



7N60L

Power MOSFET

7.4 Amps, 600Volts N-CHANNEL MOSFET

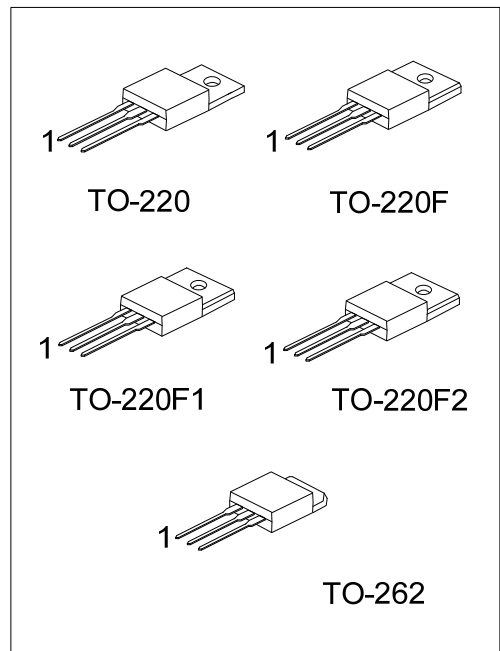
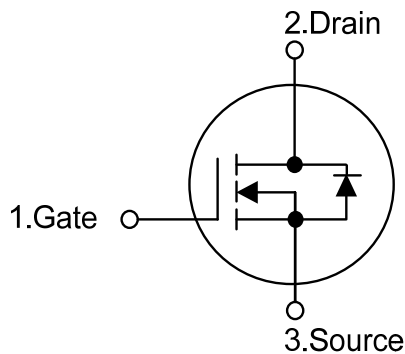
■ DESCRIPTION

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

- * $R_{DS(ON)} \leq 1.2 \Omega @ V_{GS}=10V, I_D=3.7A$
- * 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



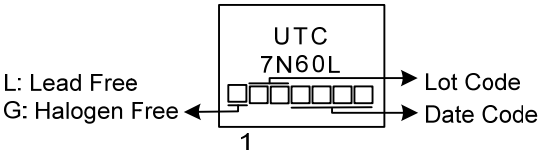
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free Plating	Halogen Free		1	2	3	
7N60LL-TA3-T	7N60LG-TA3-T	TO-220	G	D	S	Tube
7N60LL-TF1-T	7N60LG-TF1-T	TO-220F1	G	D	S	Tube
7N60LL-TF2-T	7N60LG-TF2-T	TO-220F2	G	D	S	Tube
7N60LL-TF3-T	7N60LG-TF3-T	TO-220F	G	D	S	Tube
7N60LL-T2Q-T	7N60LG-T2Q-T	TO-262	G	D	S	Tube

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

<p>7N60LG-TA3-T</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO220-F1, TF2: TO-220F2, TF3: TO-220F, T2Q: TO-262 (3) G: Halogen Free and Lead Free, L: 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}	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/TO-262	P_D	142	W
	TO-220F/TO-220F1		48	W
	TO-220F2			
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. $L = 22\text{mH}$, $I_{AS} = 7.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, 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		θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262	θ_{JC}	0.88	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		2.6	$^\circ\text{C}/\text{W}$
	TO-220F2			

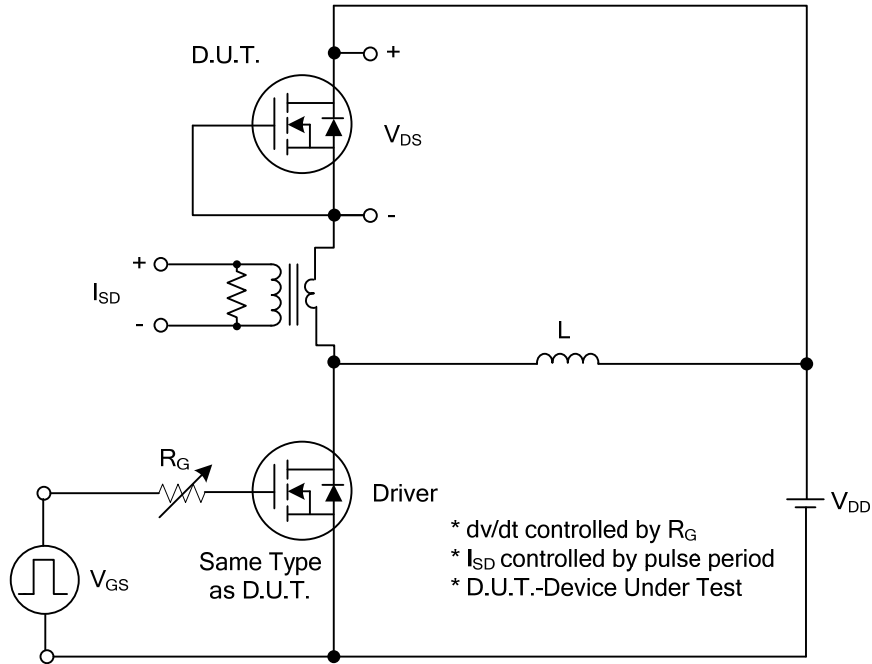
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

