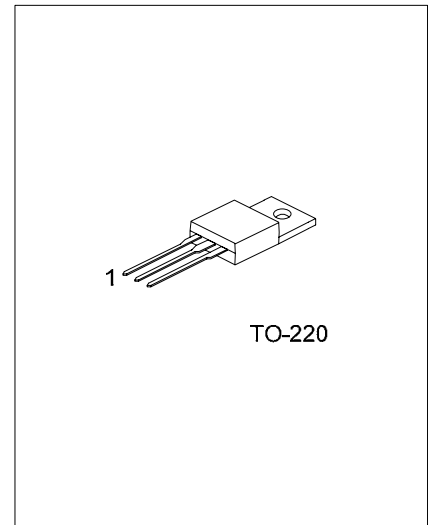
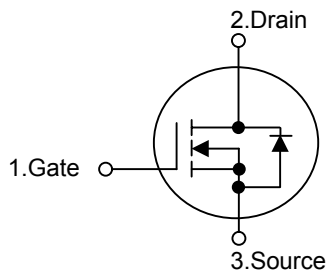
#### DESCRIPTION

The UTC 6N60 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a 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



\*Pb-free plating product number: 6N60L

#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
6N60-x-TA3-T	6N60L-x-TA3-T	TO-220	G	D	S	Tube

<p>6N60L-x-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Drain-Source Voltage (4)Lead Plating</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220 (3) A: 600V, B: 650V (4) L: Lead Free Plating, Blank: Pb/Sn</p>
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■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$  , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage	6N60-A	$V_{DSS}$	600	V
	6N60-B		650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 1)		$I_{AR}$	6.2	A
Continuous Drain Current	$T_C = 25^\circ\text{C}$	$I_D$	6.2	A
	$T_C = 100^\circ\text{C}$		3.9	A
Pulsed Drain Current (Note 1)		$I_{DM}$	24.8	A
Avalanche Energy	Single Pulsed (Note 2)	$E_{AS}$	440	mJ
	Repetitive (Note 1)	$E_{AR}$	13	mJ
Power Dissipation		$P_D$	62.5	W
Junction Temperature		$T_J$	+150	
Operating Temperature		$T_{OPR}$	-55 ~ +150	
Storage Temperature		$T_{STG}$	-55 ~ +150	

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	RATING	UNIT
Junction-to-Ambient	$\theta_{JA}$	62	$^\circ\text{C}/\text{W}$
Junction-to-Case	$\theta_{JC}$	2	$^\circ\text{C}/\text{W}$

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

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	6N60-A	$BV_{DSS}$	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	600			V
	6N60-B			650			V
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS} = 600\text{V}, V_{GS} = 0\text{V}$			10	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS} = 30\text{V}, V_{DS} = 0\text{V}$ $V_{GS} = -30\text{V}, V_{DS} = 0\text{V}$			100	nA
	Reverse					-100	nA
Breakdown Voltage Temperature Coefficient		$BV_{DSS}/T_J$	$I_D = 250\mu\text{A}, \text{Referenced to } 25^\circ\text{C}$		0.53		V/
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{V}, I_D = 3.1\text{A}$			1.5	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>							
Input Capacitance		$C_{ISS}$	$V_{DS}=25\text{V}, V_{GS}=0\text{V}, f=1.0\text{MHz}$		770	1000	pF
Output Capacitance		$C_{OSS}$			95	120	pF
Reverse Transfer Capacitance		$C_{RSS}$			10	13	pF
<b>SWITCHING CHARACTERISTICS</b>							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD}=300\text{V}, I_D = 6.2\text{A}, R_G = 25\Omega$ (Note 4, 5)		20	50	ns
Turn-On Rise Time		$t_R$			70	150	ns
Turn-Off Delay Time		$t_{D(OFF)}$			40	90	ns
Turn-Off Fall Time		$t_F$			45	100	ns
Total Gate Charge		$Q_G$	$V_{DS}=480\text{V}, I_D=6.2\text{A}, V_{GS}=10\text{V}$ (Note 4, 5)		20	25	nC
Gate-Source Charge		$Q_{GS}$			4.9		nC
Gate-Drain Charge		$Q_{GD}$			9.4		nC

### ■ ELECTRICAL CHARACTERISTICS

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 4)		2.35		$\mu\text{C}$

- Notes:
1. Repetitive Rating : Pulse width limited by  $T_J$
  2.  $L = 16.8\text{mH}, I_{AS} = 6\text{A}, V_{DD} = 90\text{V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
  3.  $I_{SD} \leq 6.2\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
  4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$
  5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

