

6N60

Power MOSFET

6.2A, 600V N-CHANNEL POWER MOSFET

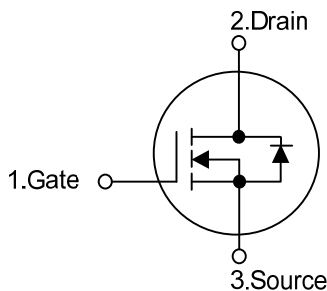
DESCRIPTION

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

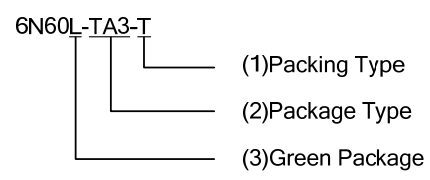
SYMBOL

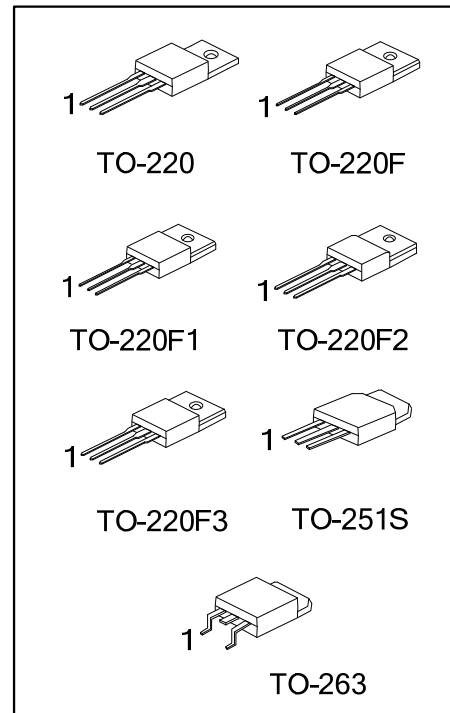


ORDERING INFORMATION

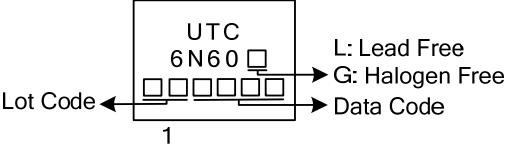
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N60L-TA3-T	6N60G-TA3-T	TO-220	G	D	S	Tube
6N60L-TF3-T	6N60G-TF3-T	TO-220F	G	D	S	Tube
6N60L-TF1-T	6N60G-TF1-T	TO-220F1	G	D	S	Tube
6N60L-TF2-T	6N60G-TF2-T	TO-220F2	G	D	S	Tube
6N60L-TF3T-T	6N60G-TF3T-T	TO-220F3	G	D	S	Tube
6N60L-TMS-T	6N60G-TMS-T	TO-251S	G	D	S	Tube
6N60L-TQ2-T	6N60G-TQ2-T	TO-263	G	D	S	Tube
6N60L-TQ2-R	6N60G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>6N60L-TA3-T</p>  <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3T: TO-220F3, TMS: TO-251S TQ2: TO-263 (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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MARKING



■ 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}	± 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/TO-263	P_D	125	W
	TO-220F/TO-220F1		40	W
	TO-220F3		42	W
	TO-251S		55	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. $L = 25\text{mH}$, $I_{AS} = 6\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\ \Omega$, 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-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-220F3/TO-263			
	TO-251S			
Junction to Case	TO-220/TO-263	θ_{JC}	1.0	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.2	
	TO-220F3		2.97	
	TO-220F2		2.27	
	TO-251S		2.27	

