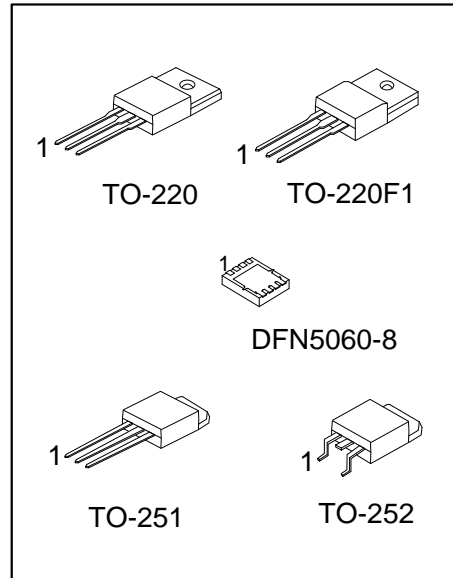




**UTT50N06M**

**POWER MOSFET**

**50A, 60V N-CHANNEL  
ENHANCEMENT MODE  
TRENCH POWER MOSFET**



**DESCRIPTION**

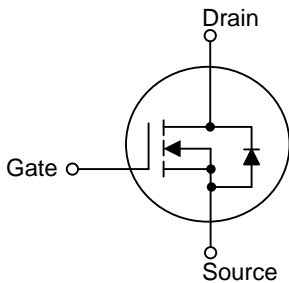
The UTC **UTT50N06M** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with low  $R_{DS(ON)}$  characteristic by high cell density trench technology.

The UTC **UTT50N06M** is suitable for high efficiency synchronous rectification in SMPS, UPS, hard switched and high frequency circuits.

**FEATURES**

- \*  $R_{DS(ON)} \leq 12 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=25\text{A}$
- $R_{DS(ON)} \leq 15 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=20\text{A}$
- \* High Cell Density Trench Technology
- \* High Power and Current Handling Capability

**SYMBOL**



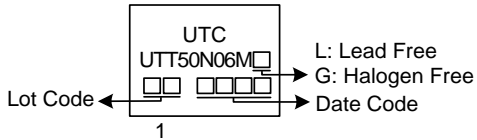
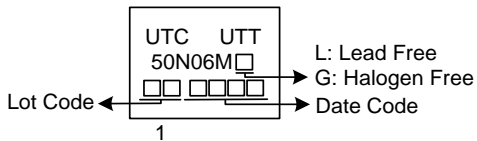
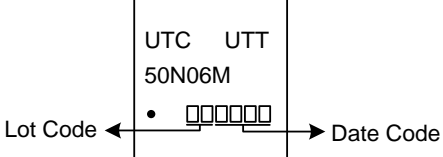
**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UTT50N06ML-TA3-T	UTT50N06MG-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
UTT50N06ML-TF1-T	UTT50N06MG-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
UTT50N06ML-TM3-T	UTT50N06MG-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
UTT50N06ML-TN3-R	UTT50N06MG-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UTT50N06ML-K08-5060-R	UTT50N06MG-K08-5060-R	DFN5060-8	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UTT50N06MG-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, TF1: TO-220F1, TM3: TO-251 TN3: TO-252, K08-5060: DFN5060-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

PACKAGE	MARKING
TO-220 / TO-220F1	 <p>UTC UTT50N06M □□□□ □□ 1</p> <p>Lot Code ← → Date Code</p> <p>L: Lead Free G: Halogen Free</p>
TO-251 / TO-252	 <p>UTC UTT 50N06M □□□□ □□ 1</p> <p>Lot Code ← → Date Code</p> <p>L: Lead Free G: Halogen Free</p>
DFN5060-8	 <p>UTC UTT 50N06M • □□□□□</p> <p>Lot Code ← → Date Code</p>

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### ■ ABSOLUTE MAXIMUM RATING ( $T_C=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	Continuous	$I_D$	50	A
	Pulsed (Note 2)	$I_{DM}$	200	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	26	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.4	V/ns
Power Dissipation	TO-220	$P_D$	100	W
	TO-220F1		36	W
	TO-251/TO-252		46	W
	DFN5060-8		20.8	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature Range		$T_{STG}$	-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.  $L = 0.1 \text{ mH}$ ,  $I_{AS} = 23\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$ .

4.  $I_{SD} \leq 30\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J = 25^{\circ}\text{C}$ .

