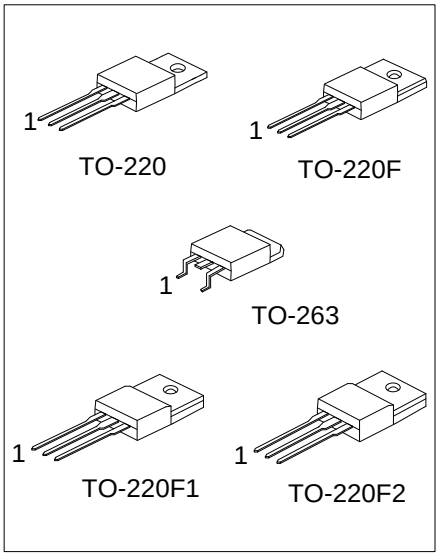
10A, 600V N-CHANNEL POWER MOSFET



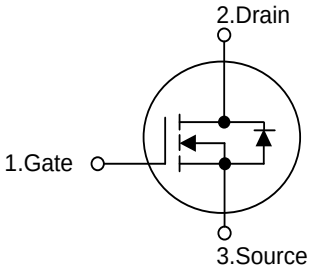
■ DESCRIPTION

The **UTC 10N60-Q** 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 AC to DC converters and bridge circuits.

■ FEATURES

* $R_{DS(ON)} \leq 0.9\Omega$ @ 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

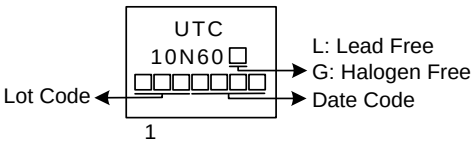
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10N60L-TA3-T	10N60G-TA3-T	TO-220	G	D	S	Tube
10N60L-TF3-T	10N60G-TF3-T	TO-220F	G	D	S	Tube
10N60L-TF1-T	10N60G-TF1-T	TO-220F1	G	D	S	Tube
10N60L-TF2-T	10N60G-TF2-T	TO-220F2	G	D	S	Tube
10N60L-TQ2-T	10N60G-TQ2-T	TO-263	G	D	S	Tube
10N60L-TQ2-R	10N60G-TQ2-R	TO-263	G	D	S	Tape Reel

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

10N60G-TA3-T
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1
TF2: TO-220F2, TQ2: TO-263
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°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}	500	mJ
	Repetitive (Note 2)	E_{AR}	12	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220/TO-263	P_D	156	W
	TO-220F/TO-220F1 TO-220F2		52	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-55 ~ +150	°C
Storage Temperature		T_{STG}	-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 = 10mH, I_{AS} = 10A, V_{DD} = 50V, R_G = 25 Ω Starting T_J = 25°C
4. I_{SD} ≤ 10A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

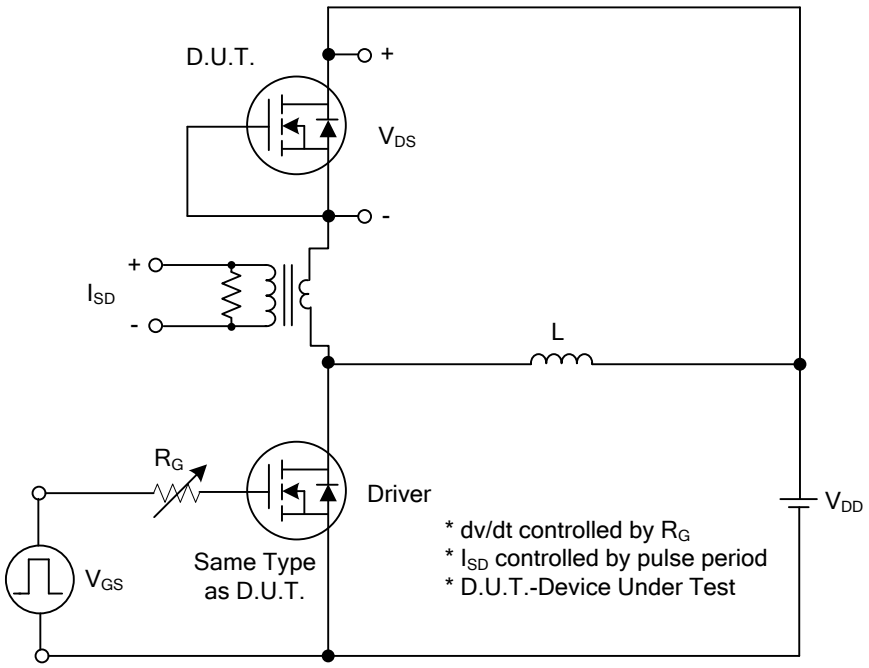
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	0.8	°C/W
	TO-220F/TO-220F1 TO-220F2		2.4	°C/W

