



10N60K-MT

Preliminary

Power MOSFET

**10A, 600V N-CHANNEL
POWER MOSFET**

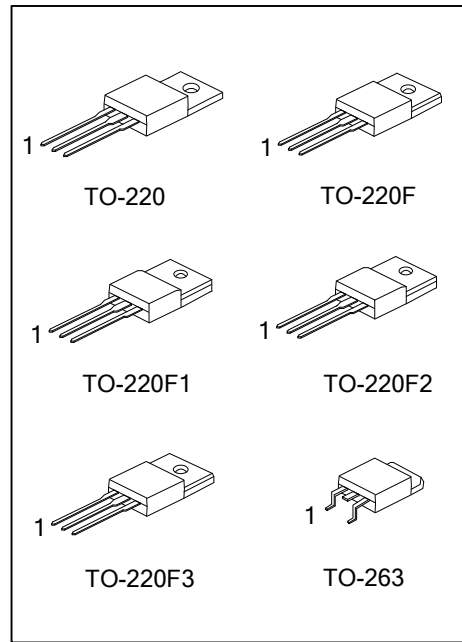
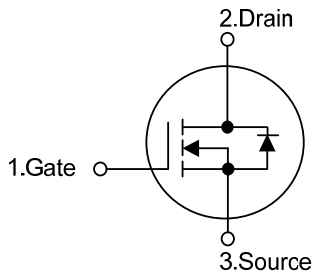
■ DESCRIPTION

The **UTC 10N60K-MT** 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 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

- * $R_{DS(ON)} < 0.75\Omega @ V_{GS} = 10V, I_D = 5 A$
- * Low gate charge (typical 33 nC)
- * Low Crss (typical 18 pF)
- * Fast switching
- * 100% avalanche tested
- * Improved dv/dt capability

■ SYMBOL



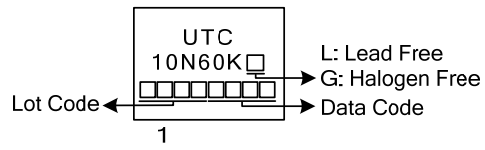
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10N60KL-TA3-T	10N60KG-TA3-T	TO-220	G	D	S	Tube
10N60KL-TF3-T	10N60KG-TF3-T	TO-220F	G	D	S	Tube
10N60KL-TF1-T	10N60KG-TF1-T	TO-220F1	G	D	S	Tube
10N60KL-TF2-T	10N60KG-TF2-T	TO-220F2	G	D	S	Tube
10N60KL-TF3T-T	10N60KG-TF3T-T	TO-220F3	G	D	S	Tube
10N60KL-TQ2-T	10N60KG-TQ2-T	TO-263	G	D	S	Tube
10N60KL-TQ2-R	10N60KG-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>10N60KL-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1 TF2: TO-220F2, TF3T: TO-220F3, TQ2: TO-263 (3) L: Lead Free, G: Halogen Free and 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}	10	A
Drain Current	Continuous	I_D	10
	Pulsed (Note 2)	I_{DM}	38
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	200
	Repetitive (Note 2)	E_{AR}	12
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	TO-220/TO-263	P_D	156
	TO-220F/TO-220F1		52
	TO-220F2/TO-220F3		
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. $L = 4\text{mH}$, $I_{AS} = 10\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$ Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 9.5\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	θ_{JC}	0.8
	TO-220F/TO-220F1		2.4
	TO-220F2/TO-220F3		

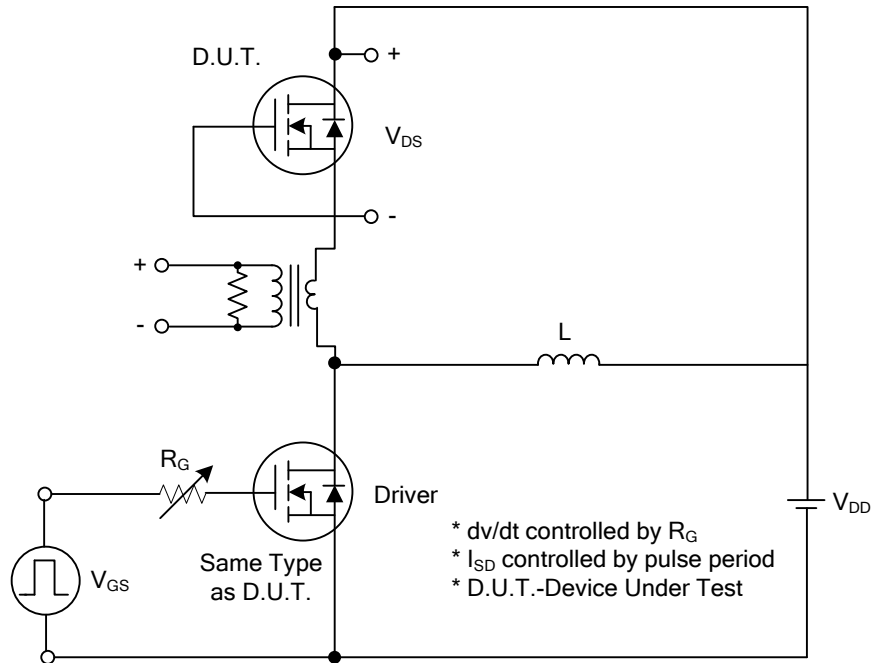
■ ELECTRICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

