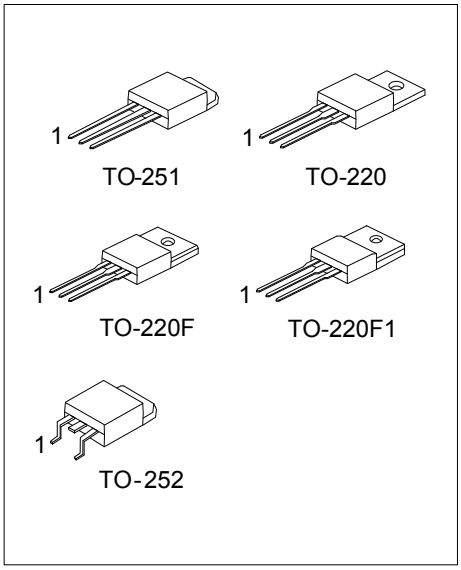
6N60

Power MOSFET

6.2 Amps, 600/650 Volts N-CHANNEL MOSFET



Lead-free: 6N60L
Halogen-free:6N60G

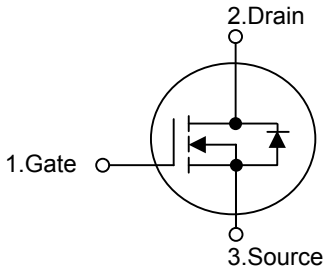
■ DESCRIPTION

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

* $R_{DS(ON)}$ = 1.5Ω @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-x-TA3-T	6N60G-x-TA3-T	TO-220	G	D	S	Tube
6N60L-x-TF1-T	6N60G-x-TF1-T	TO-220F1	G	D	S	Tube
6N60L-x-TF3-T	6N60G-x-TF3-T	TO-220F	G	D	S	Tube
6N60L-x-TM3-T	6N60G-x-TM3-T	TO-251	G	D	S	Tube
6N60L-x-TN3-R	6N60G-x-TN3-R	TO-252	G	D	S	Tape Reel

6N60L-x-TA3-T
(1)Packing Type
(2)Package Type
(3)Drain-Source Voltage
(4)Lead Plating

(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F
TM3: TO-251, TN3: TO-252
(3) A: 600V, B: 650V
(4) G: Halogen Free, L: Lead Free

■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, 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}	±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	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	θ_{JA}	62.5	°C/W
	TO-220F/TO-220F1		62.5	°C/W
	TO-251/TO-252		110	°C/W
Junction to Case	TO-220	θ_{JC}	1.0	°C/W
	TO-220F/TO-220F1		3.2	°C/W
	TO-251/TO-252		2.27	°C/W

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

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	6N60-A	BV_{DSS}	V_{GS} = 0V, I_D = 250μA	600			V
	6N60-B			650			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 = 250 μA, 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			1.5	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

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
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			45	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

