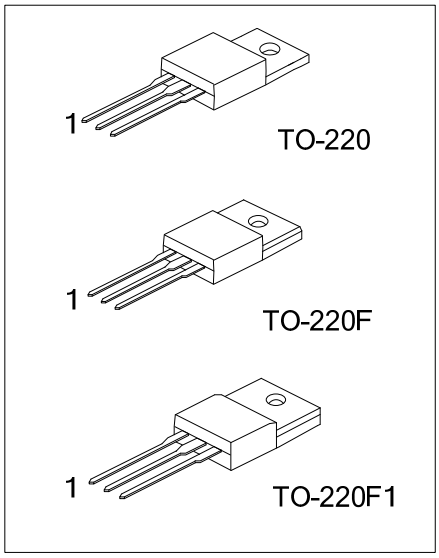
7N60L

Power MOSFET

7.4 Amps, 600Volts
N-CHANNEL MOSFET



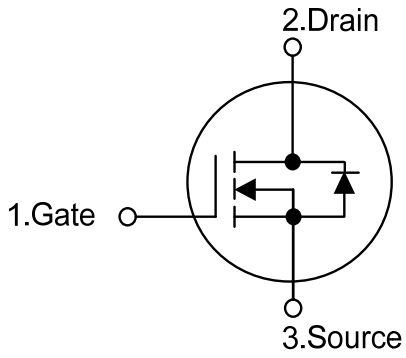
■ DESCRIPTION

The UTC **7N60L** 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

* $R_{DS(ON)}$ < 1.2Ω @V_{GS} = 10 V
* 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



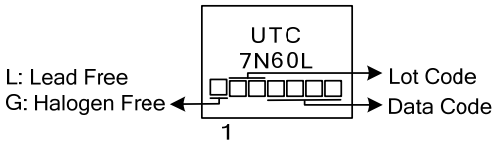
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free Plating	Halogen Free		1	2	3	
7N60LL-x-TA3-T	7N60LG-x-TA3-T	TO-220	G	D	S	Tube
7N60LL-x-TF1-T	7N60LG-x-TF1-T	TO-220F1	G	D	S	Tube
7N60LL-x-TF3-T	7N60LG-x-TF3-T	TO-220F	G	D	S	Tube

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

7N60LL-TA3-T (1)Packing Type (2)Package Type (3)Lead Plating	(1) T: Tube (2) TA3: TO-220, TF1: TO220-F1, TF3: TO-220F (3) L: Lead Free, G: Halogen Free

■ MARKING



■ 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}	7.4	A
Continuous Drain Current		I_D	7.4	A
Pulsed Drain Current (Note 1)		I_{DM}	29.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	600	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	P_D	142	W
	TO-220F/TO-220F1		48	W
Junction Temperature		T_J	+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 maximum junction temperature
3. L = 22mH, I_{AS} = 7.4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
4. I_{SD} ≤7.4A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	°C/W
	TO-220F/TO-220F1		62.5	°C/W
Junction to Case	TO-220	θ_{JC}	0.88	°C/W
	TO-220F/TO-220F1		2.6	°C/W

■ ELECTRICAL CHARACTERISTICS (T_C =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			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		$\triangle BV_{DSS}/\triangle T_J$	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			1.2	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
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, dI_F / dt = 100A/μs (Note 1)		320		ns
Reverse Recovery Charge		Q_{RR}			2.4		μC

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

■ TEST CIRCUITS AND WAVEFORMS

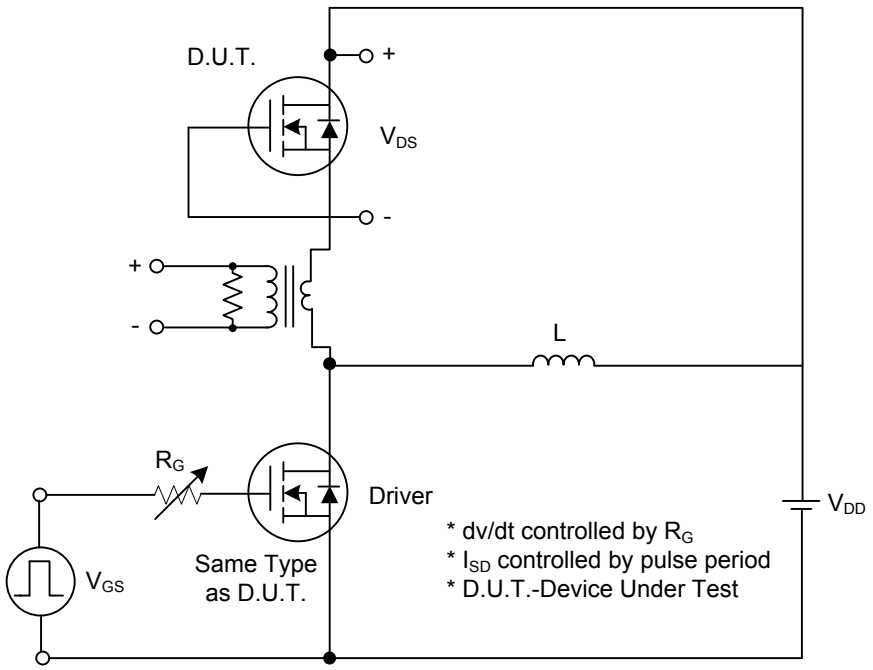


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

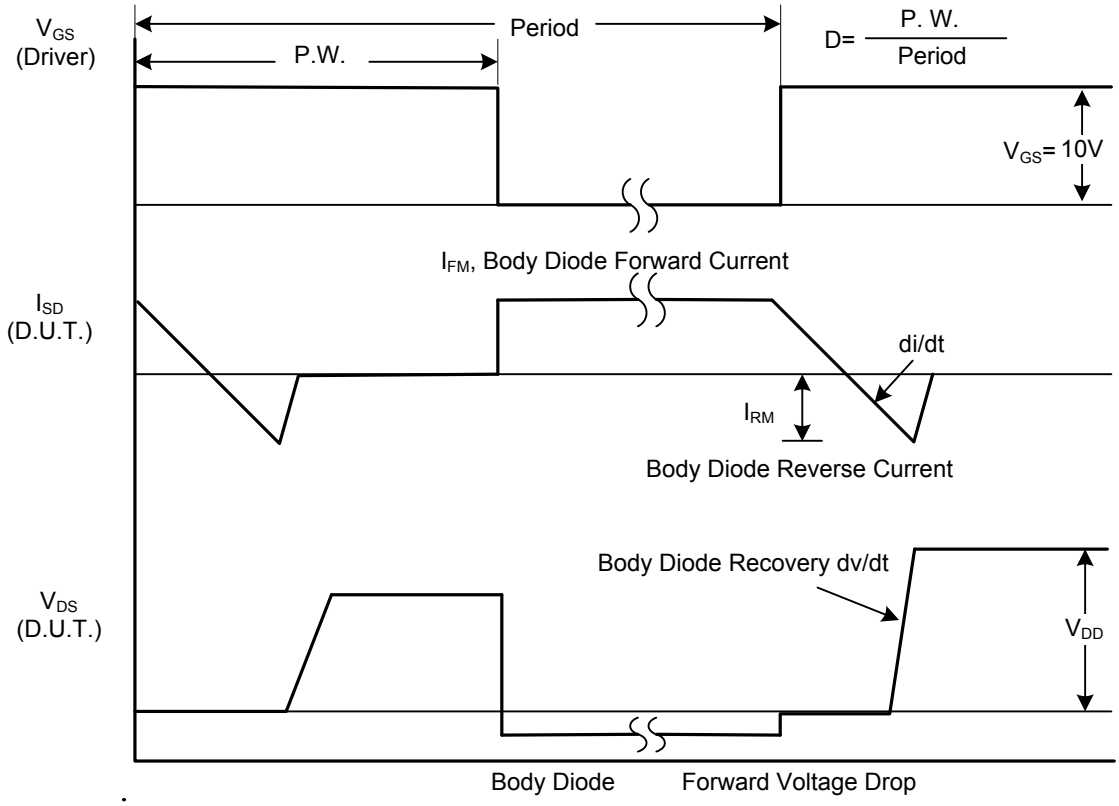


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

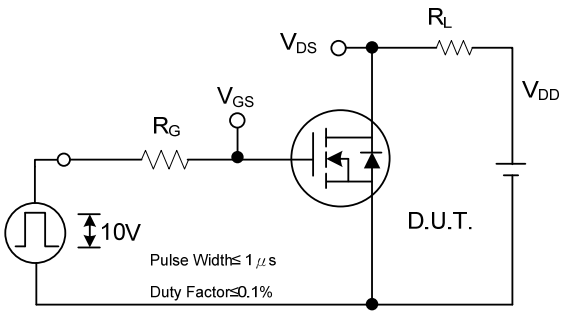


Fig. 2A Switching Test Circuit

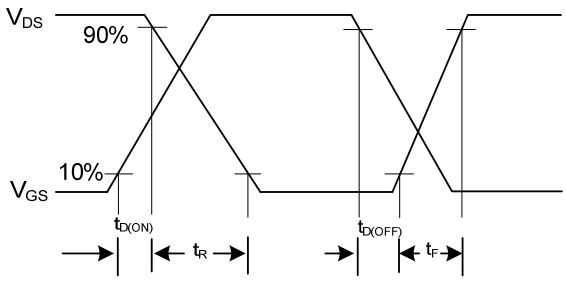


Fig. 2B Switching Waveforms

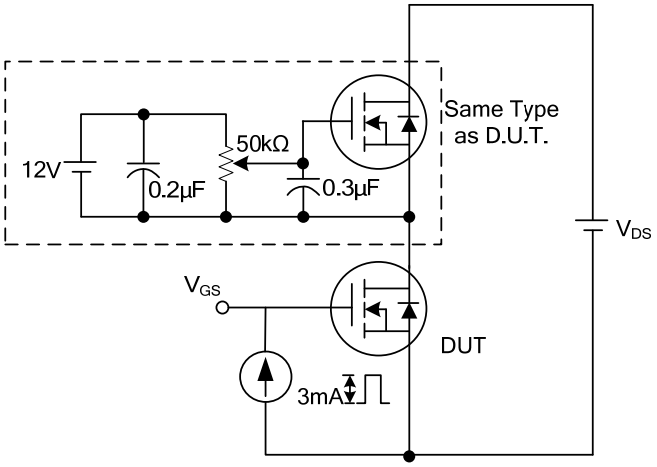


Fig. 3A Gate Charge Test Circuit

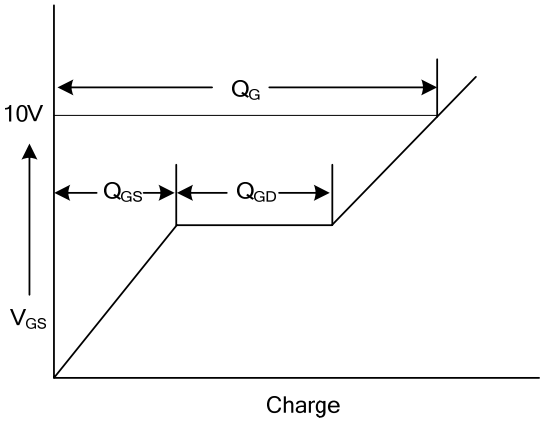


Fig. 3B Gate Charge Waveform

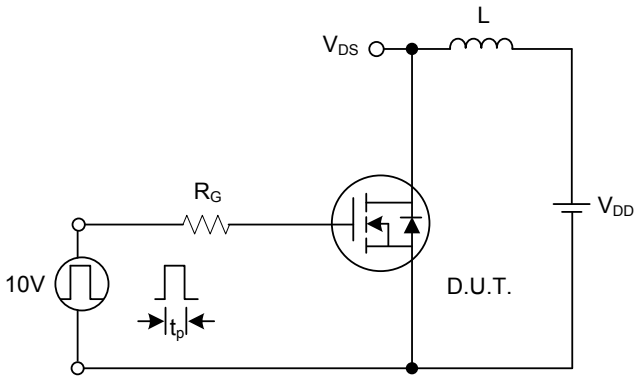


Fig. 4A Unclamped Inductive Switching Test Circuit

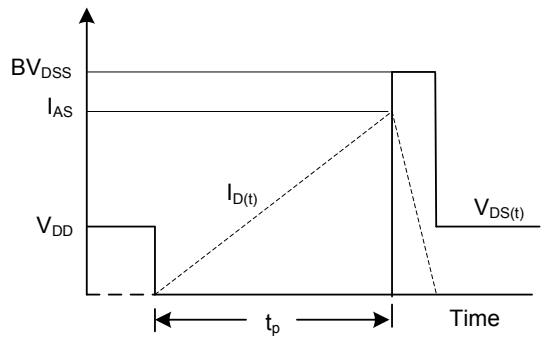
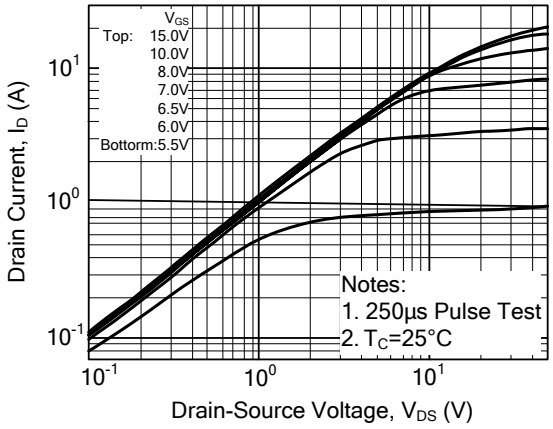


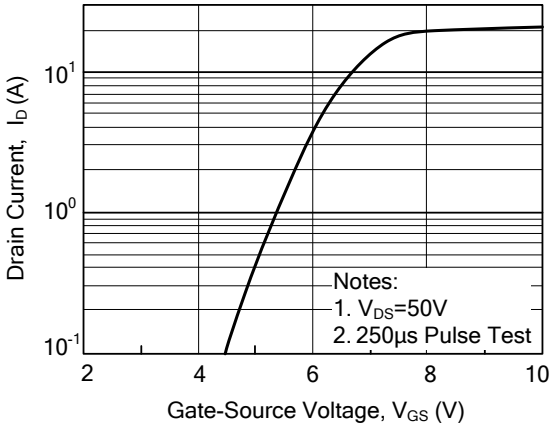
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

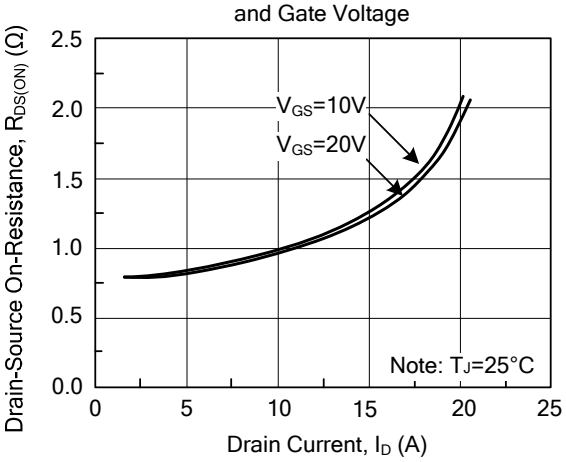
On-Region Characteristics



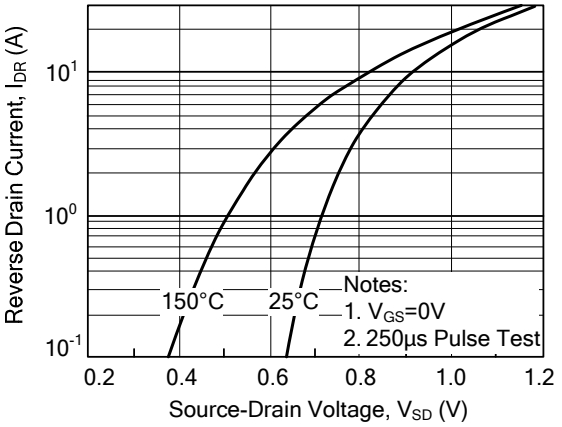
Transfer Characteristics



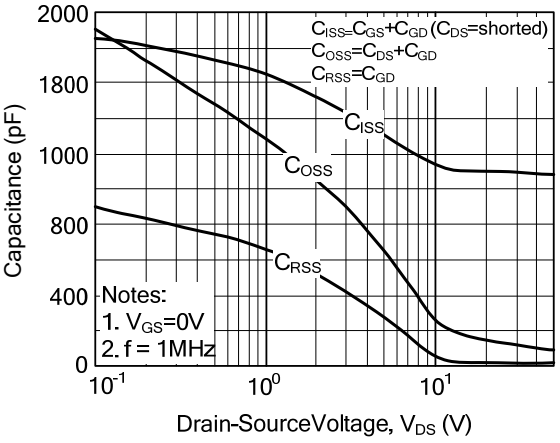
On-Resistance Variation vs. Drain Current and Gate Voltage



Body Diode Forward Voltage Variation vs. Source Current and Temperature



Capacitance Characteristics



Maximum Safe Operating Area