



# 12N60K-MT

**Power MOSFET**

## 12A, 600V N-CHANNEL POWER MOSFET

■ DESCRIPTION

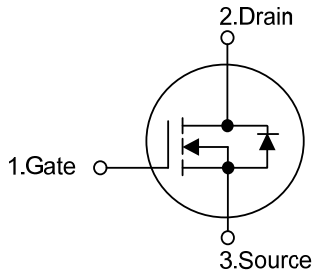
The UTC **12N60K-MT** are N-Channel enhancement mode power field effect transistors (MOSFET) which are produced using UTC's proprietary, planar stripe, DMOS technology.

These devices are suited for high efficiency switch mode power supply. To minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode the advanced technology has been especially tailored.

■ FEATURES

- \*  $R_{DS(ON)} < 0.70\Omega @ V_{GS} = 10V, I_D = 6A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

■ SYMBOL



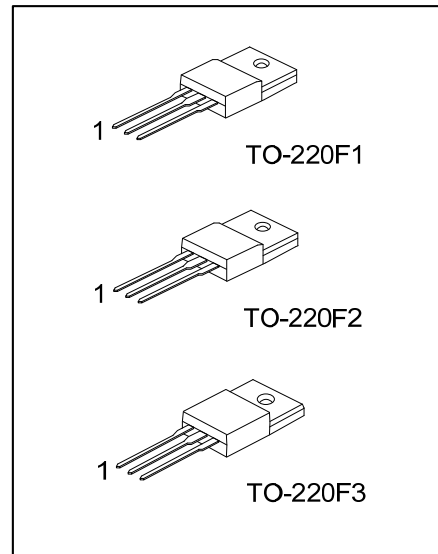
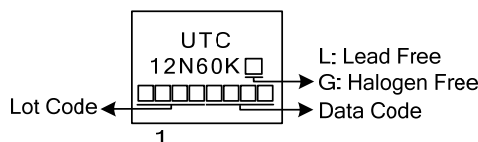
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12N60KL-TF1-T	12N60KG-TF1-T	TO-220F1	G	D	S	Tube
12N60KL-TF2-T	12N60KG-TF2-T	TO-220F2	G	D	S	Tube
12N60KL-TF3T-T	12N60KG-TF3T-T	TO-220F3	G	D	S	Tube

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

<p>12N60KL-TF1-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TF1: TO-220F1, TF2: TO-220F2, TF3T: TO-220F3 (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V <sub>DSS</sub>	600	V
Gate-Source Voltage	V <sub>GSS</sub>	±30	V
Drain Current	Continuous	I <sub>D</sub>	12
	Pulsed (Note 2)	I <sub>DM</sub>	48
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	420
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	P <sub>D</sub>	51	W
Junction Temperature	T <sub>J</sub>	+150	°C
Operating Temperature	T <sub>OPR</sub>	-55 ~ +150	°C
Storage Temperature	T <sub>STG</sub>	-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 = 5.8mH, I<sub>AS</sub> = 12A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
4. I<sub>SD</sub> ≤ 12A, di/dt ≤ 200A/s, V<sub>DD</sub> ≤ BV<sub>DSS</sub> Starting T<sub>J</sub> = 25°C

■ THERMAL DATA

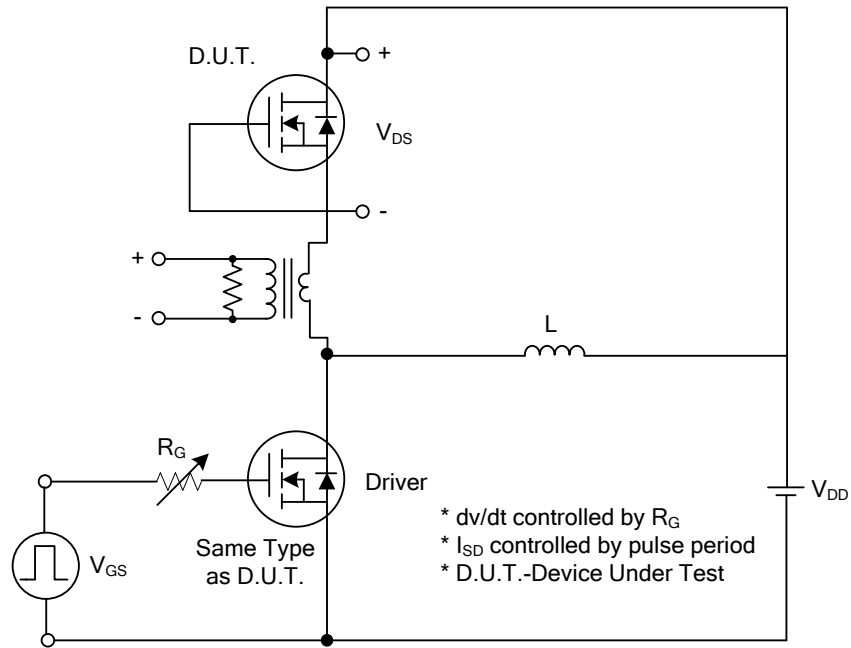
PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ <sub>JA</sub>	62.5	°C/W
Junction to Case	θ <sub>JC</sub>	2.43	°C/W

