



# 6N60

*Power MOSFET*

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

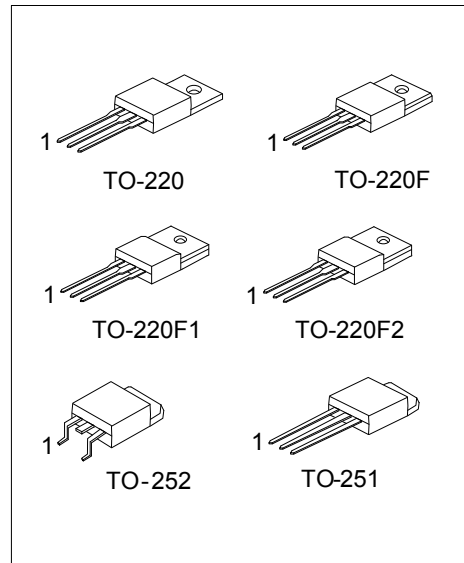
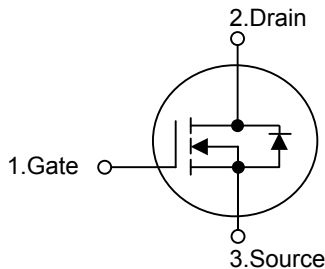
■ DESCRIPTION

The UTC **6N60** 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 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



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N60L-TA3-T	6N60G-TA3-T	TO-220	G	D	S	Tube
6N60L-TF1-T	6N60G-TF1-T	TO-220F1	G	D	S	Tube
6N60L-TF2-T	6N60G-TF2-T	TO-220F2	G	D	S	Tube
6N60L-TF3-T	6N60G-TF3-T	TO-220F	G	D	S	Tube
6N60L-TM3-T	6N60G-TM3-T	TO-251	G	D	S	Tube
6N60L-TN3-R	6N60G-TN3-R	TO-252	G	D	S	Tape Reel
6N60L-TN3-T	6N60G-TN3-T	TO-252	G	D	S	Tube

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

<p>6N60L-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F TM3: TO-251, TN3: TO-252, TF2: TO-220F2 (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	mJ
	Repetitive (Note 2)	$E_{AR}$	13	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	ns
Power Dissipation	TO-220	$P_D$	125	W
	TO-220F/TO-220F1		40	
	TO-220F2		42	
	TO-251/TO-252		55	
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

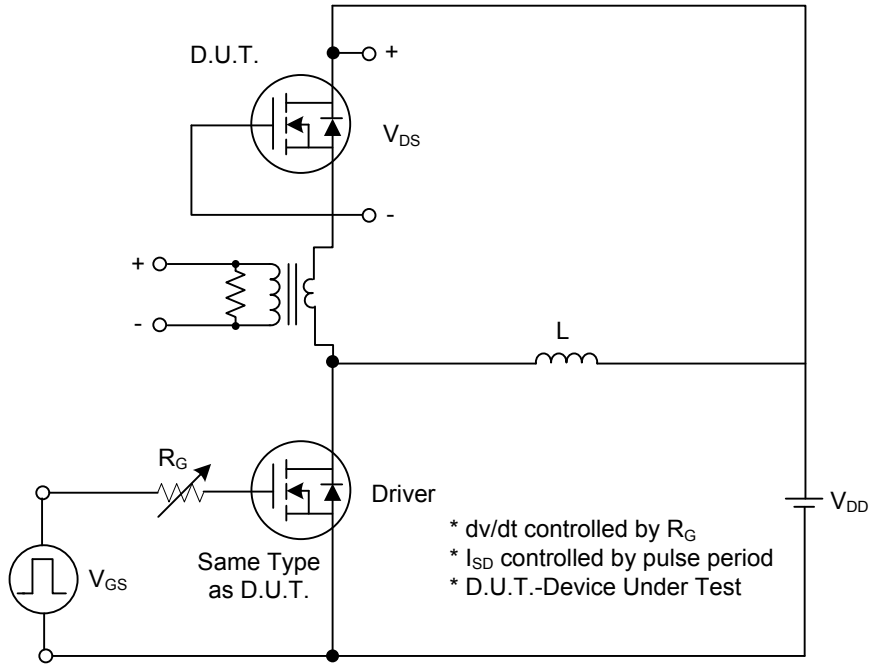
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ TO-220F2	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		62.5	
	TO-251/TO-252		110	
Junction to Case	TO-220	$\theta_{JC}$	1.0	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.2	
	TO-220F2		2.97	
	TO-251/TO-252		2.27	