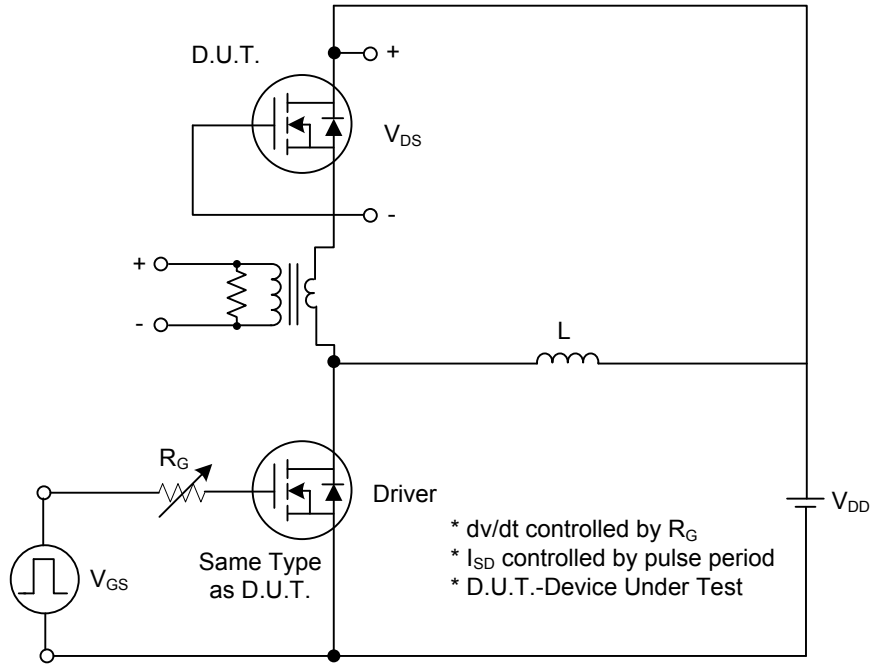
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
		$V_{DS}=480V, V_{GS}=0V, T_J=125^\circ\text{C}$			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}				
	Reverse					
		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$, Referenced to 25°C		0.53		$V/^\circ\text{C}$
ON CHARACTERISTICS						
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.1A$		1.0	1.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{ MHz}$		770	1000	pF
Output Capacitance	C_{OSS}			95	120	pF
Reverse Transfer Capacitance	C_{RSS}			10	13	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=300V, I_D=6.2A, R_G=25\Omega$ (Note 1, 2)		40	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			80	100	ns
Total Gate Charge	Q_G	$V_{DS}=480V, I_D=6.2A, V_{GS}=10V$ (Note 1, 2)		20	25	nC
Gate-Source Charge	Q_{GS}			4.9		nC
Gate-Drain Charge	Q_{GD}			9.4		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=6.2\text{ A}$			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}	$V_{GS}=0V, I_S=6.2A,$ $di_F/dt=100\text{ A}/\mu\text{s}$ (Note 1)		290		ns
Reverse Recovery Charge	Q_{RR}			2.35		μC

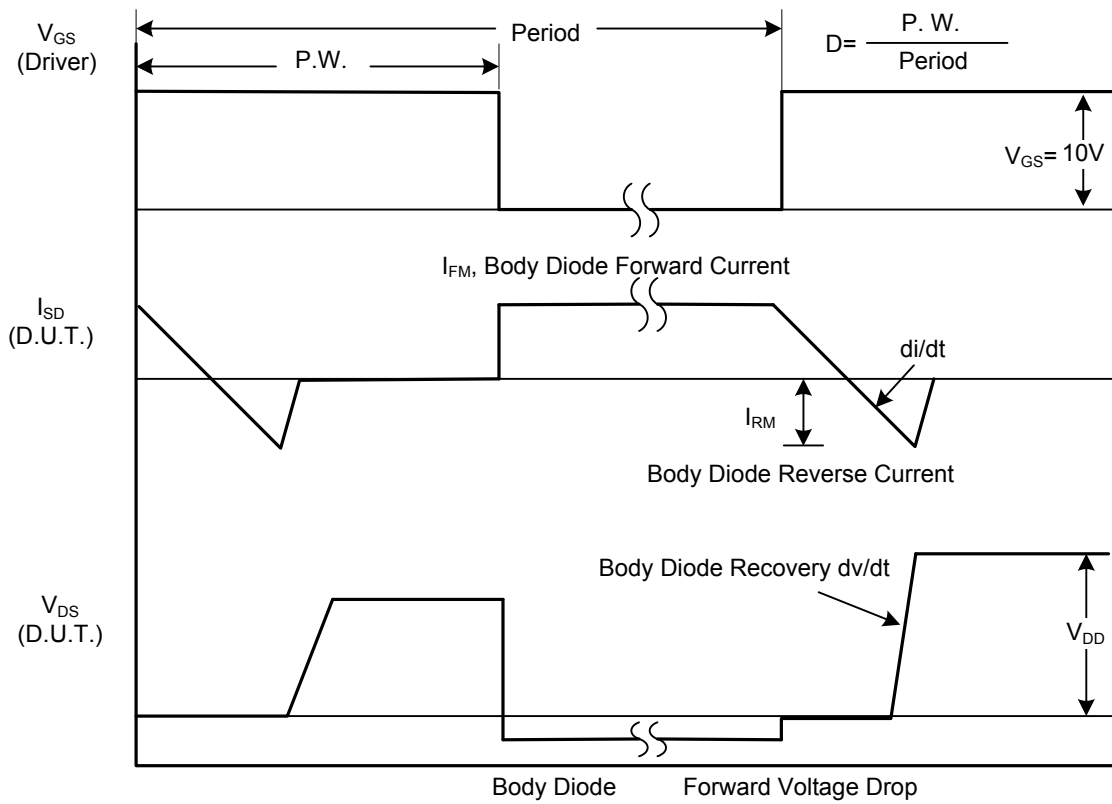
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