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}			100	nA
	Reverse				-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			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						
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
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
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				7.4	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				29.6	A
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 7.4 A			1.4	V
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	

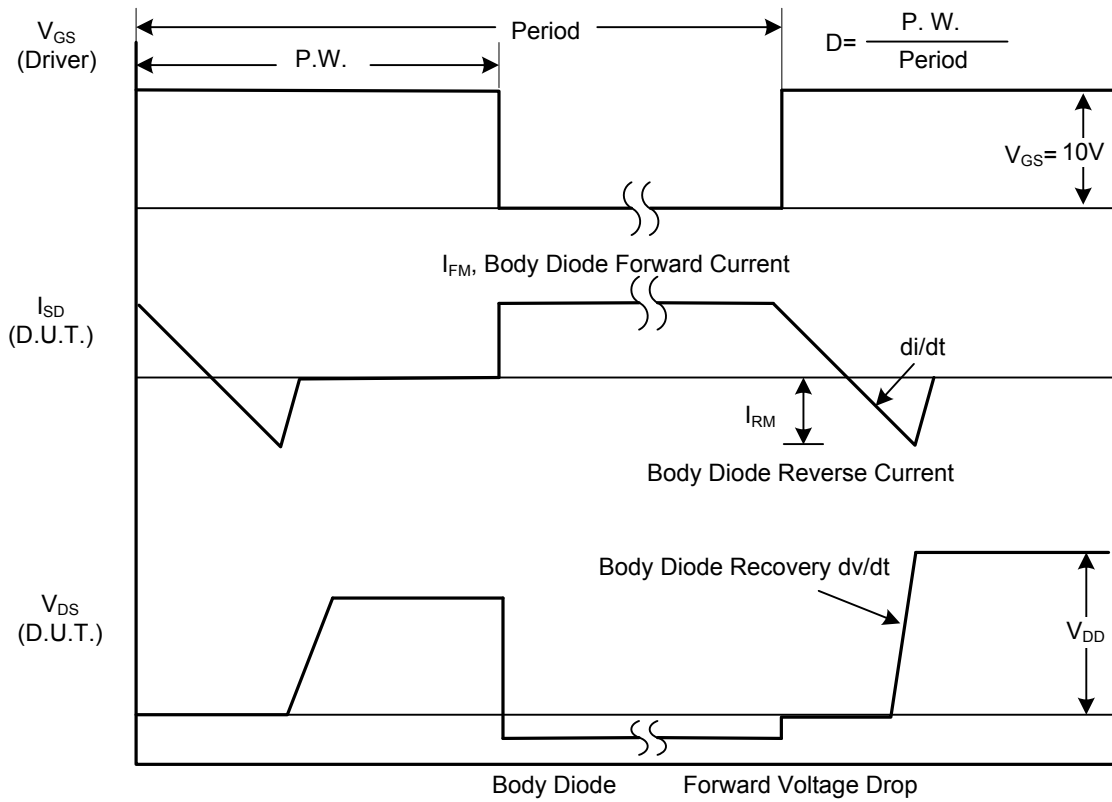
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

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

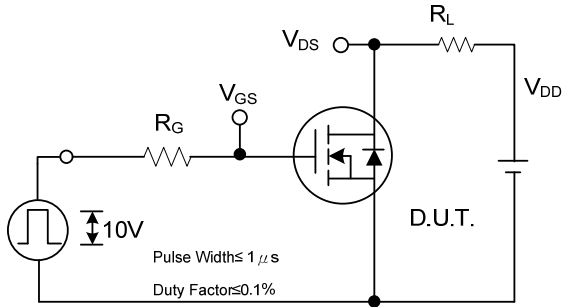


Fig. 2A Switching Test Circuit

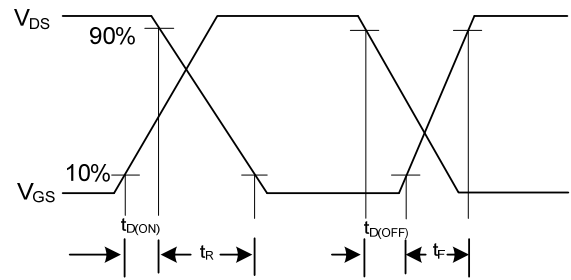


Fig. 2B Switching Waveforms

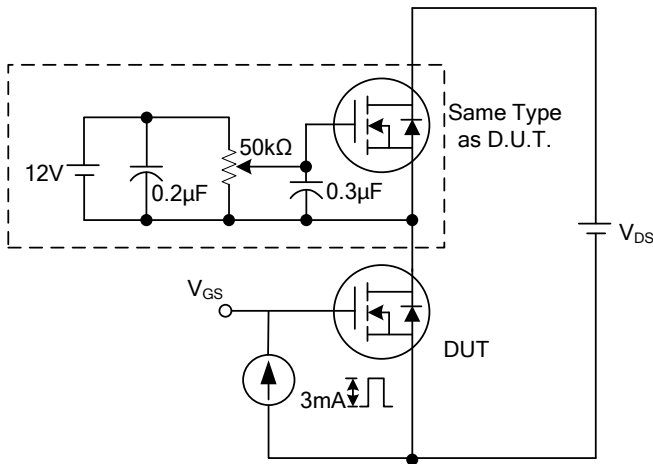


Fig. 3A Gate Charge Test Circuit

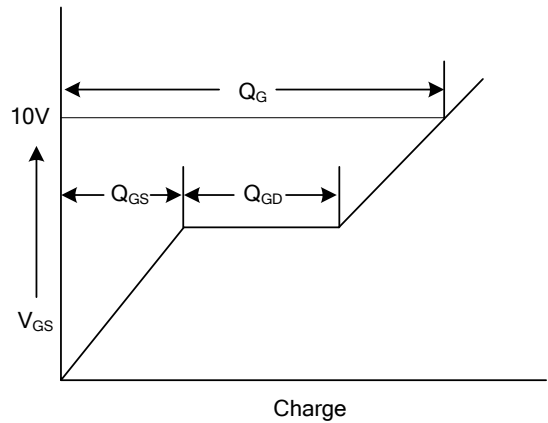


Fig. 3B Gate Charge Waveform

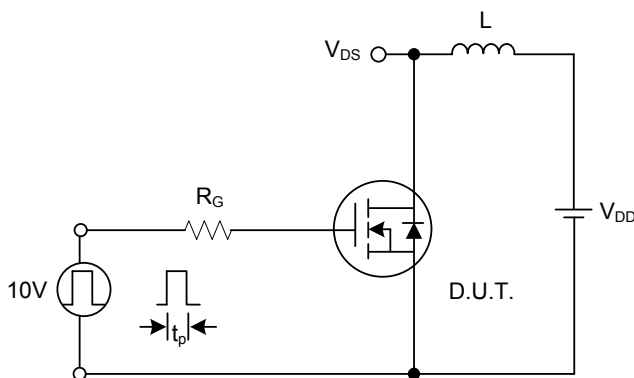