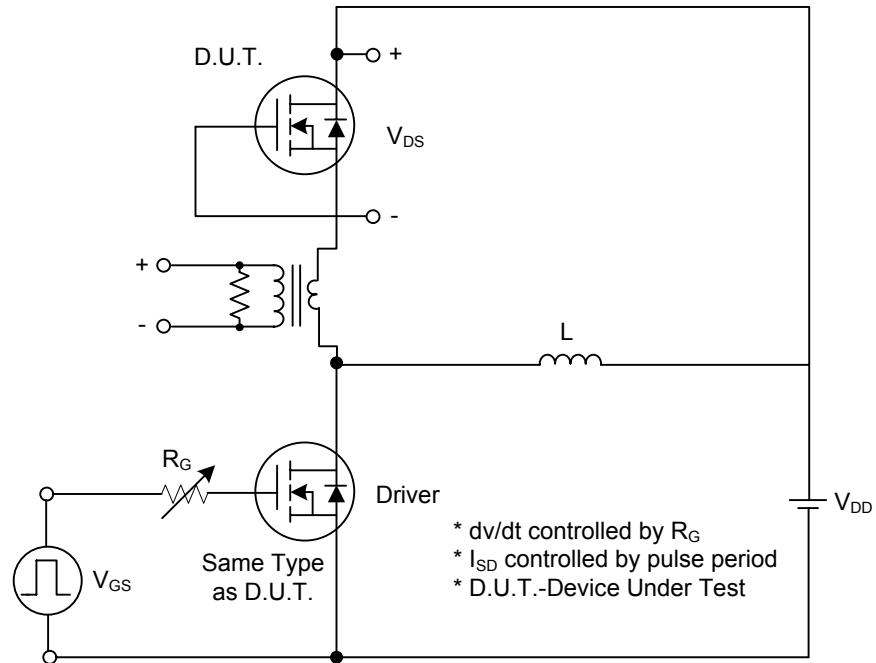


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

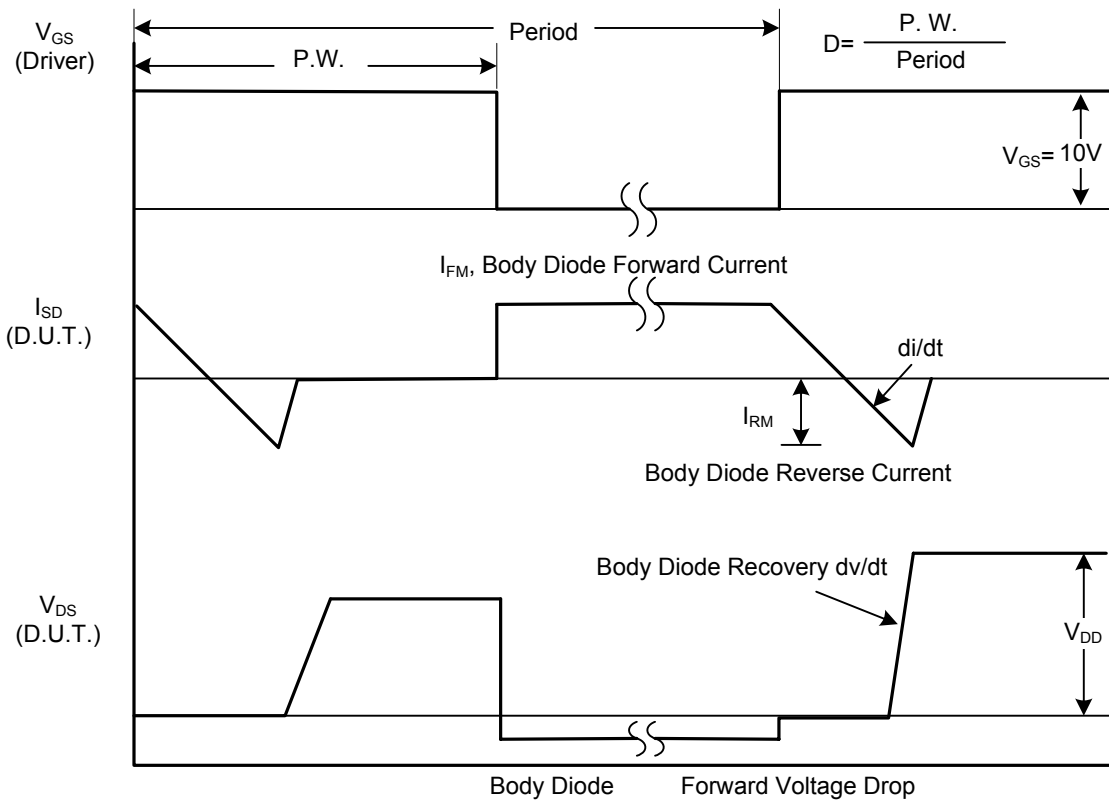


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

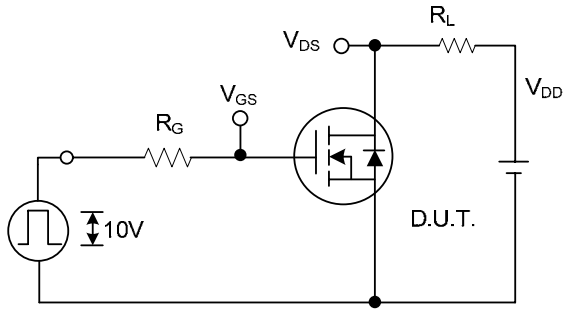


Fig. 2A Switching Test Circuit

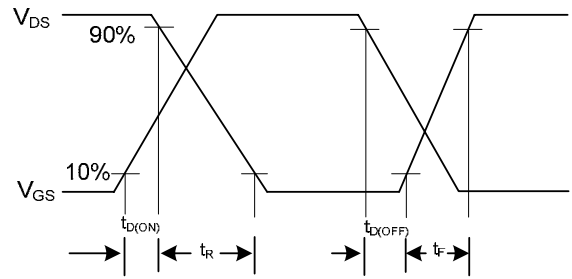


Fig. 2B Switching Waveforms

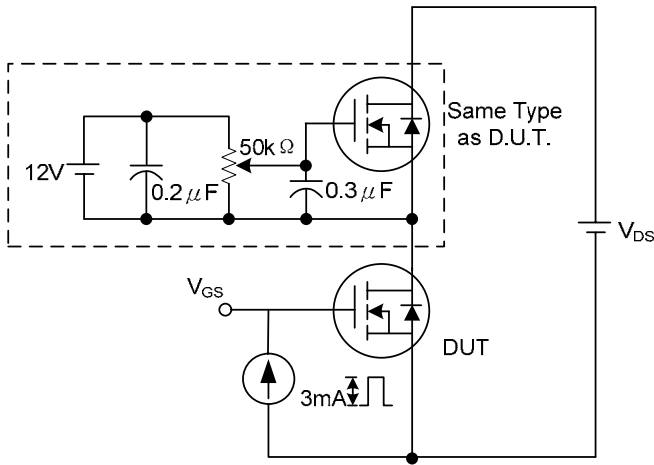