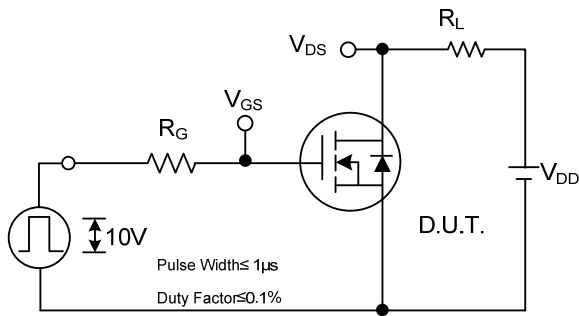


Peak Diode Recovery dv/dt Test Circuit

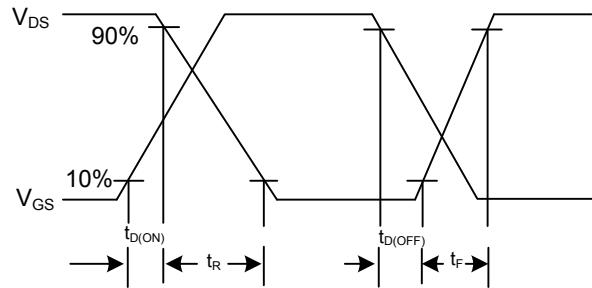


Peak Diode Recovery dv/dt Waveforms

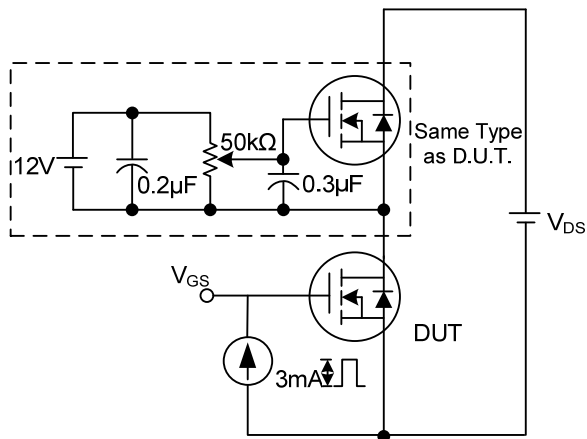
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



