



**7N60-CBQ**

Preliminary

**Power MOSFET**

**7.0A, 600V N-CHANNEL  
POWER MOSFET**

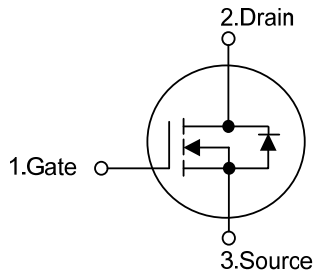
■ DESCRIPTION

The UTC **7N60-CBQ** is a high voltage and high current power MOSFET, 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 power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- \*  $R_{DS(ON)} < 1.4\Omega @ V_{GS} = 10V, I_D = 3.5A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL

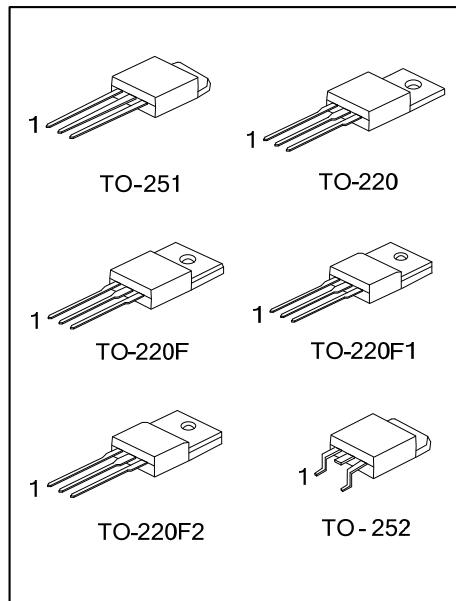


■ ORDERING INFORMATION

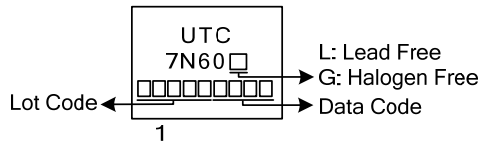
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N60L-TA3-T	7N60G-TA3-T	TO-220	G	D	S	Tube
7N60L-TF1-T	7N60G-TF1-T	TO-220F1	G	D	S	Tube
7N60L-TF3-T	7N60G-TF3-T	TO-220F2	G	D	S	Tube
7N60L-TF3-T	7N60G-TF3-T	TO-220F	G	D	S	Tube
7N60L-TM3-R	7N60G-TM3-R	TO-251	G	D	S	Tape Reel
7N60L-TN3-R	7N60G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>7N60L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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## MARKING



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■ 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	7.0	A
	Pulsed (Note 2)	$I_{DM}$	28	A
Avalanche Current (Note 2)		$I_{AR}$	3.7	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	68	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.0	V/ns
Power Dissipation	TO-220	$P_D$	142	W
	TO-220F/TO-220F1 TO-220F2		48	W
	TO-251/TO-252		59	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Operating Temperature		$T_{OPR}$	-55 ~ +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.  $L = 10\text{mH}$ ,  $I_{AS} = 3.7\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 7.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
	TO-220		0.88	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1 TO-220F2	$\theta_{JC}$	2.6	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.12	$^\circ\text{C}/\text{W}$

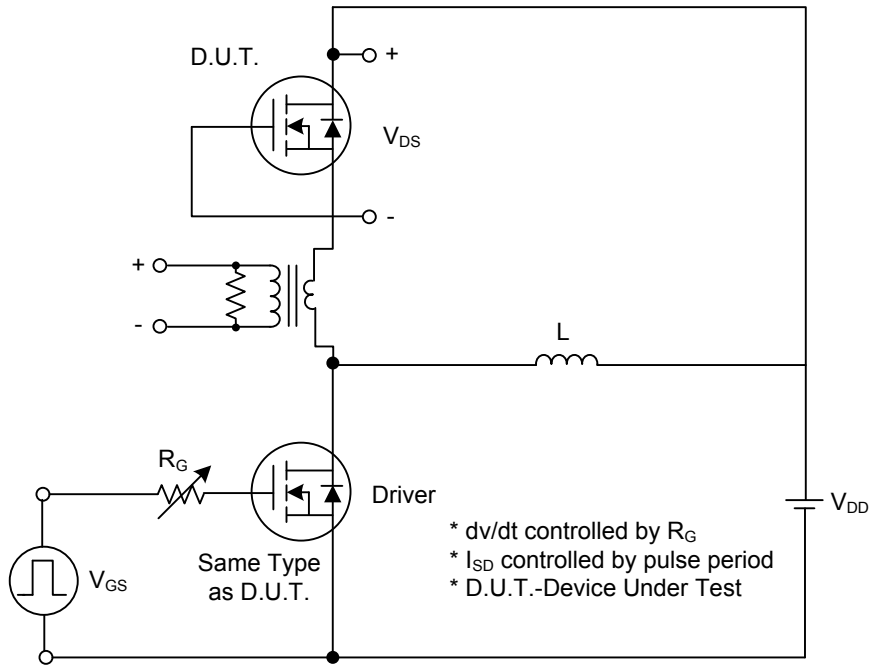
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$			1.4	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		625		pF
Output Capacitance	$C_{OSS}$			83		pF
Reverse Transfer Capacitance	$C_{RSS}$			4.3		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=50\text{ V}, V_{GS}=10\text{ V}, I_D=1.3\text{ A}$ $I_G=100\ \mu\text{A}$ (Note 1, 2)		64		nC
Gate to Source Charge	$Q_{GS}$			5.6		nC
Gate to Drain Charge	$Q_{GD}$			3.6		nC
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD} = 30\text{ V}, V_{GS} = 10\text{ V},$ $I_D = 0.5\text{ A}, R_G = 25\ \Omega$ (Note 1, 2)		48		ns
Rise Time	$t_R$			22		ns
Turn-off Delay Time	$t_{D(OFF)}$			160		ns
Fall-Time	$t_F$			25		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				7	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				28	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 7.0\text{ A}$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$V_{GS} = 0\text{ V}, I_S = 7.0\text{ A}$		440		ns
Reverse Recovery Charge	$Q_{rr}$	$dI_F/dt = 100\text{ A}/\mu\text{s}$		2.2		$\mu\text{C}$

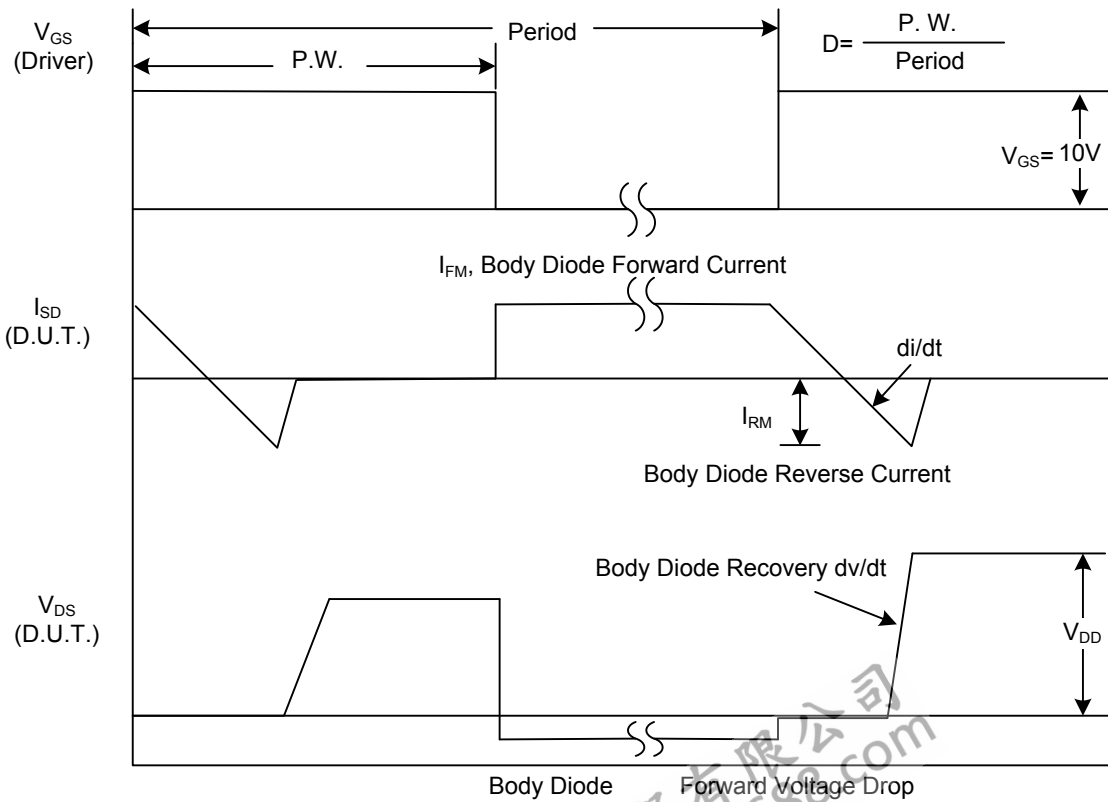
Notes: 1. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