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

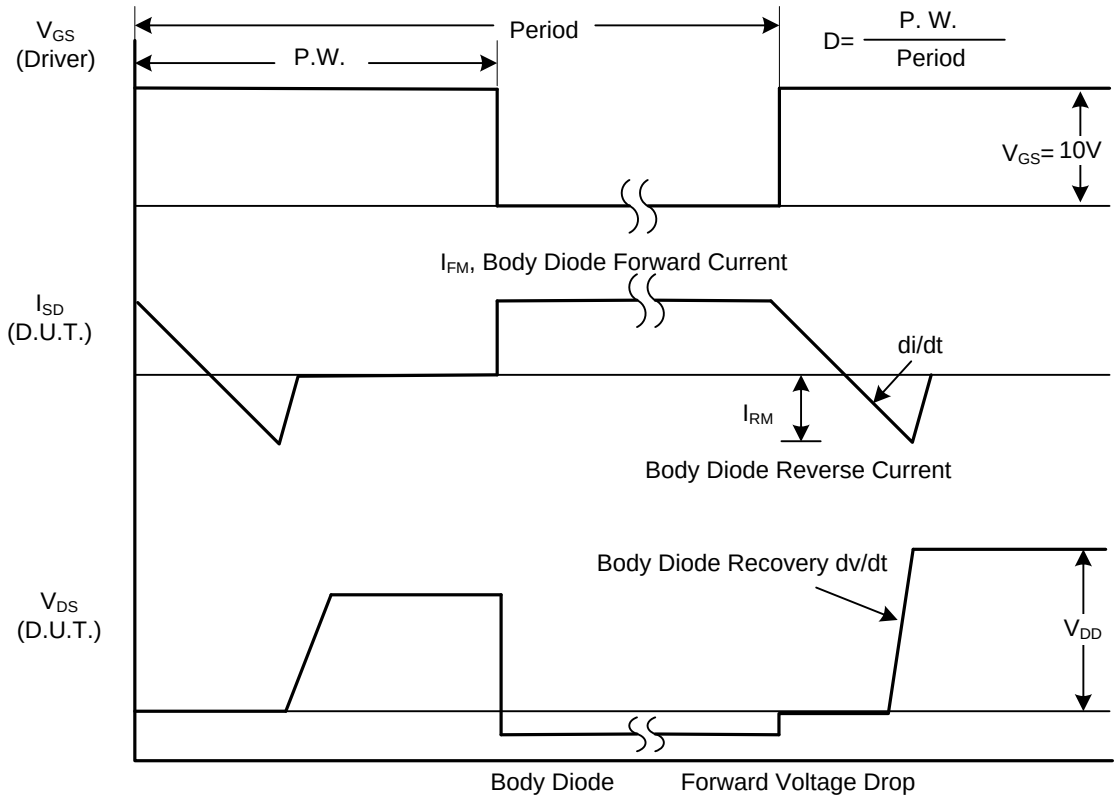
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D= 250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=30V, V_{DS}=0V			100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	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			0.9	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0 MHz		1300		pF
Output Capacitance		C_{OSS}			140		pF
Reverse Transfer Capacitance		C_{RSS}			19		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}=50V, I_D=1.3A, V_{GS}=10V I_G=100μA (Note1, 2)		43	57	nC
Gate-Source Charge		Q_{GS}			7.5		nC
Gate-Drain Charge		Q_{GD}			13		nC
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=30V, I_D=0.5A, R_G=25Ω, V_{GS}=0V (Note1, 2)		80		ns
Turn-On Rise Time		t_R			120		ns
Turn-Off Delay Time		$t_{D(OFF)}$			300		ns
Turn-Off Fall Time		t_F			160		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				10	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				40	A
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_S=10A			1.4	V
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		μC