■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C, unless otherwise specified)

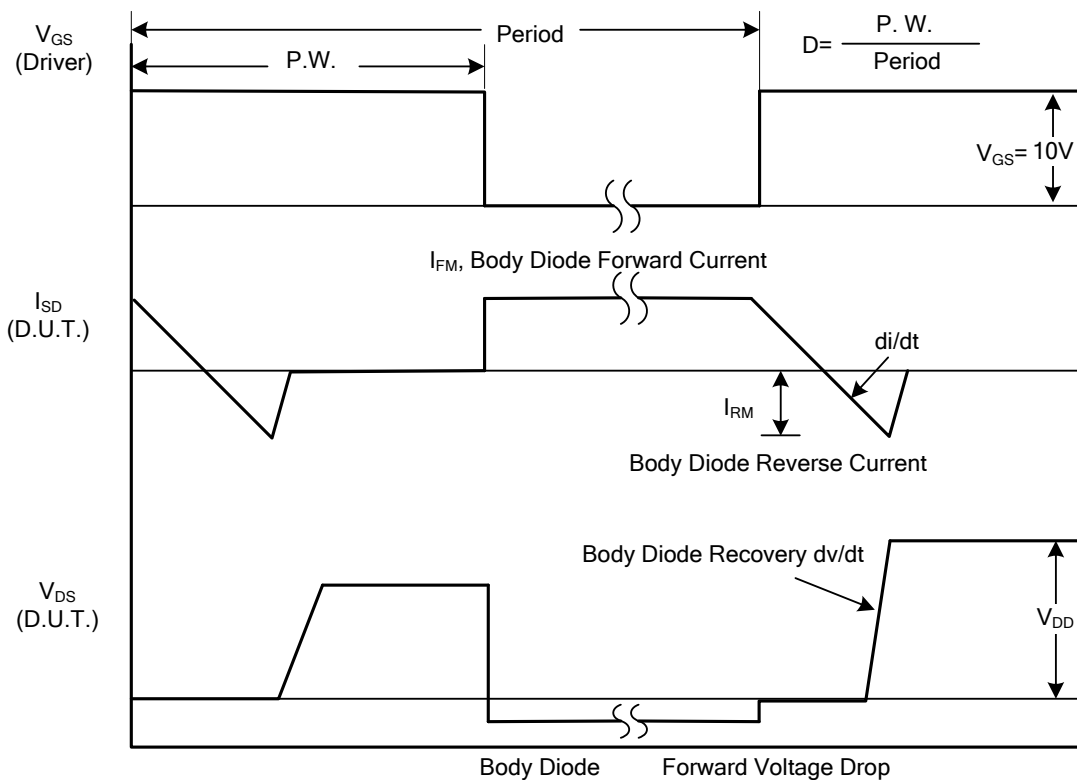
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	600			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V			1	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V			±100	nA
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> = 250μA, Referenced to 25°C		0.7		V/°C
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 6.0A		0.57	0.70	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1MHz		1600	1900	pF
Output Capacitance	C <sub>OSS</sub>			173	270	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			10	18	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.5A, R <sub>G</sub> = 25Ω (Note 1, 2)		90	100	ns
Turn-On Rise Time	t <sub>R</sub>			109	125	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			190	210	ns
Turn-Off Fall Time	t <sub>F</sub>			100	130	ns
Total Gate Charge	Q <sub>G</sub>			40		nC
Gate-Source Charge	Q <sub>GSS</sub>	V <sub>DS</sub> = 50V, I <sub>D</sub> = 1.3A, V <sub>GS</sub> = 10 V (Note 1, 2)		10.4		nC
Gate-Drain Charge	Q <sub>GD</sub>			10		nC
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 12A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				12	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				48	A

