



7N60

Power MOSFET

7.4 Amps, 600/650 Volts N-CHANNEL POWER MOSFET

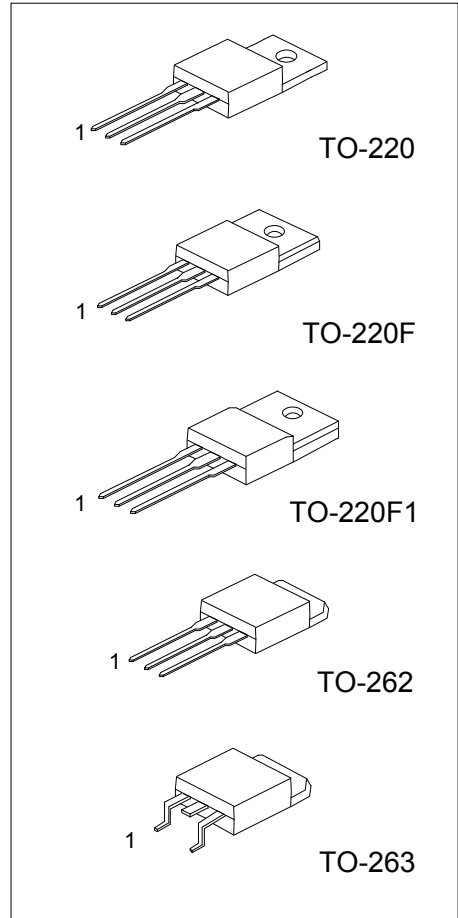
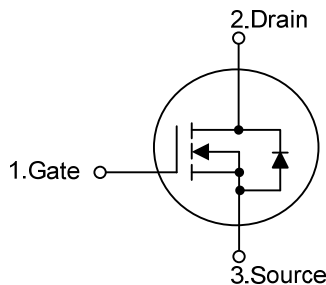
DESCRIPTION

The UTC **7N60** 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

- * $R_{DS(ON)} = 1.0\Omega$ @ $V_{GS} = 10\text{ V}$ (7N60/7N60-R)
- * $R_{DS(ON)} = 1.2\Omega$ @ $V_{GS} = 10\text{ V}$ (7N60-F/7N60-M/7N60-Q)
- * Ultra Low Gate Charge (Typical 29 nC)
- * Low Reverse Transfer Capacitance (C_{RSS} = typical 16pF)
- * 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	
7N60L-x-TA3-T	7N60G-x-TA3-T	TO-220	G	D	S	Tube
7N60L-x-TF3-T	7N60G-x-TF3-T	TO-220F	G	D	S	Tube
7N60L-x-TF1-T	7N60G-x-TF1-T	TO-220F1	G	D	S	Tube
7N60L-x-T2Q-T	7N60G-x-T2Q-T	TO-262	G	D	S	Tube
7N60L-x-TQ2-R	7N60G-x-TQ2-R	TO-263	G	D	S	Tape Reel
7N60L-x-TQ2-T	7N60G-x-TQ2-T	TO-263	G	D	S	Tube

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

7N60L-x-TA3-T (1) Packing Type (2) Package Type (3) Drain-Source Voltage (4) Lead Free	(1) R: Tape Reel, T: Tube (2) TA3: TO-220, TF1: TO220-F1, TF3: TO-220F T2Q: TO-262, TQ2: TO-263 (3) A: 600V, B: 650V (4) G: Halogen Free, L: Lead Free
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■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage	7N60-A	V_{DSS}	600	V
	7N60-B		650	V
Gate-Source Voltage		V_{GSS}	± 30	V
Avalanche Current (Note 2)		I_{AR}	7.4	A
Drain Current	Continuous	I_D	7.4	A
	Pulsed (Note 2)	I_{DM}	29.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	530	mJ
	Repetitive (Note 2)	E_{AR}	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220/TO-262/TO-263	P_D	142	W
	TO-220F/TO-220F1		48	W
Junction Temperature		T_J	+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 maximum junction temperature

3. $L = 19.5\text{mH}$, $I_{AS} = 7.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 7.4\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-262/TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262/TO-263	θ_{JC}	0.88	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		2.6	$^\circ\text{C}/\text{W}$

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

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	7N60-A	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	600			V
	7N60-B			650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} = 600V, V _{GS} = 0V			1	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		ΔBV _{DSS} /ΔT _J	I _D = 250μA, Referenced to 25°C		0.67		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 = 3.7A	7N60		1.0	Ω
				7N60-F		1.2	Ω
				7N60-M		1.2	Ω
				7N60-Q		1.2	Ω
				7N60-R		1.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0 MHz			1400	pF
Output Capacitance		C _{OSS}				180	pF
Reverse Transfer Capacitance		C _{RSS}			16	21	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		t _{D(ON)}	V _{DD} =300V, I _D =7.4A, R _G =25Ω (Note 1, 2)			70	ns
Turn-On Rise Time		t _R				170	ns
Turn-Off Delay Time		t _{D(OFF)}				140	ns
Turn-Off Fall Time		t _F				130	ns

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q _G	V _{DS} =480V, I _D =7.4A, V _{GS} =10 V (Note 1, 2)		29	38	nC
Gate-Source Charge	Q _{GS}			7		nC
Gate-Drain Charge	Q _{GD}			14.5		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 7.4 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I _S				7.4	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				29.6	A
Reverse Recovery Time	t _{RR}	V _{GS} = 0V, I _S = 7.4 A,		320		ns
Reverse Recovery Charge	Q _{RR}	dl _F / dt = 100A/μs (Note 1)		2.4		μC

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

2. Essentially independent of operating temperature

■ CLASSIFICATION OF $R_{DS(ON)}$

RANK	-	F	M	Q	R
VALUE	1.0 Ω	1.2 Ω	1.2 Ω	1.2 Ω	1.0 Ω

■ TEST CIRCUITS AND WAVEFORMS

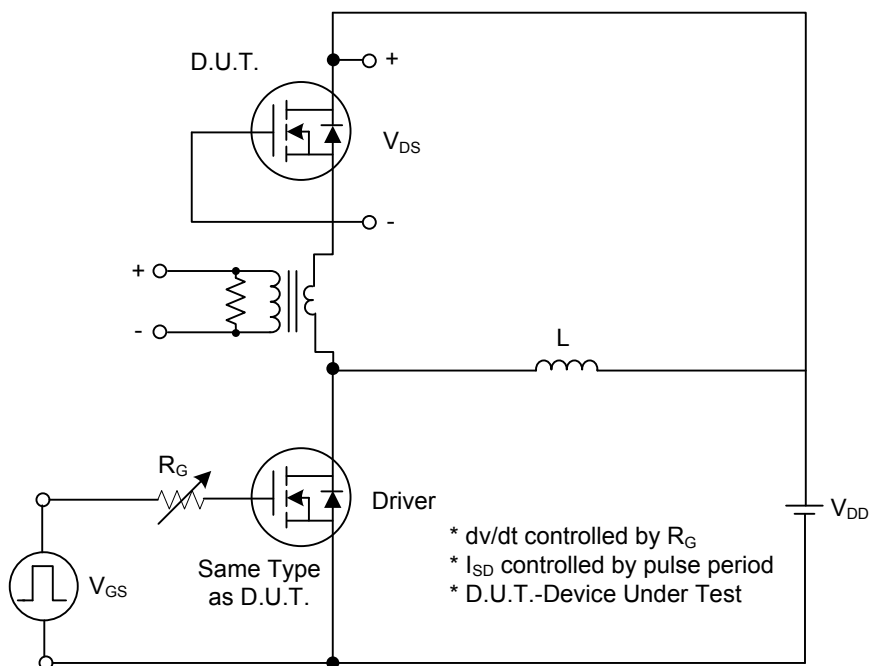


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

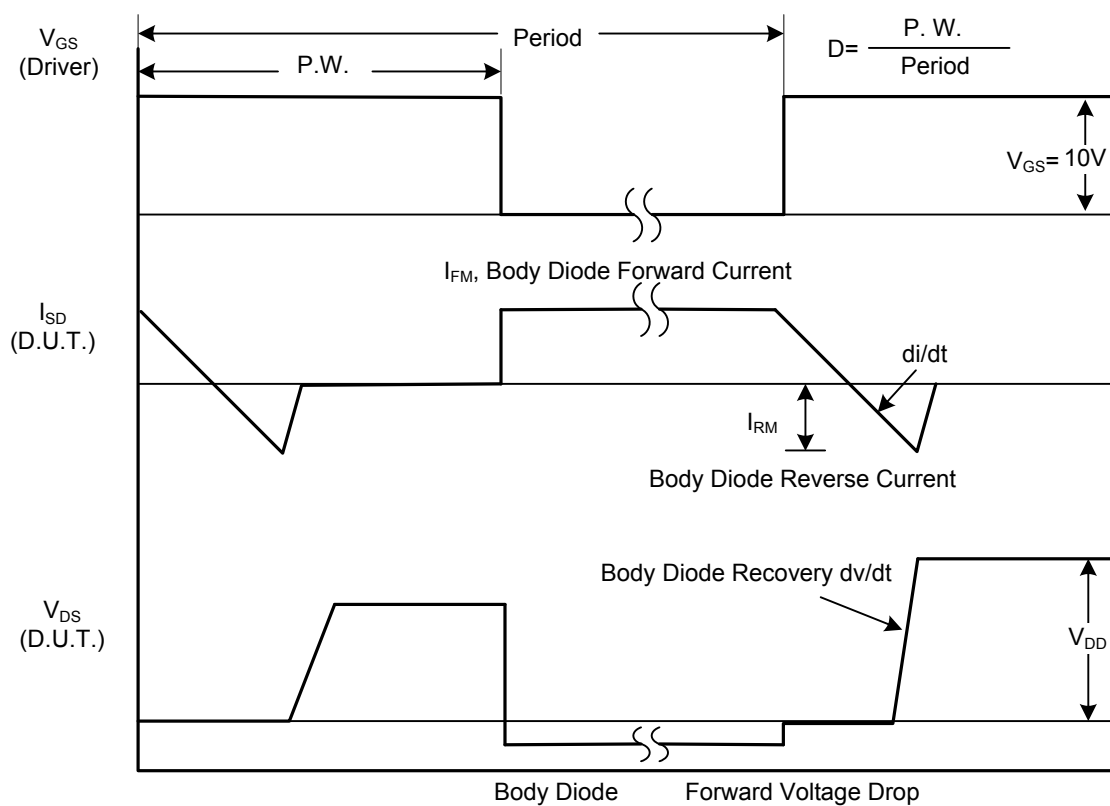


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

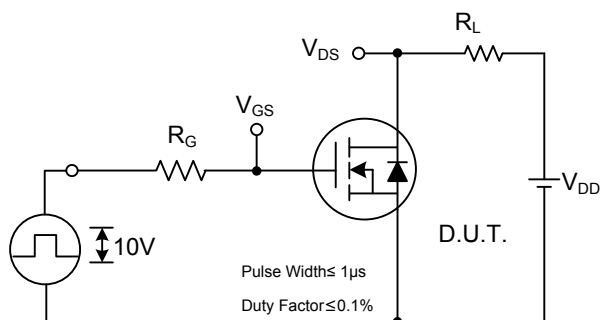


Fig. 2A Switching Test Circuit

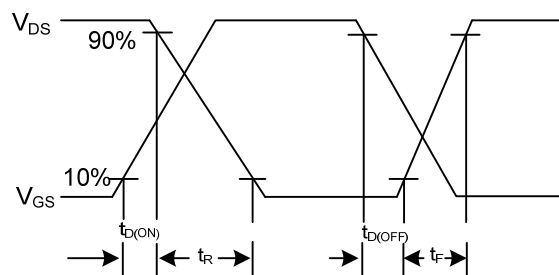


Fig. 2B Switching Waveforms

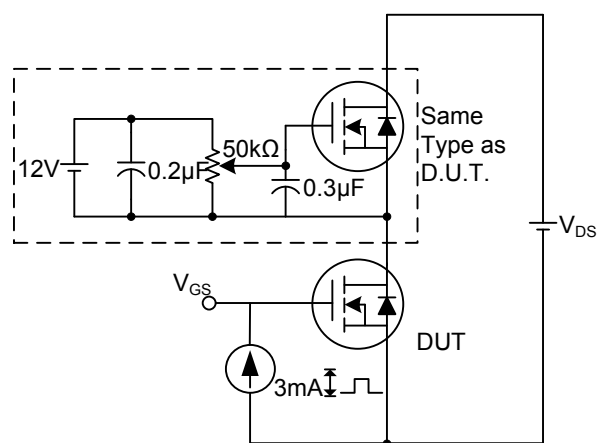


Fig. 3A Gate Charge Test Circuit

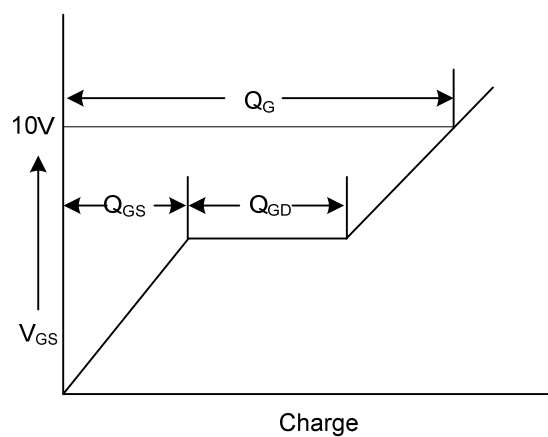


Fig. 3B Gate Charge Waveform

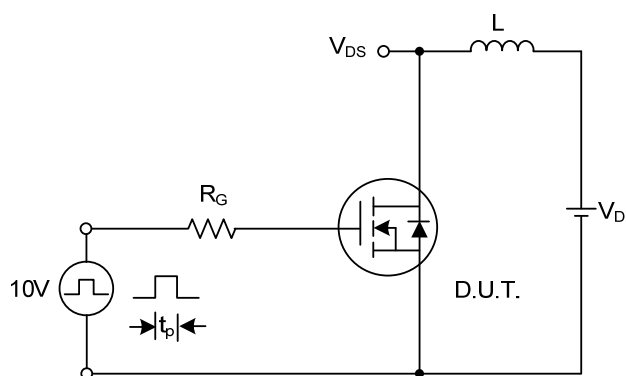


Fig. 4A Unclamped Inductive Switching Test Circuit

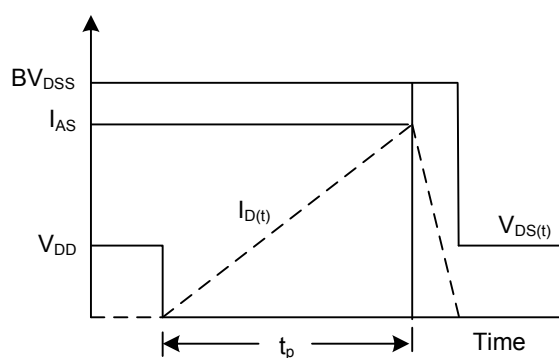


Fig. 4B Unclamped Inductive Switching Waveforms

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