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

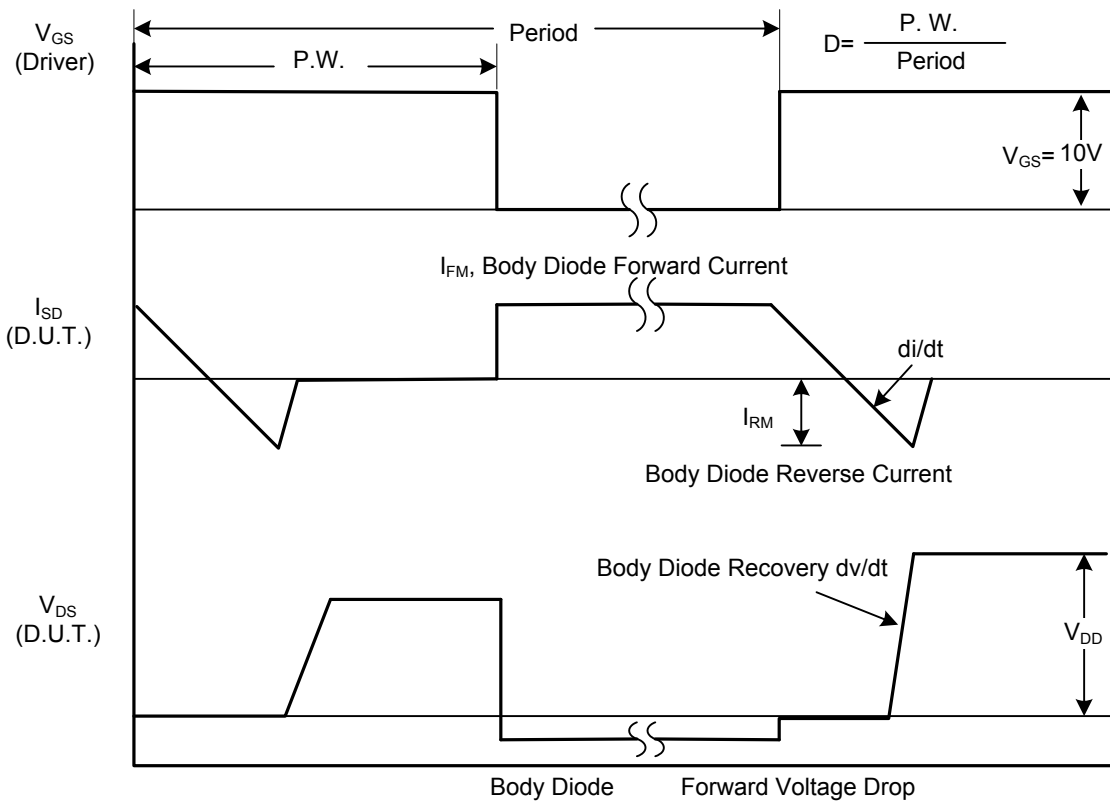
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	600			V	
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V			10	μA	
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA	
	Reverse				-100	nA	
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	
<b>ON CHARACTERISTICS</b>							
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	
<b>DYNAMIC CHARACTERISTICS</b>							
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
<b>SWITCHING CHARACTERISTICS</b>							
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	
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>							
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 6.2 A			1.4	V	
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				6.2	A	
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				24.8	A	
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 6.2 A, dI <sub>F</sub> /dt = 100 A/μs (Note 1)		290		ns	
Reverse Recovery Charge	Q <sub>RR</sub>			2.35		μC	

- Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%  
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