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

■ TEST CIRCUITS AND WAVEFORMS

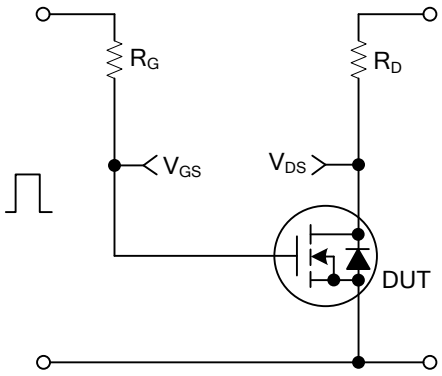


Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS



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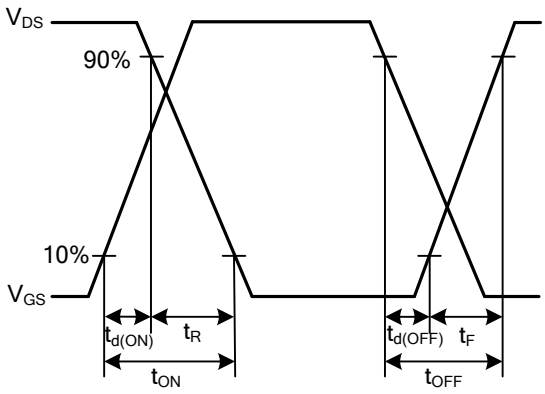
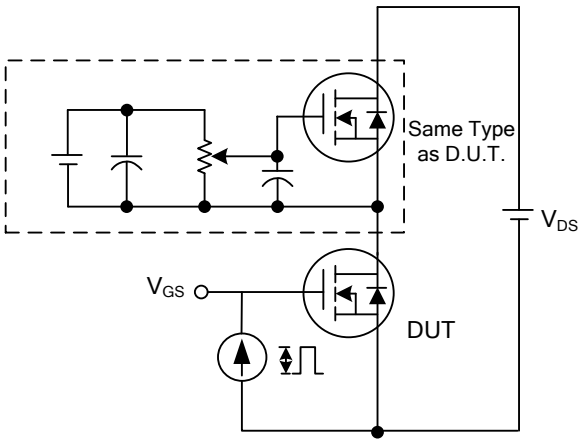
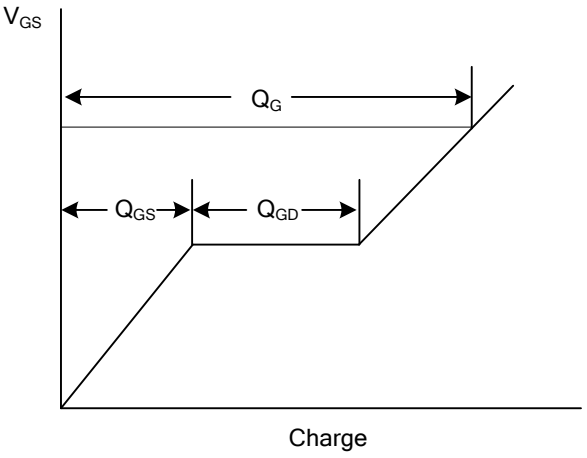


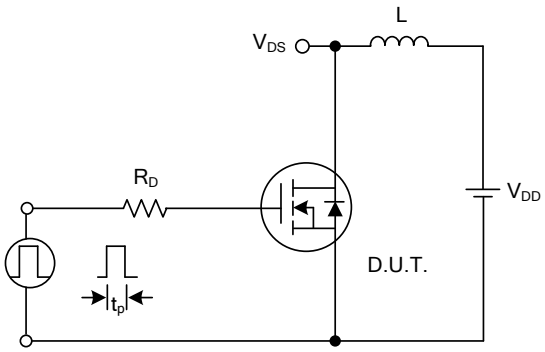
Switching Waveforms



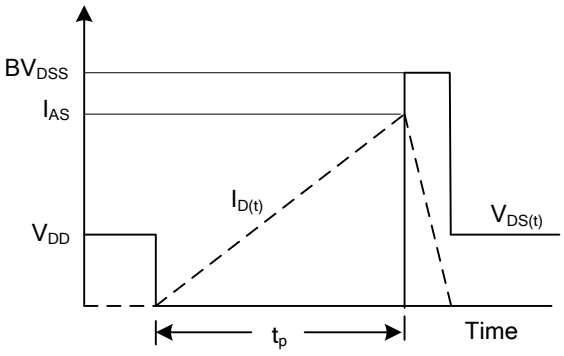
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms