



10N60K

Power MOSFET

10A, 600V N-CHANNEL POWER MOSFET

■ DESCRIPTION

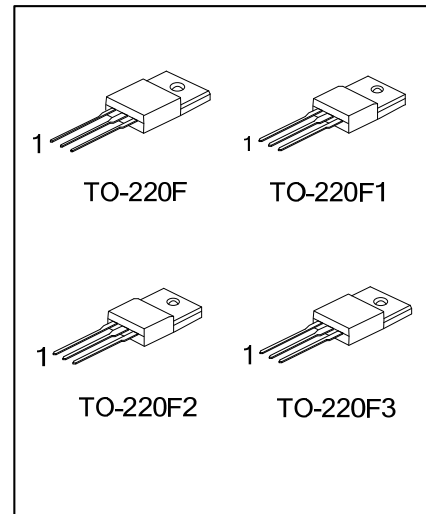
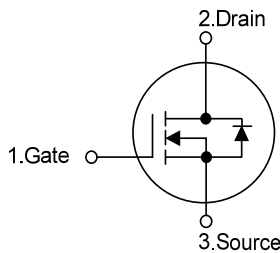
The UTC **10N60K** is an N-channel Power MOSFET using UTC's advanced technology to provide customers a minimum on-state resistance and superior switching performance, etc.

The UTC **10N60K** is generally applied in high efficient DC to DC converters, PWM motor controls and bridge circuits, etc.

■ FEATURES

- * $R_{DS(ON)} < 1.2\Omega @ V_{GS} = 10V$
- * Low Gate Charge (Typical 90nC)
- * Low C_{RSS} (typical 18 pF)
- * High Switching Speed
- * Improved dv/dt capability

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
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

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

<p>10N60KL-TF3-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube (2) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2 TF3T: TO-220F3 (3) L: Lead Free, G: Halogen Free</p>
--	--

■ MARKING INFORMATION

PACKAGE	MARKING
TO-220F TO-220F1 TO-220F2 TO-220F3	<p>UTC 10N60K</p> <p>Lot Code ← [] → Data Code</p> <p>L: Lead Free G: Halogen Free</p>

■ 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	A
	Pulsed (Note 2)	I_{DM}	38	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	300	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F/TO-220F1	P_D	50	W
	TO-220F3			
	TO-220F2		52	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. $L=6\text{mH}$, $I_{AS}=10\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, 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

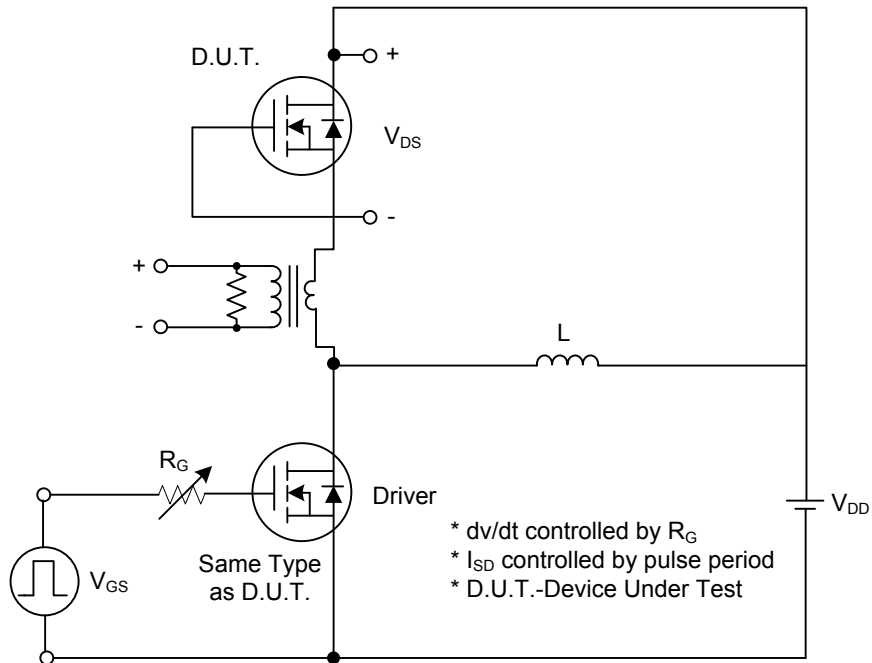
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1	θ_{JC}	2.5	$^\circ\text{C}/\text{W}$
	TO-220F3			
	TO-220F2		2.4	$^\circ\text{C}/\text{W}$