Fig. 4A Unclamped Inductive Switching Test Circuit

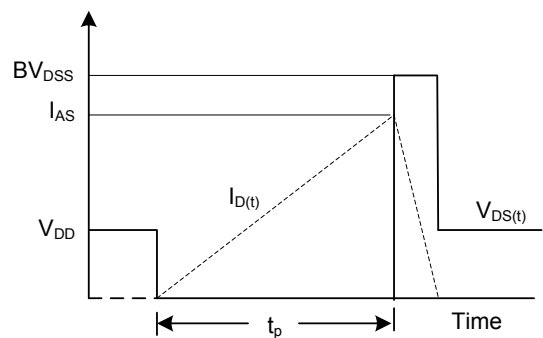
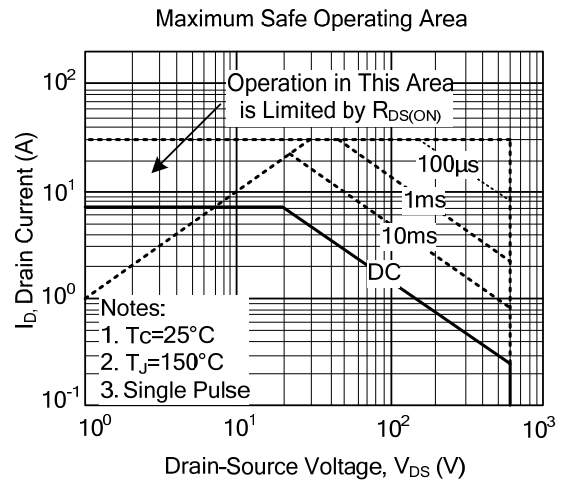
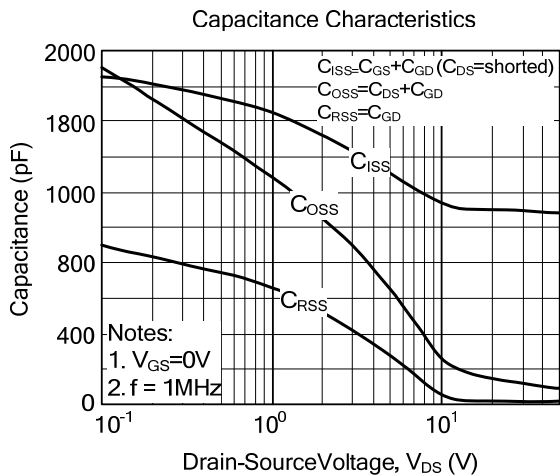
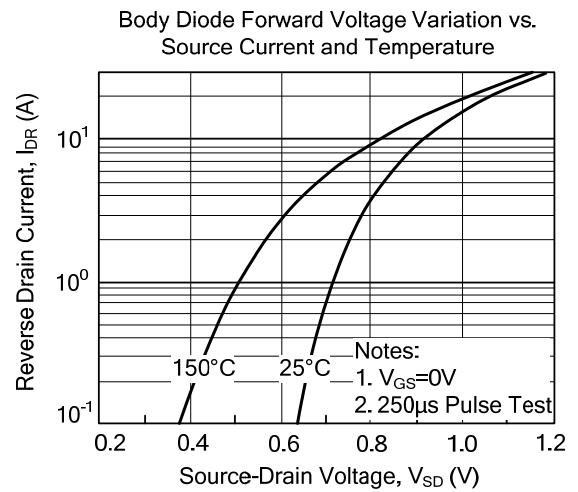
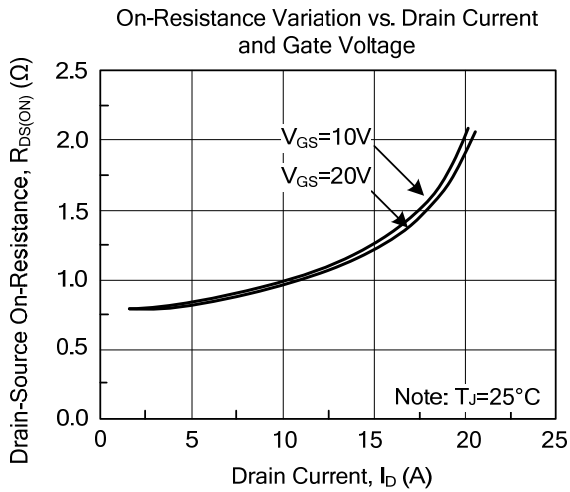
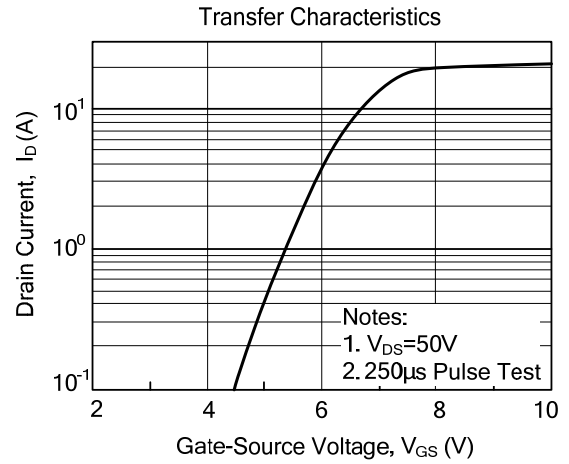
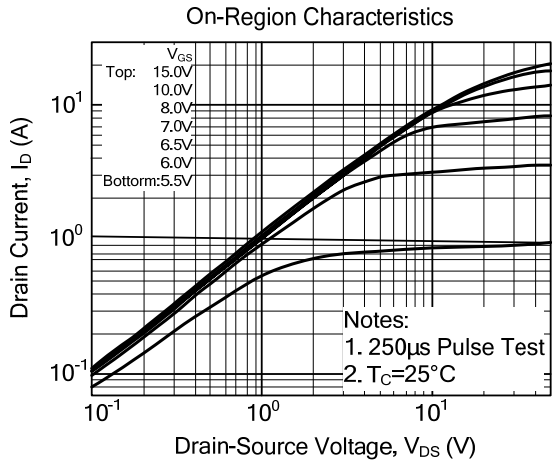


Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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