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

## TEST CIRCUITS AND WAVEFORMS

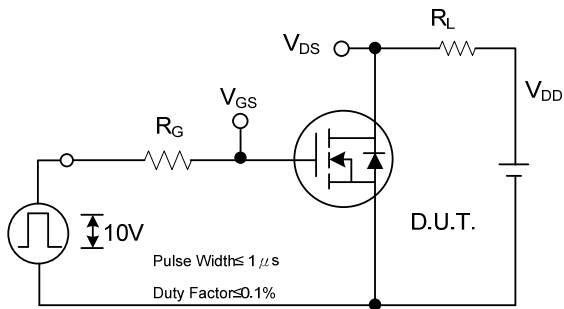


Peak Diode Recovery  $dv/dt$  Test Circuit

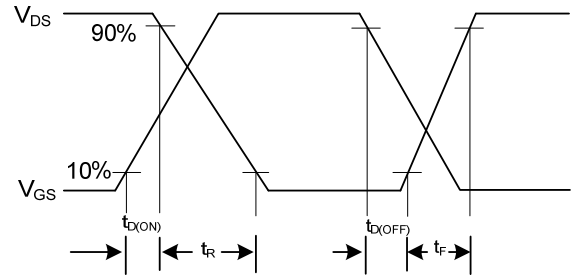


Peak Diode Recovery  $dv/dt$  Waveforms

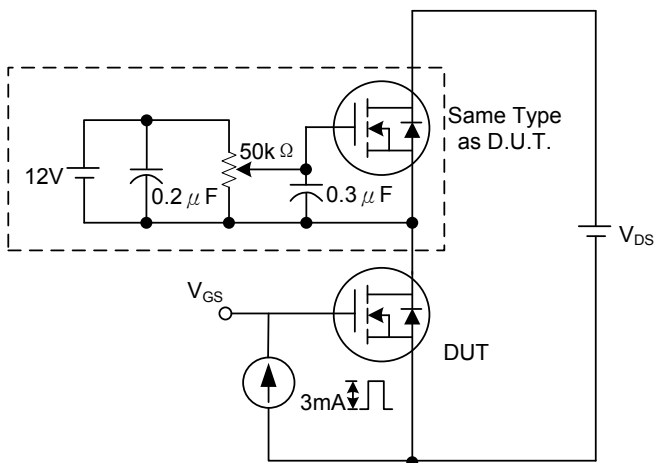
### TEST CIRCUITS AND WAVEFORMS (Cont.)



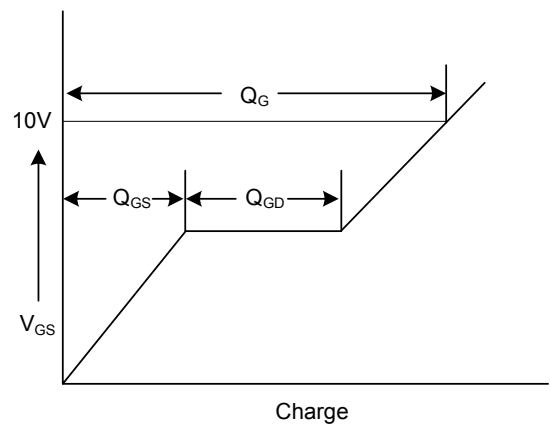
**Switching Test Circuit**



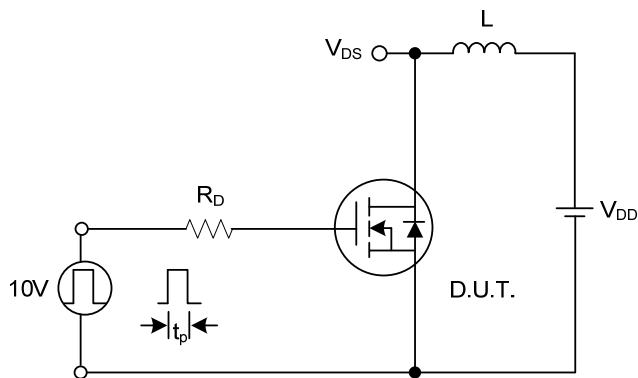
**Switching Waveforms**



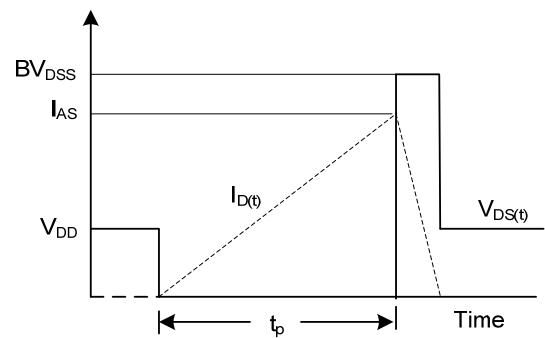
**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

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