



## 6N60-CQ

Preliminary

Power MOSFET

### 6A, 600V N-CHANNEL POWER MOSFET

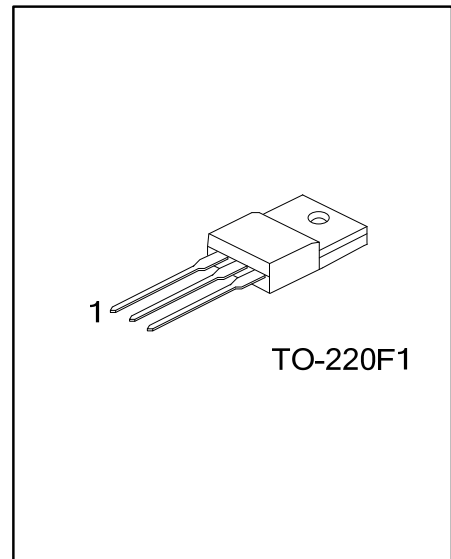
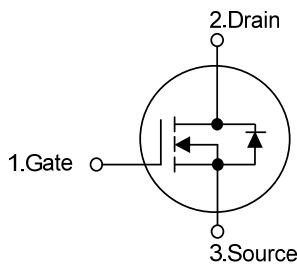
#### DESCRIPTION

The UTC **6N60-CQ** is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

#### FEATURES

- \*  $R_{DS(ON)} < 1.2 \Omega @ V_{GS} = 10 V, I_D = 3.0 A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL



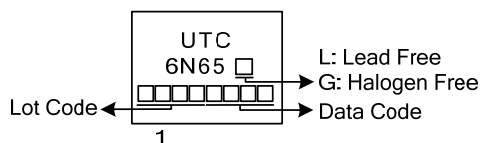
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N60L-TF1-T	6N60G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>6N65G-TF1-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) TF1: TO-220F1</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
--	--

#### 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	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	6	A
Pulsed Drain Current (Note 2)	$I_{DM}$	24	A
Avalanche Energy	$E_{AS}$	216	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	3	V/ns
Power Dissipation	$P_D$	40	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.  $L = 12\text{mH}$ ,  $I_{AS} = 6.0\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 6.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	3.2	$^\circ\text{C}/\text{W}$

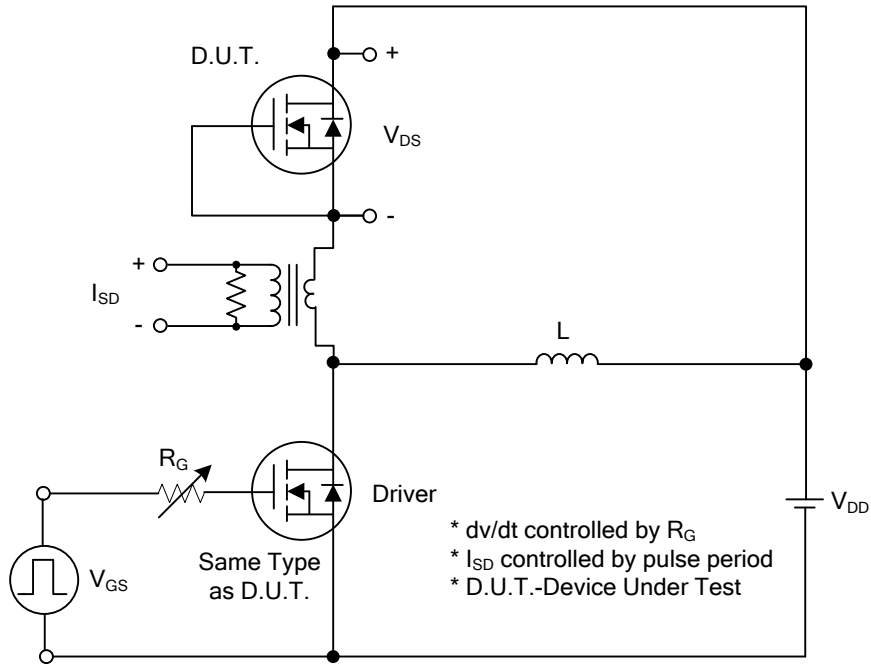
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

