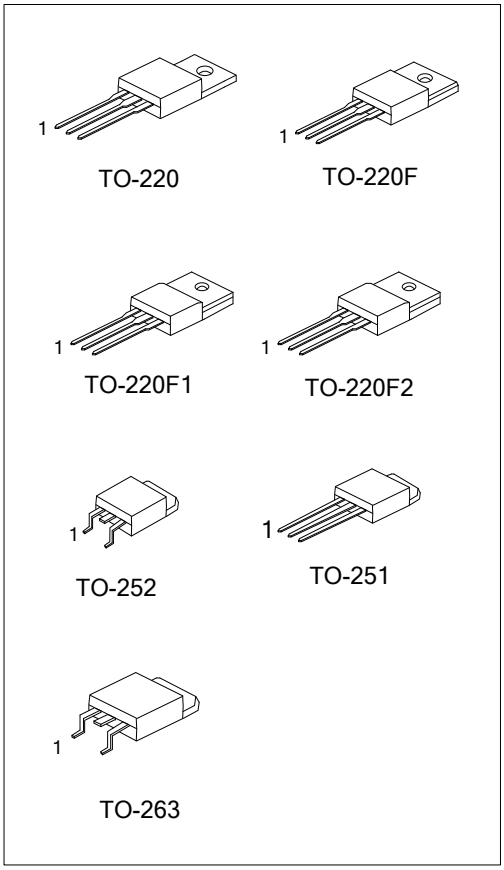
6N60

Power MOSFET

6.2A, 600V N-CHANNEL POWER MOSFET



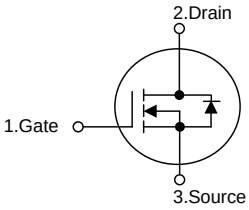
■ DESCRIPTION

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

* $R_{DS(ON)}$ = 1.5Ω @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

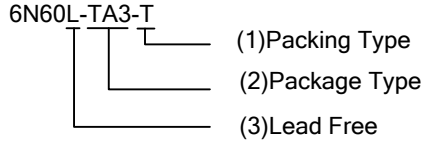
■ SYMBOL



■ 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
6N60L-TQ2-R	6N60G-TQ2-R	TO-263	G	D	S	Tape Reel
6N60L-TQ2-T	6N60G-TQ2-T	TO-263	G	D	S	Tube

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



(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
TQ2: TO-263
(3) L: Lead Free, G: Halogen Free

■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°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-220F2		42	W
	TO-251/TO-252		55	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-55 ~ +150	°C
Storage Temperature		T_{STG}	-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 T_J
3. L = 14mH, I_{AS} = 6A, V_{DD} = 90V, R_G = 25 Ω, Starting T_J = 25°C
4. I_{SD} ≤ 6.2A, di/dt ≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

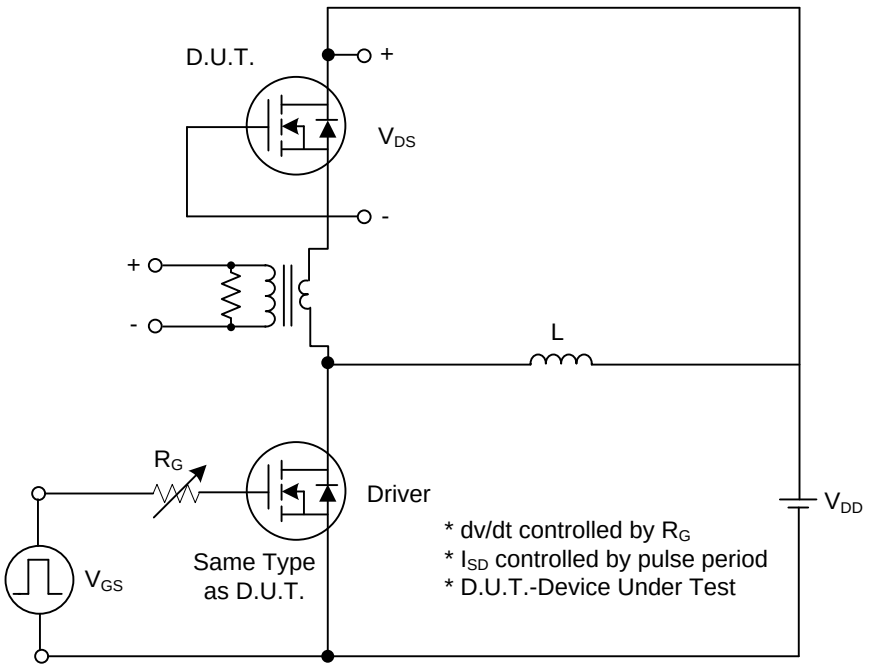
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F2	θ_{JA}	62.5	°C/W
	TO-220F/TO-220F1		62.5	
	TO-251/TO-252		110	
	TO-263		62.5	
Junction to Case	TO-220	θ_{JC}	1.0	°C/W
	TO-220F/TO-220F1		3.2	
	TO-220F2		2.97	
	TO-251/TO-252		2.27	
	TO-263		1.0	