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

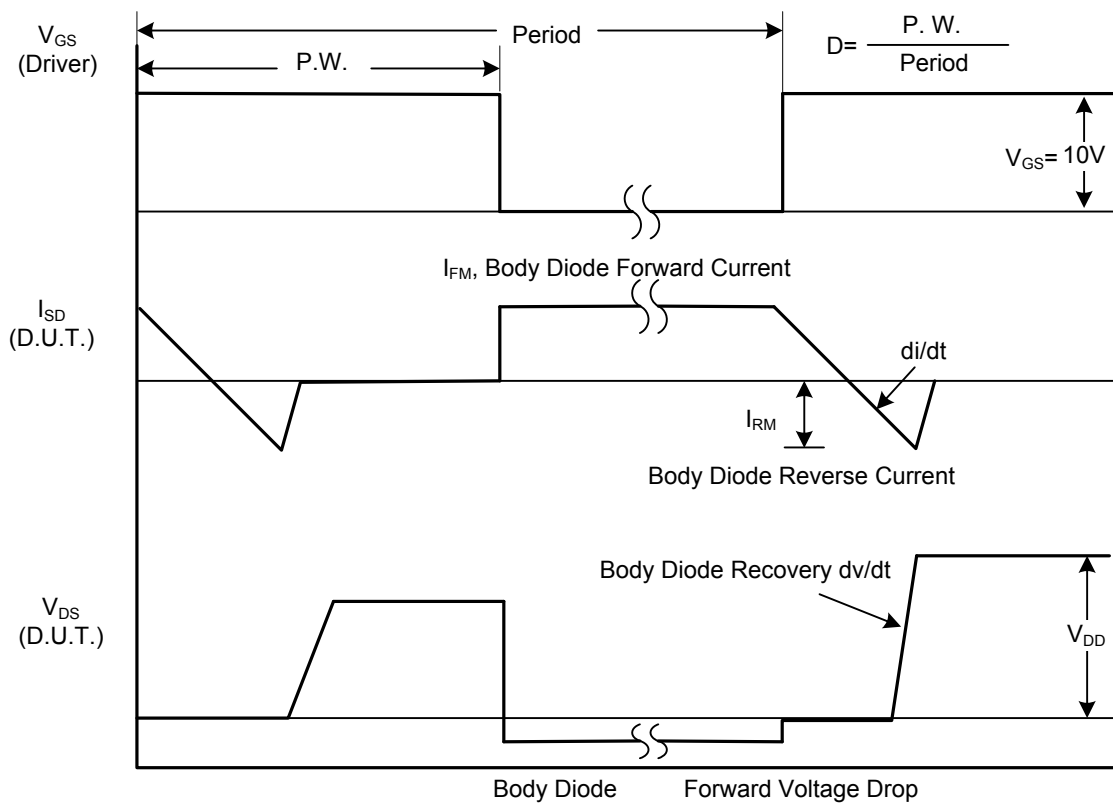
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	600			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 600V, V _{GS} = 0V			1	μA
		V _{DS} = 480V, V _{GS} = 0V, T _C =125°C			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}			100	nA
	Reverse					
					-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, 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	0.5	0.8	1.2	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0 MHz		1000	2040	pF
Output Capacitance	C _{OSS}			125	215	pF
Reverse Transfer Capacitance	C _{RSS}			18	24	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} =300V, I _D =10A, R _G =25Ω (Note 1, 2)		50	70	ns
Turn-On Rise Time	t _R			69	150	ns
Turn-Off Delay Time	t _{D(OFF)}			230	260	ns
Turn-Off Fall Time	t _F			88	105	ns
Total Gate Charge	Q _G	V _{DS} =480V, I _D =10A, V _{GS} =10 V (Note 1, 2)		90	120	nC
Gate-Source Charge	Q _{GS}			20		nC
Gate-Drain Charge	Q _{GD}			22		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0 V, 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} = 0 V, I _S = 10A, dI _F / dt = 100 A/μs (Note 1)		420		ns
Reverse Recovery Charge	Q _{RR}			4.2		μC