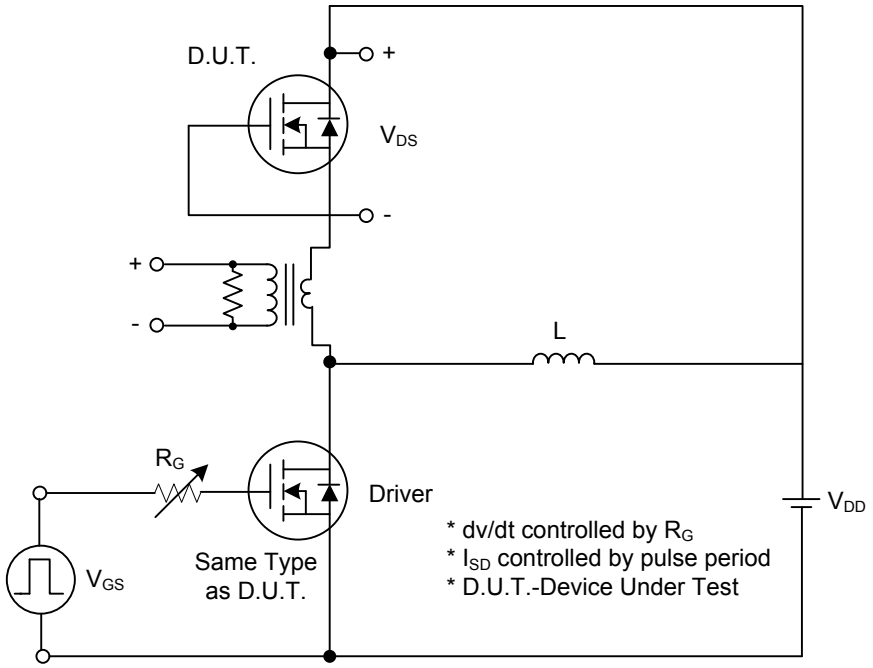


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

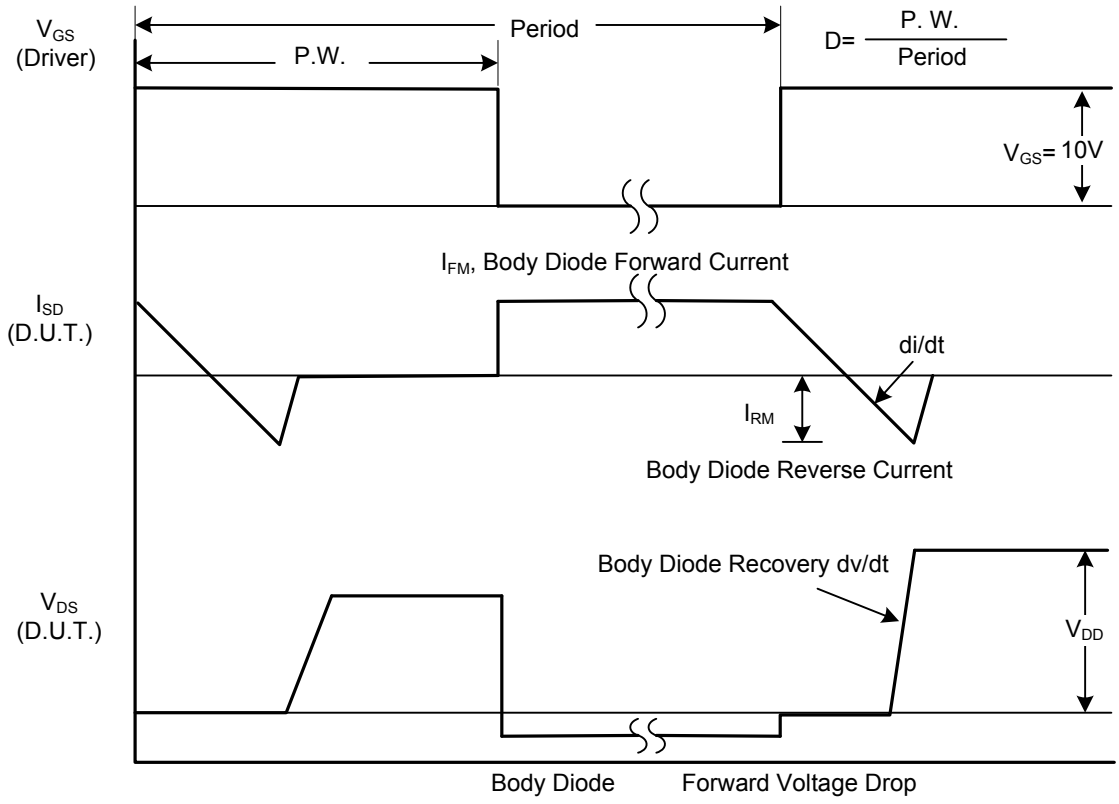


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

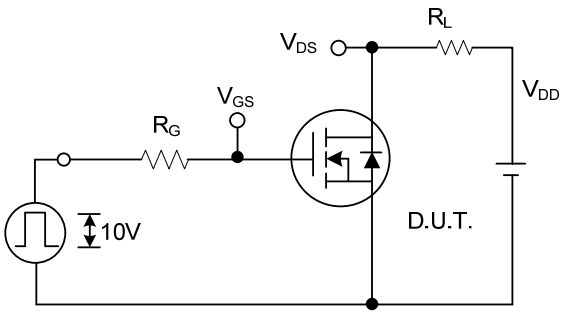


Fig. 2A Switching Test Circuit

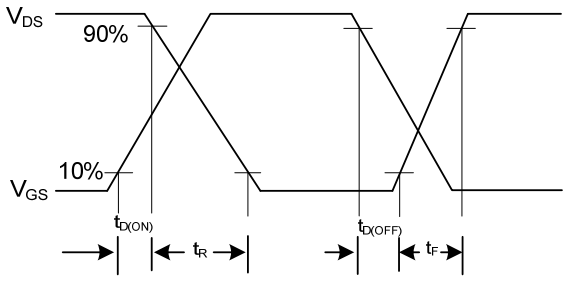


Fig. 2B Switching Waveforms

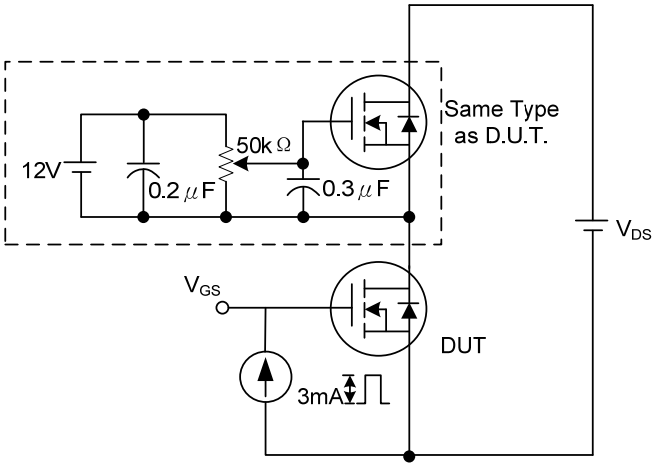


Fig. 3A Gate Charge Test Circuit

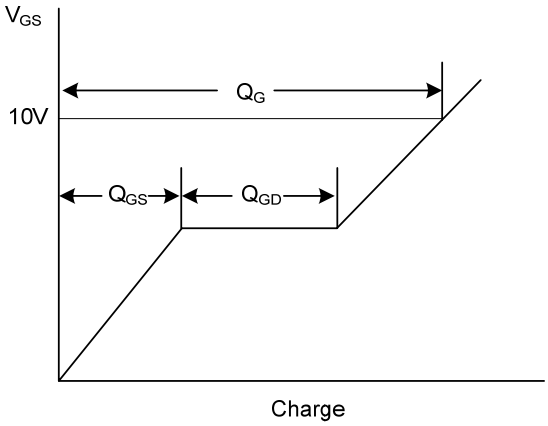


Fig. 3B Gate Charge Waveform