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

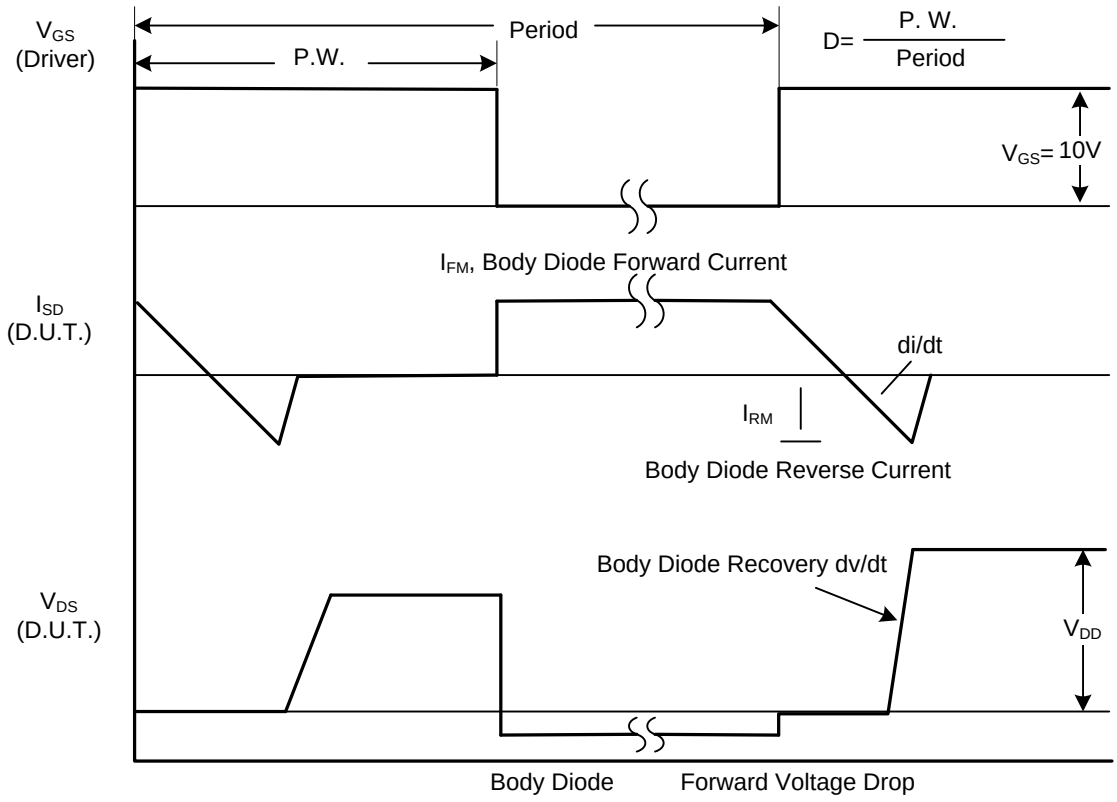
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 600V, V_{GS} = 0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA, Referenced to 25°C		0.53		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	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 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 =25Ω (Note 1, 2)		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			80	100	ns
Total Gate Charge		Q_G	V_{DS}=480V, I_D=6.2A, V_{GS}=10 V (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} = 0 V, I_S = 6.2 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 V, I_S = 6.2 A, dI_F/dt = 100 A/μs (Note 1)		290		ns
Reverse Recovery Charge		Q_{RR}			2.35		μC