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

TEST CIRCUITS AND WAVEFORMS

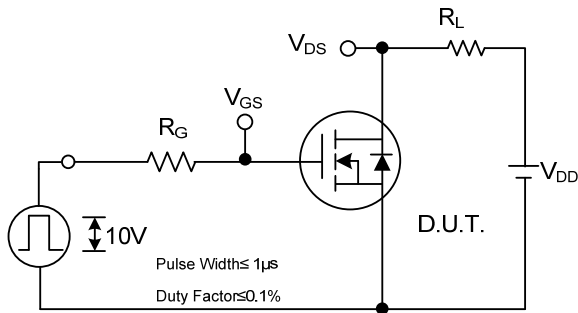


Peak Diode Recovery dv/dt Test Circuit

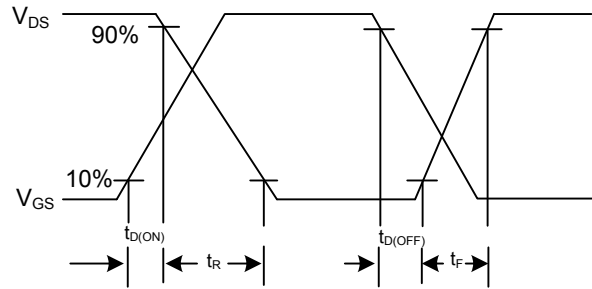


Peak Diode Recovery dv/dt Waveforms

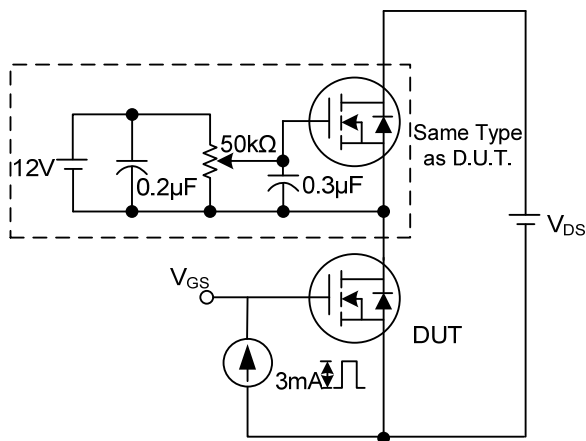
TEST CIRCUITS AND WAVEFORMS (Cont.)