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	$I_{DSS}$	$V_{DS} = 600\text{V}$ , $V_{GS} = 0\text{V}$			10	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$			100	nA
					Reverse	$V_{GS} = 30\text{V}$ , $V_{DS} = 0\text{V}$
<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	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$ , $I_D = 3.0\text{A}$			1.2	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\ \text{MHz}$		940		pF
Output Capacitance	$C_{OSS}$			250		pF
Reverse Transfer Capacitance	$C_{RSS}$			85		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS} = 50\text{V}$ , $V_{GS} = 10\text{V}$ , $I_D = 1.3\text{A}$ , $I_D = 100\ \mu\text{A}$ (Note 1, 2)		97		nC
Gate-Source Charge	$Q_{GS}$			8		nC
Gate-Drain Charge	$Q_{GD}$			21		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)		54		ns
Turn-On Rise Time	$t_R$			128		ns
Turn-Off Delay Time	$t_{D(OFF)}$			272		ns
Turn-Off Fall Time	$t_F$			178		ns
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				6	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				24	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S = 6.0\text{A}$ , $V_{GS} = 0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_S = 6.0\text{A}$ , $V_{GS} = 0\text{V}$		320		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{A}/\mu\text{s}$		2.27		$\mu\text{C}$

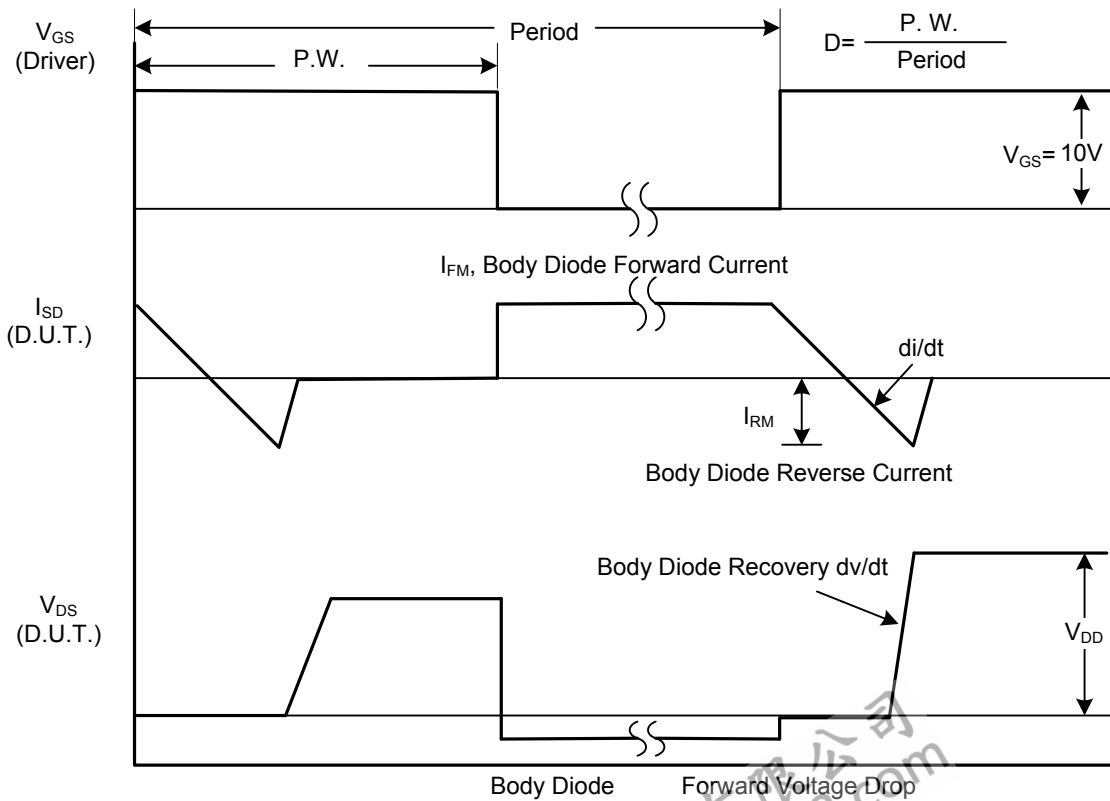
Notes: 1. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