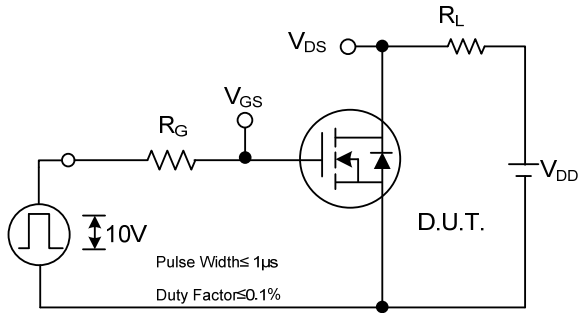


Peak Diode Recovery dv/dt Test Circuit

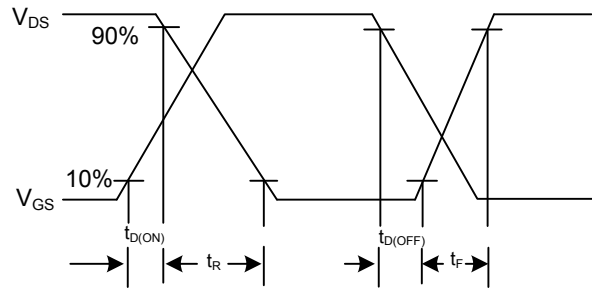


Peak Diode Recovery dv/dt Waveforms

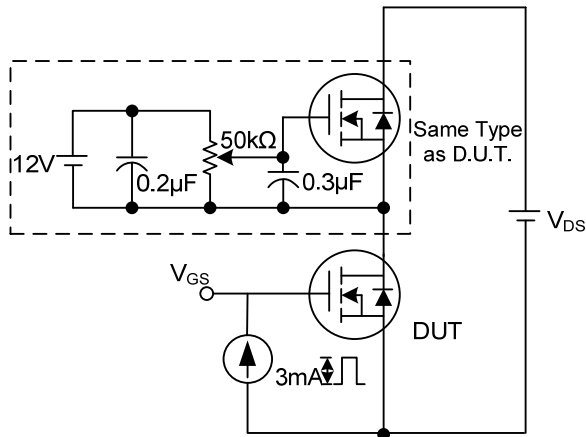
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