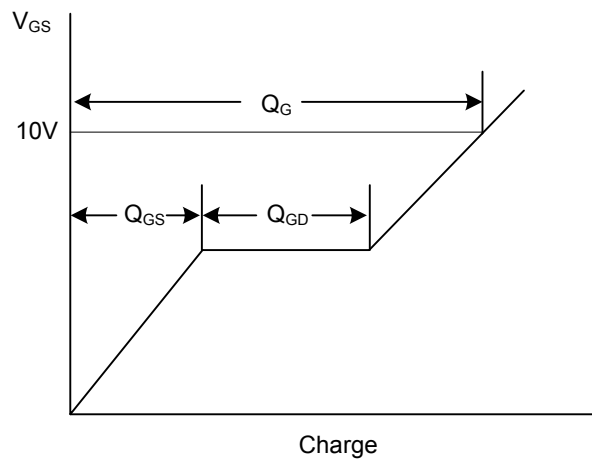
Switching Test Circuit



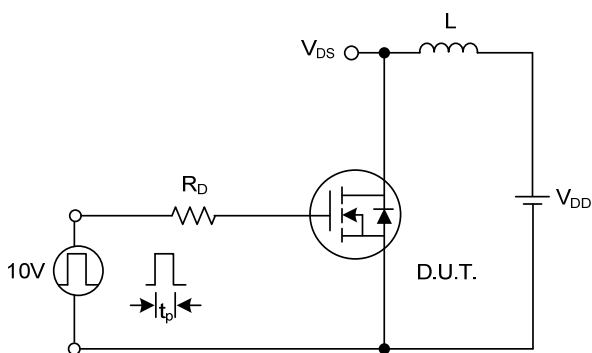
Switching Waveforms



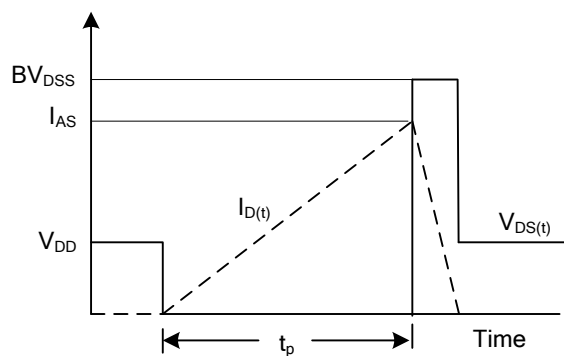
Gate Charge Test Circuit



Gate Charge Waveform

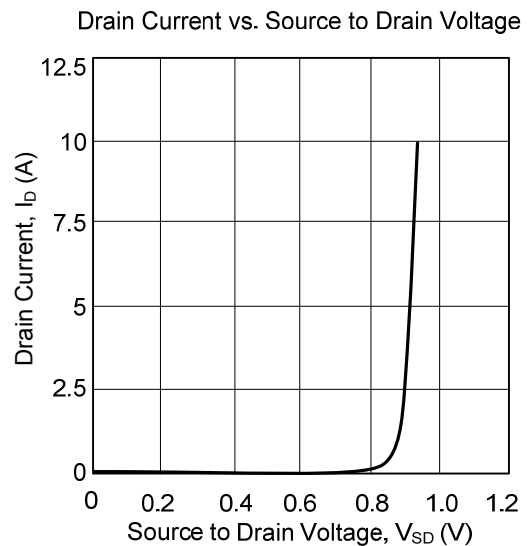
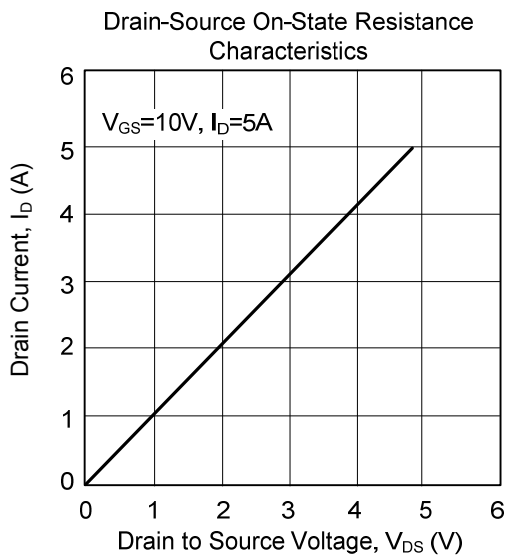
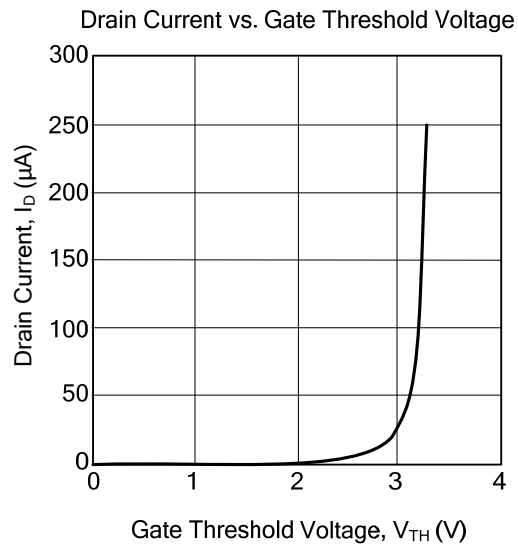
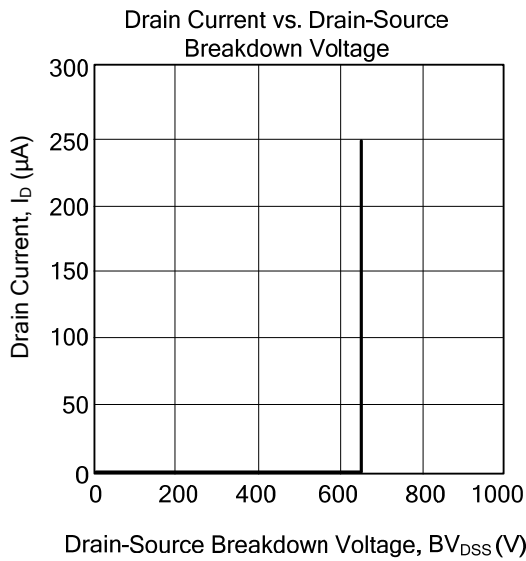


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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.