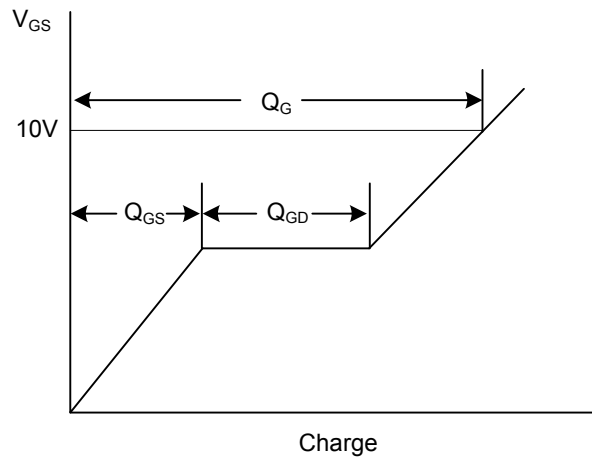
Switching Test Circuit



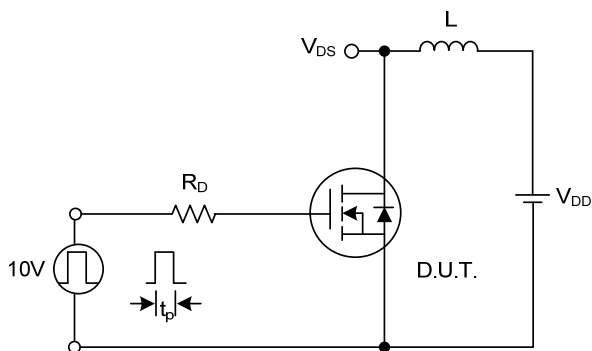
Switching Waveforms



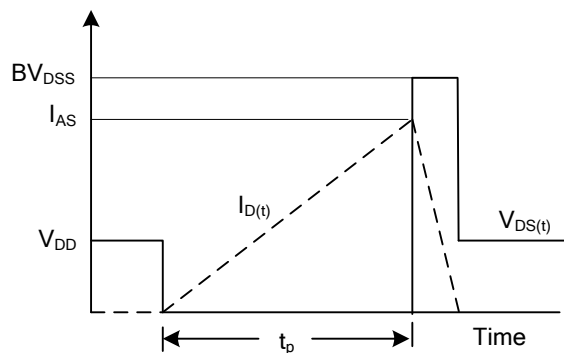
Gate Charge Test Circuit



Gate Charge Waveform

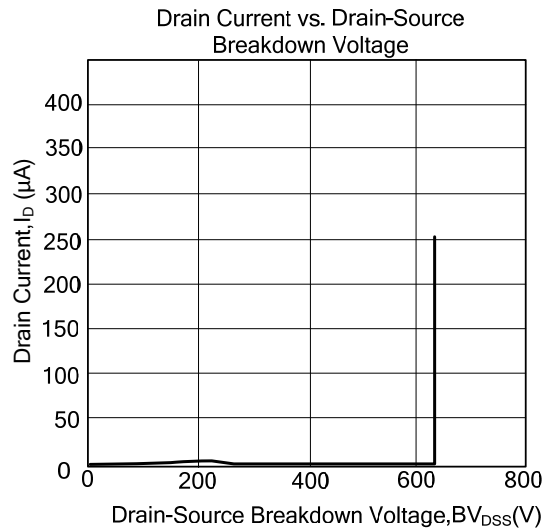
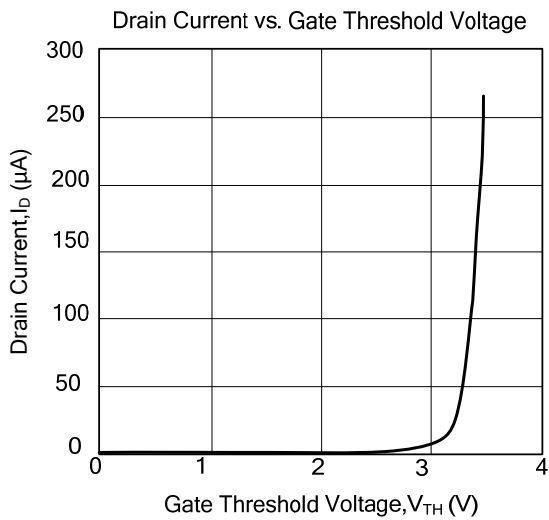
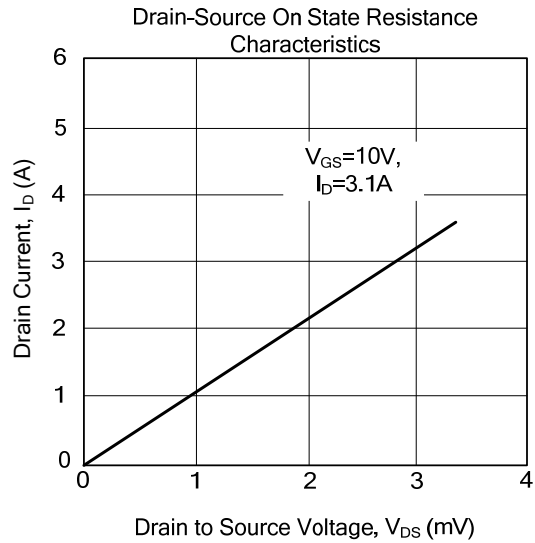
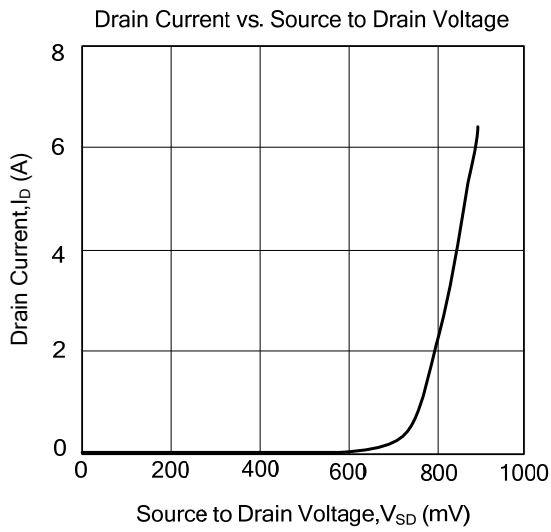


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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