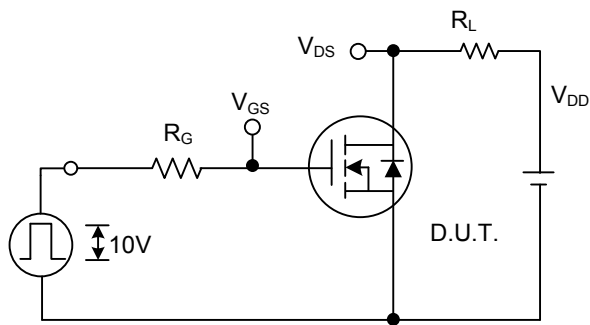


Peak Diode Recovery  $dv/dt$  Test Circuit

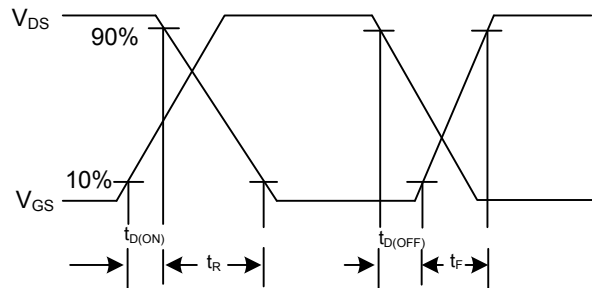


Peak Diode Recovery  $dv/dt$  Waveforms

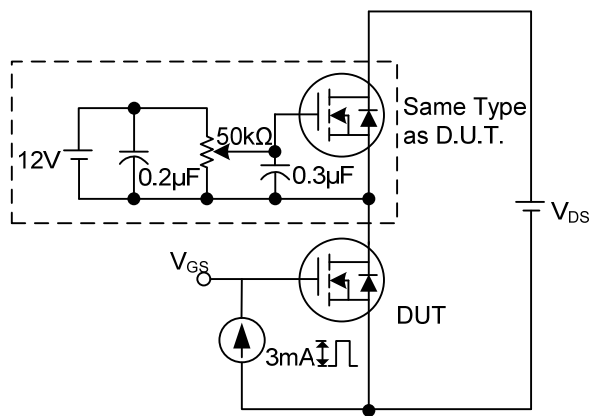
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



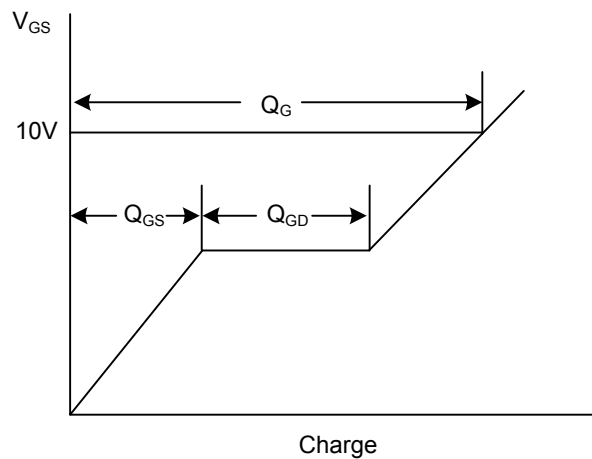
Switching Test Circuit



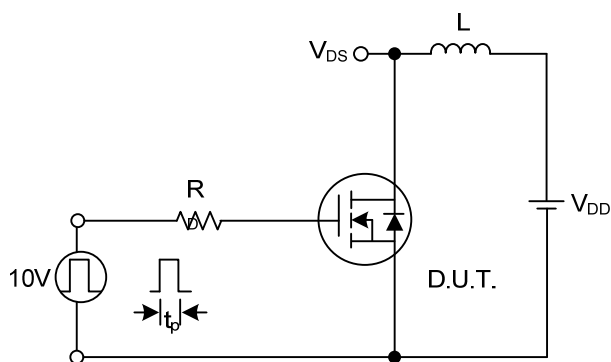
Switching Waveforms



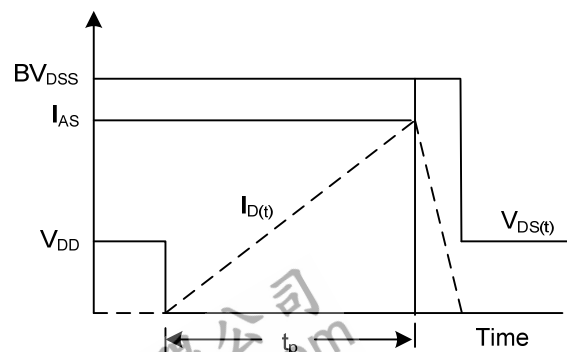
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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