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	$\theta_{JA}$	62.5	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-252		100	$^{\circ}\text{C}/\text{W}$
	DFN5060-8		65 (Note)	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	1.24	$^{\circ}\text{C}/\text{W}$
	TO-220F1		3.47	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-252		2.7 (Note)	$^{\circ}\text{C}/\text{W}$
	DFN5060-8		6 (Note)	$^{\circ}\text{C}/\text{W}$

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

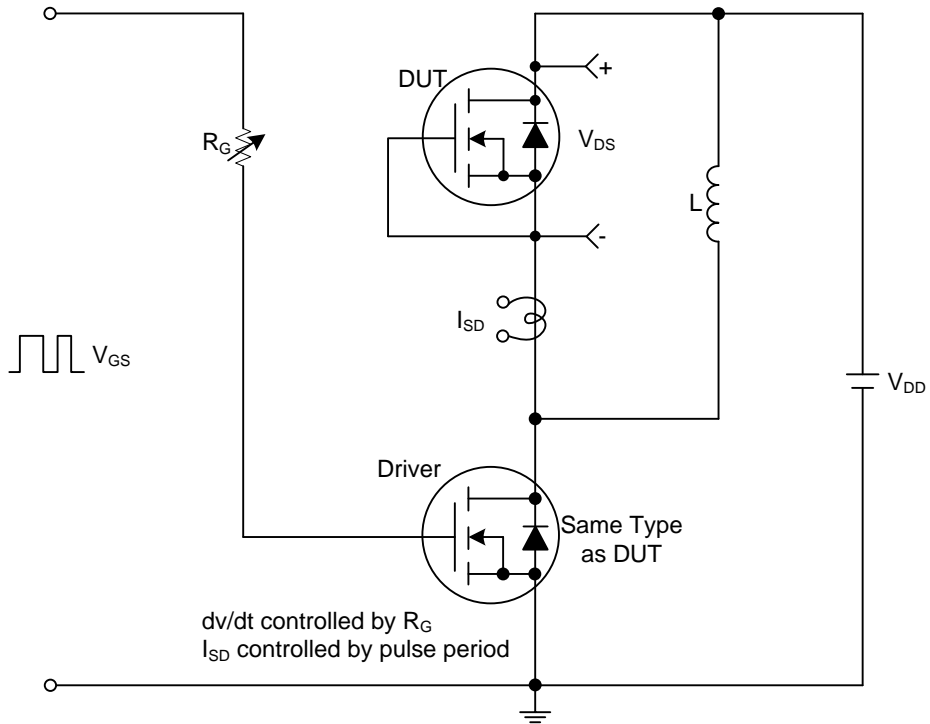
■ **ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	60			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=60\text{V}$ , $V_{GS}=0\text{V}$			1.0	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$V_{GS}=+20\text{V}$ , $V_{DS}=0\text{V}$ $V_{GS}=-20\text{V}$ , $V_{DS}=0\text{V}$			+100	nA
	Reverse				-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1.0		3.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=25\text{A}$			12	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$ , $I_D=20\text{A}$			15	$\text{m}\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		2600		pF
Output Capacitance	$C_{OSS}$			220		pF
Reverse Transfer Capacitance	$C_{RSS}$			190		pF
<b>SWITCHING PARAMETERS</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)		195		nC
Gate to Source Charge	$Q_{GS}$			9.6		nC
Gate to Drain Charge	$Q_{GD}$			18		nC
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=30\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=0.5\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		68		ns
Rise Time	$t_R$			86		ns
Turn-off Delay Time	$t_{D(OFF)}$			700		ns
Fall-Time	$t_F$			244		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				50	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				200	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=50\text{A}$ , $V_{GS}=0\text{V}$			1.3	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=30\text{A}$ , $V_{GS}=0\text{V}$ ,		32		nS
Reverse Recovery Charge	$Q_{rr}$	$di_F/dt = 100\text{A}/\mu\text{s}$		28		nC

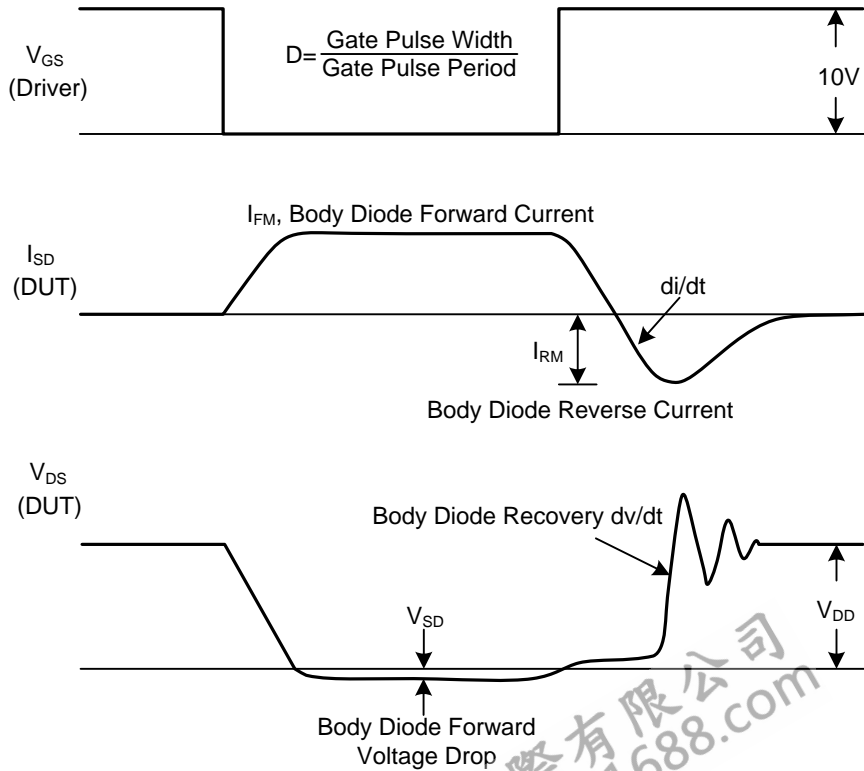
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating ambient temperature.