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} V _{GS} =30V, V _{DS} =0V			100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250 μA, Referenced to 25°C		0.7		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 =5A		0.63	0.75	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0 MHz		1570	2040	pF
Output Capacitance	C _{OSS}			166	215	pF
Reverse Transfer Capacitance	C _{RSS}			18	24	pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q _G	V _{DS} =50V, I _D =1.3A, V _{GS} =10V I _G =100μA (Note1, 2)		33	57	nC
Gate-Source Charge	Q _{GS}			9		nC
Gate-Drain Charge	Q _{GD}			8.5		nC
Turn-On Delay Time	t _{D(ON)}	V _{DD} =30V, I _D =0.5A, R _G =25Ω, V _{GS} =0V (Note1, 2)		67		ns
Turn-On Rise Time	t _R			84		ns
Turn-Off Delay Time	t _{D(OFF)}			205		ns
Turn-Off Fall Time	t _F			95		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =10A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I _S				10	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				38	A
Reverse Recovery Time	t _{rr}	V _{GS} =0V, I _S =10A, dI _F /dt=100A/μs (Note1)		420		ns
Reverse Recovery Charge	Q _{RR}				4.2	

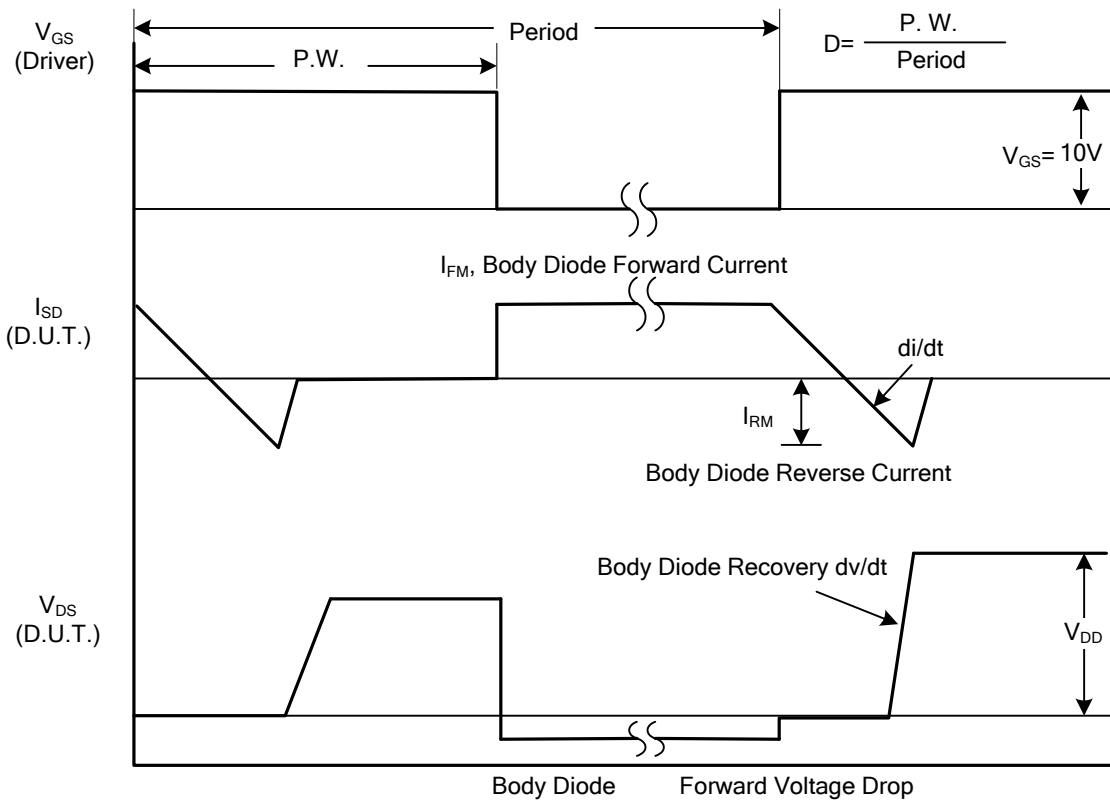
Notes: 1. Pulse Test : Pulse width ≤300μs, Duty cycle ≤2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