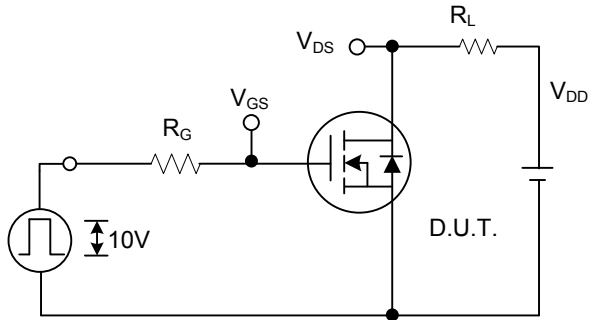


Peak Diode Recovery dv/dt Test Circuit

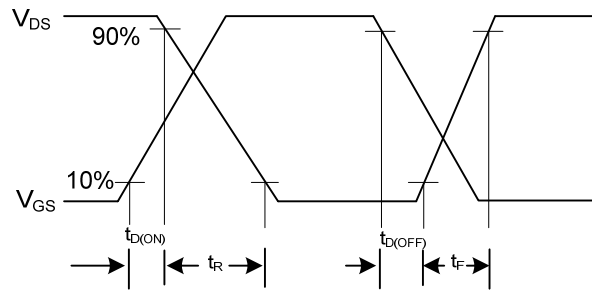


Peak Diode Recovery dv/dt Waveforms

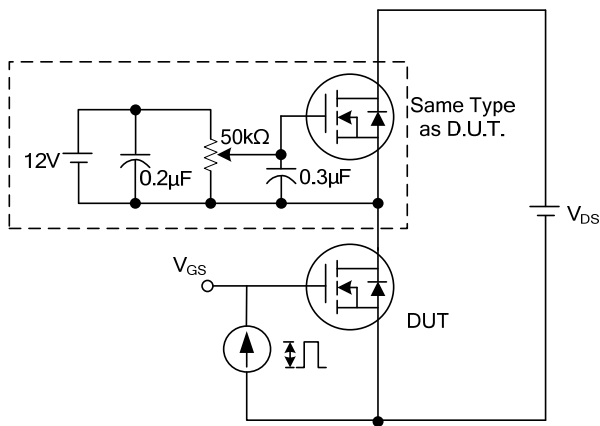
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



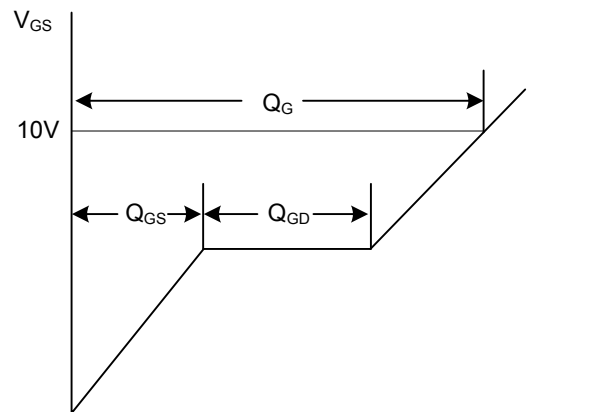
Switching Test Circuit



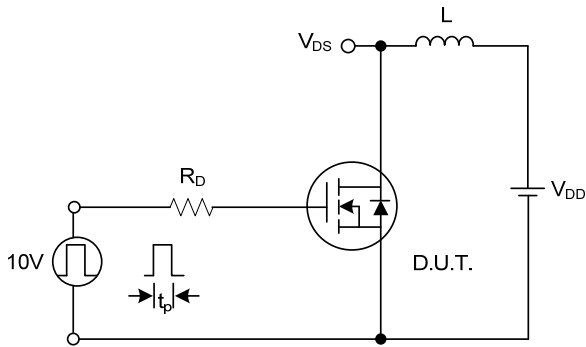
Switching Waveforms



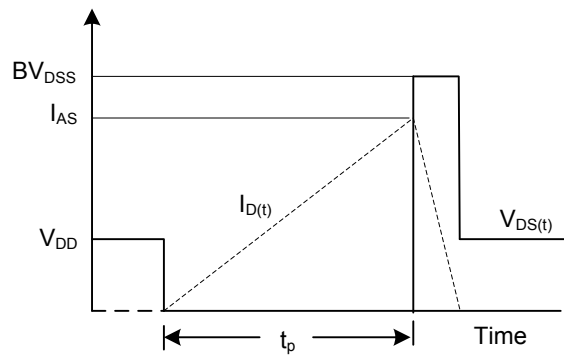
Gate Charge Test Circuit



Charge  
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.