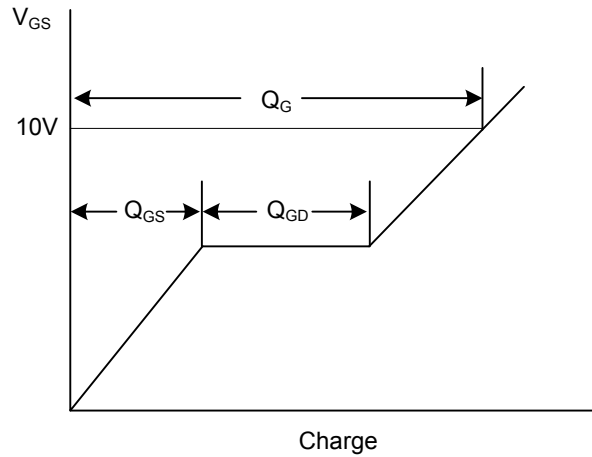
Switching Test Circuit



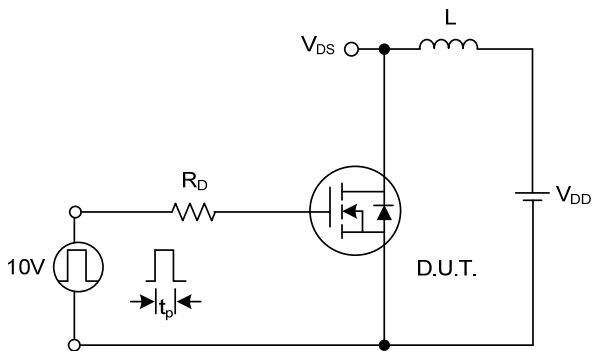
Switching Waveforms



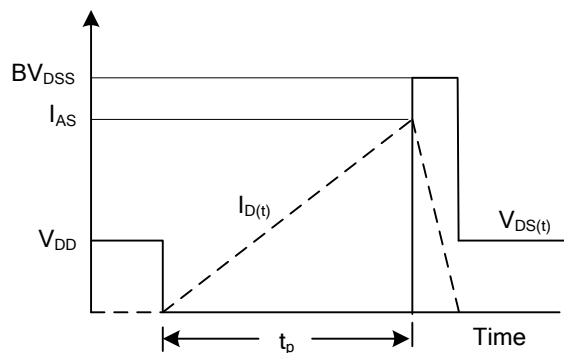
Gate Charge Test Circuit



Gate Charge Waveform

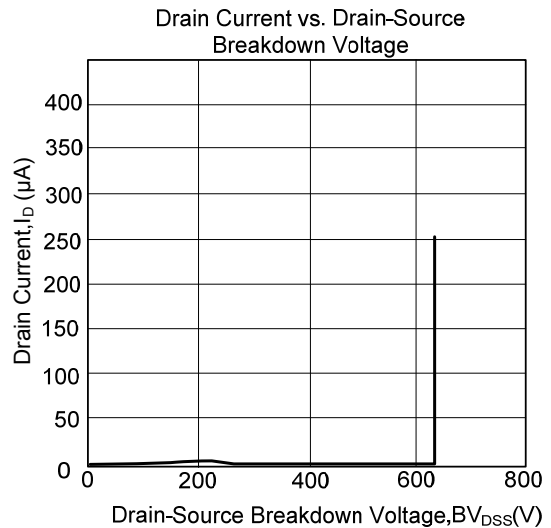
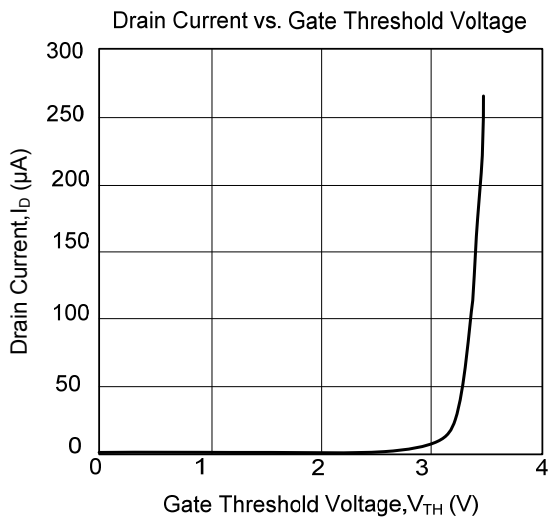
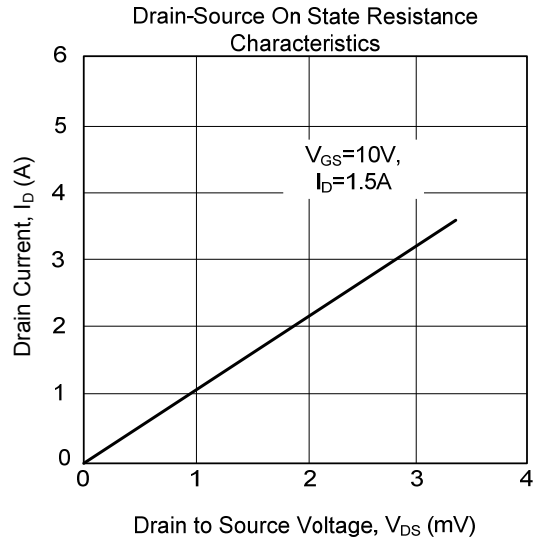
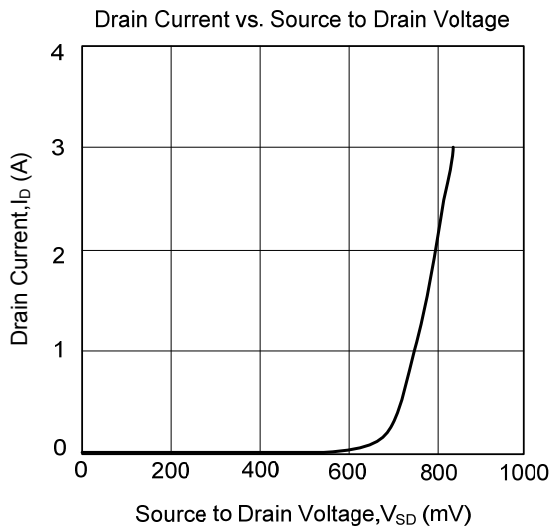


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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