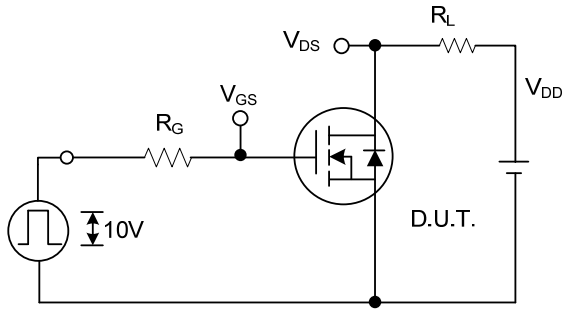


Peak Diode Recovery dv/dt Test Circuit

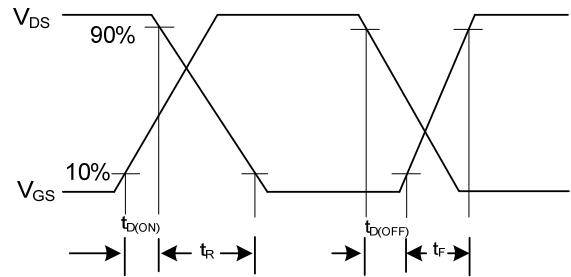


Peak Diode Recovery dv/dt Waveforms

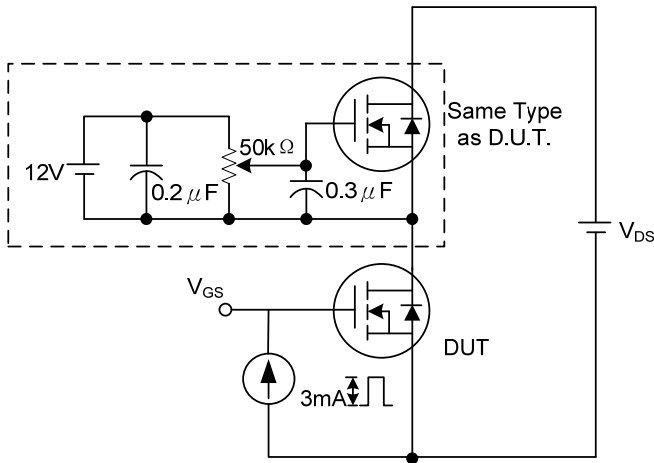
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



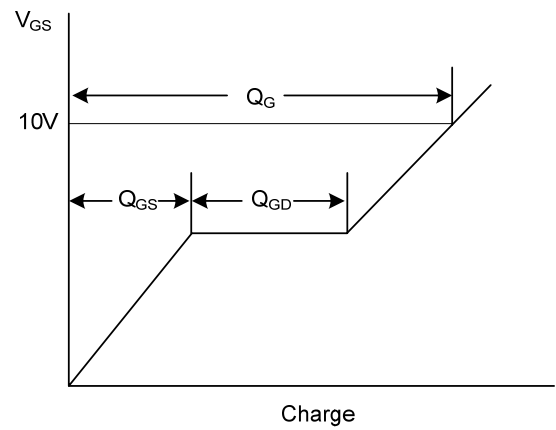
Switching Test Circuit



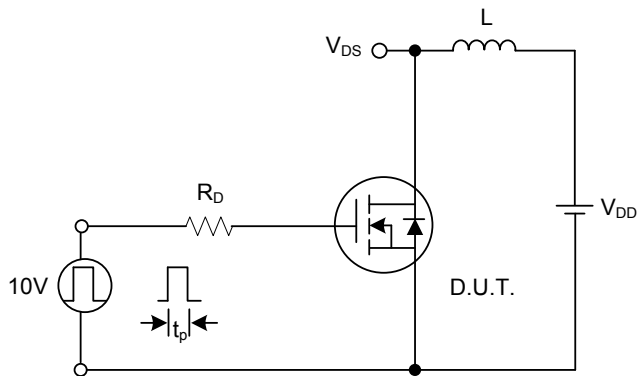
Switching Waveforms



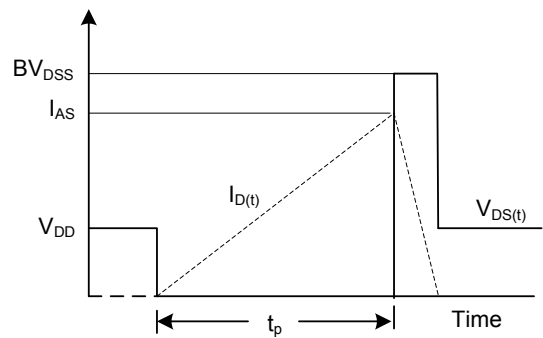
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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