Fig. 3A Gate Charge Test Circuit

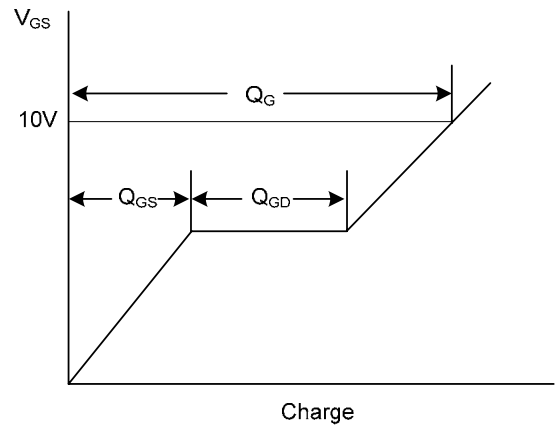


Fig. 3B Gate Charge Waveform

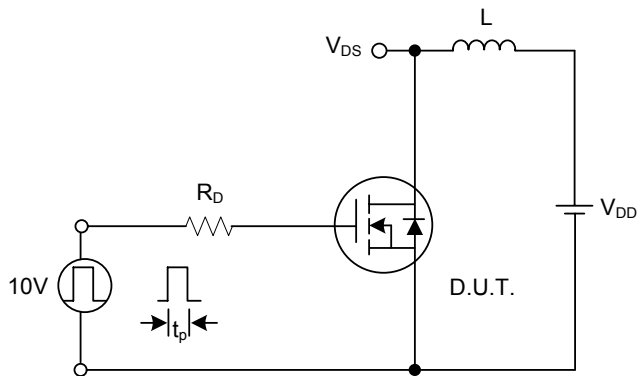


Fig. 4A Unclamped Inductive Switching Test Circuit

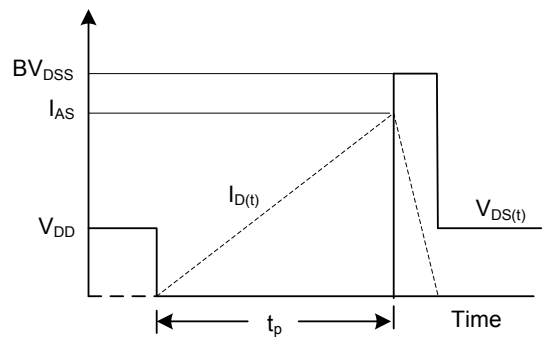


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

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