## TEST CIRCUITS AND WAVEFORMS



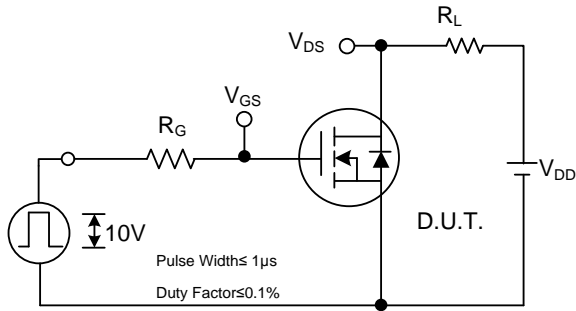
Peak Diode Recovery dv/dt Test Circuit



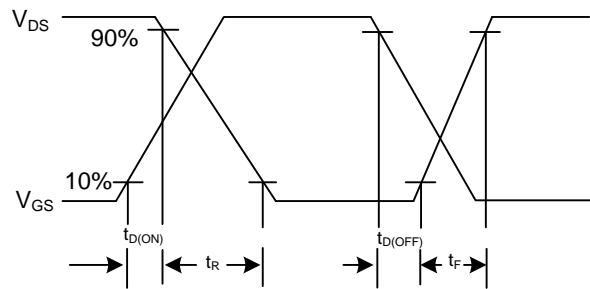
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

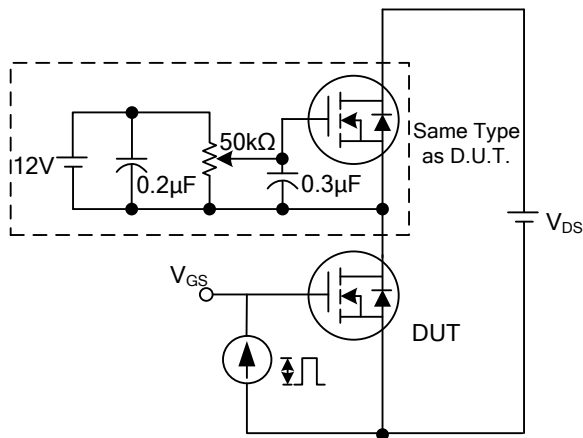
## TEST CIRCUITS AND WAVEFORMS



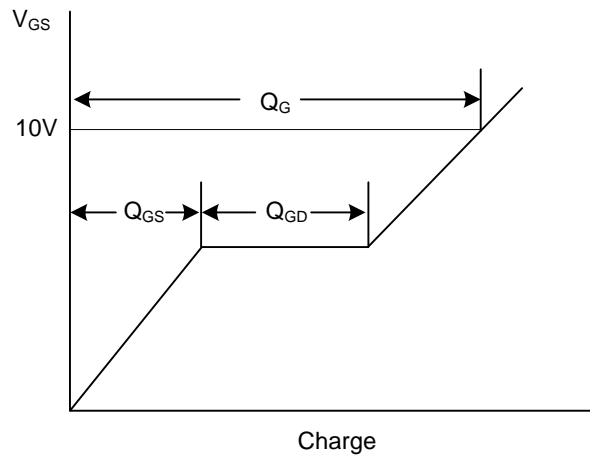
Switching Test Circuit



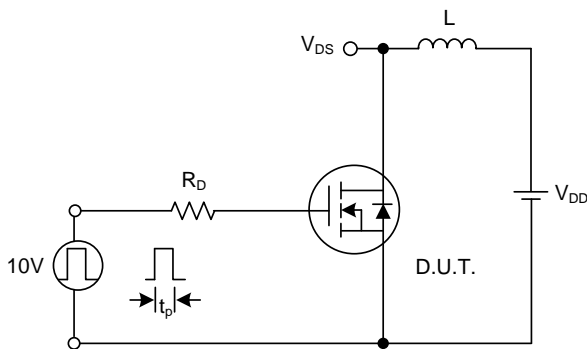
Switching Waveforms



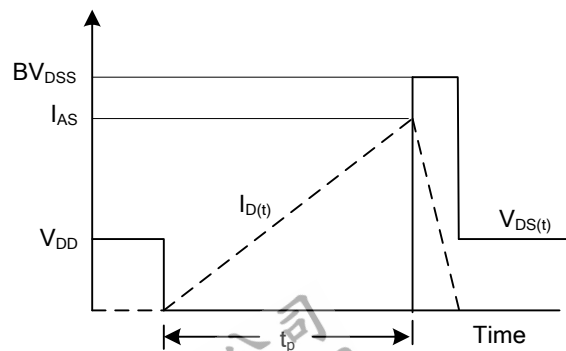
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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