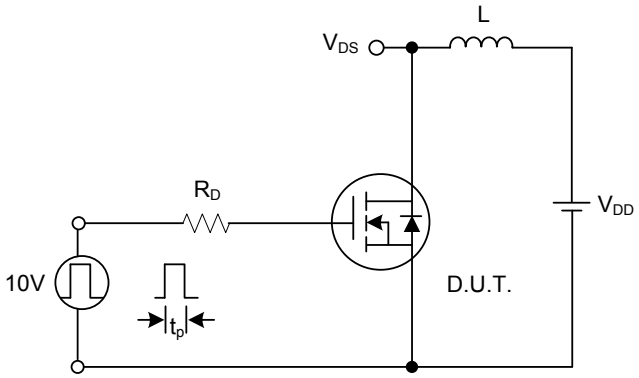


Fig. 4A Unclamped Inductive Switching Test Circuit

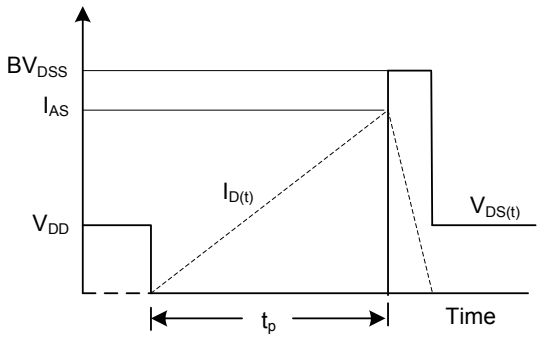
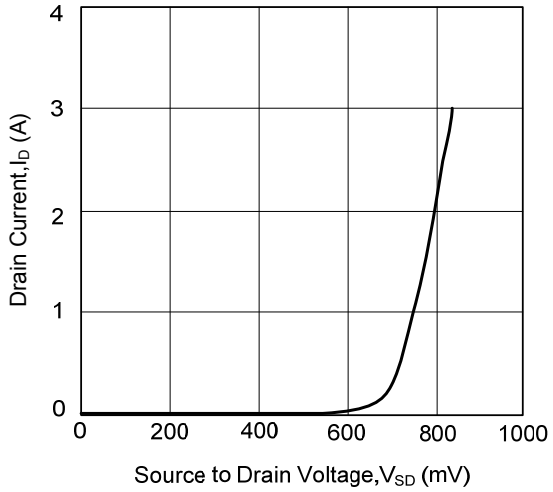


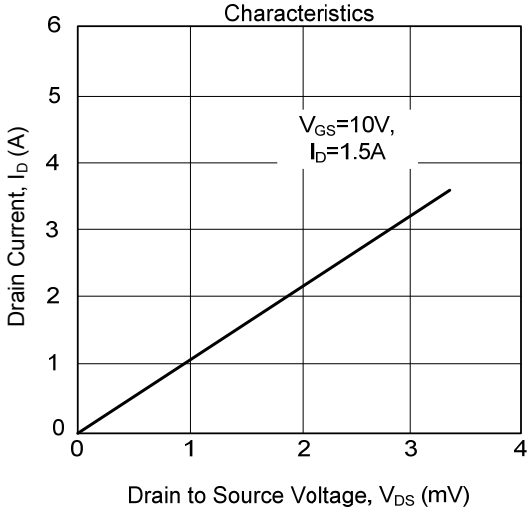
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

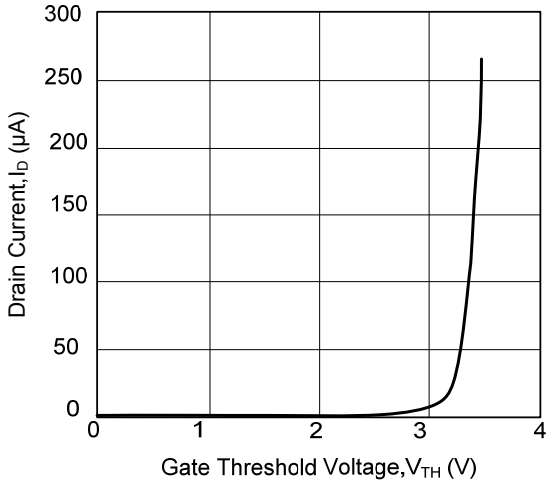
Drain Current vs. Source to Drain Voltage



Drain-Source On State Resistance Characteristics



Drain Current vs. Gate Threshold Voltage



Drain Current vs. Drain-Source Breakdown Voltage