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

■ TEST CIRCUITS AND WAVEFORMS

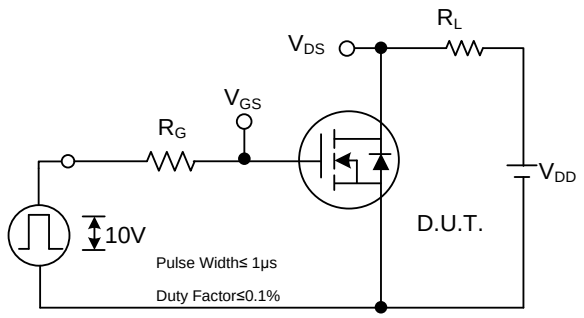


Peak Diode Recovery dv/dt Test Circuit

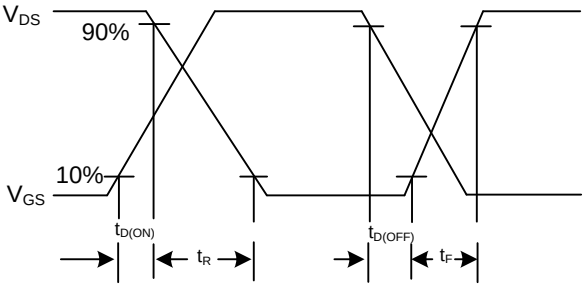


Peak Diode Recovery dv/dt Waveforms

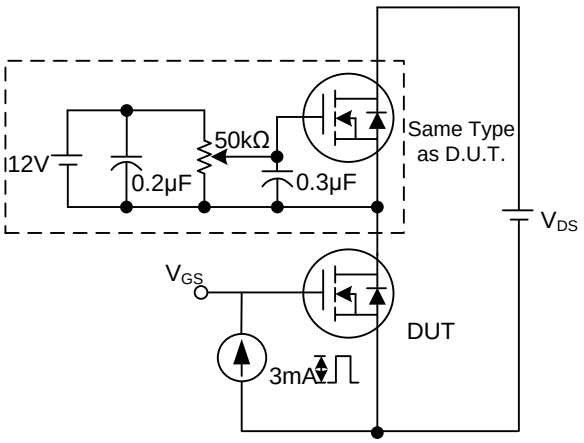
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



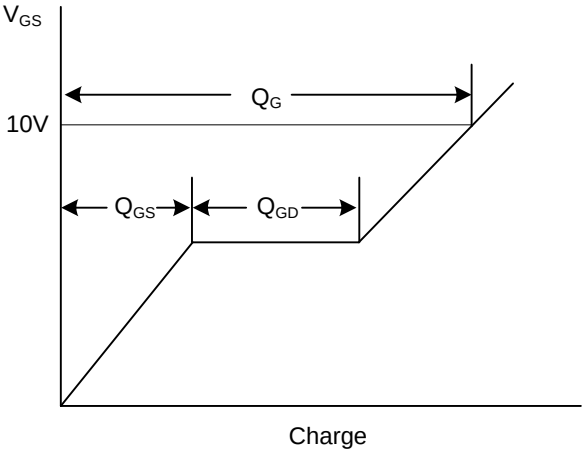
Switching Test Circuit



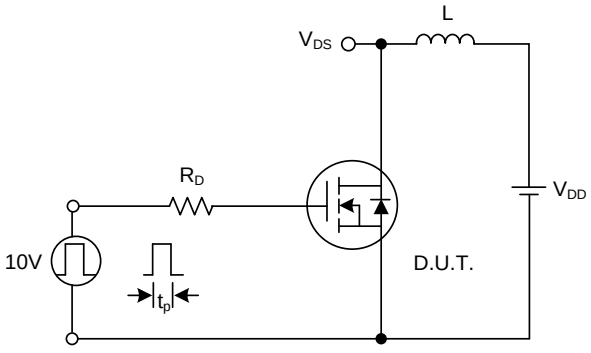
Switching Waveforms



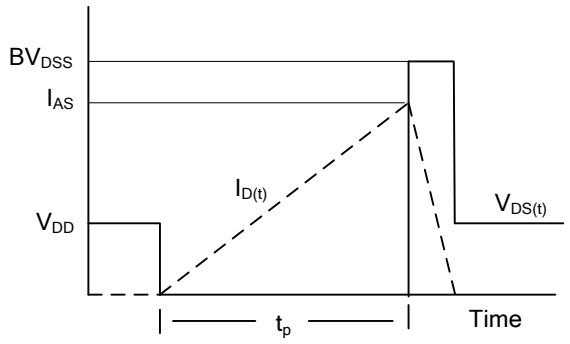
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS