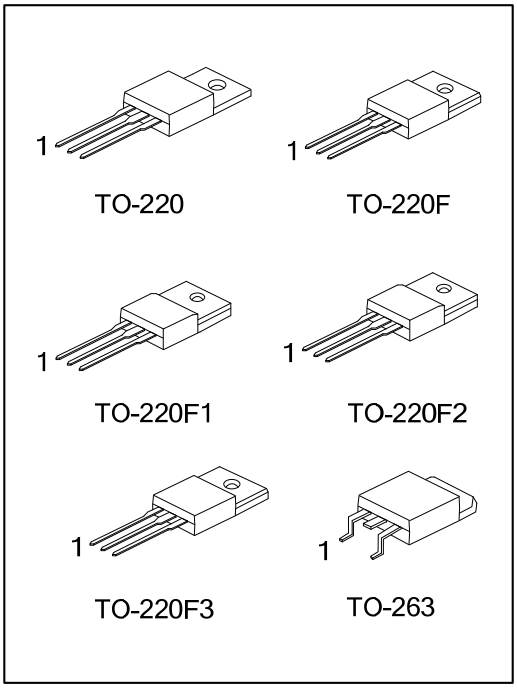
7N60K

Power MOSFET

7.4A, 600V N-CHANNEL POWER MOSFET



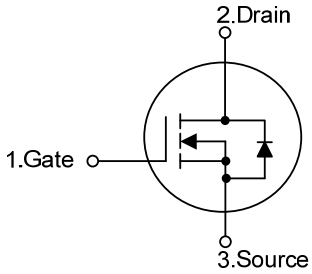
■ DESCRIPTION

The UTC **7N60K** is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in switching power supplies and adaptors.

■ FEATURES

* $R_{DS(ON)}$ < 1.2Ω @V_{GS} = 10V
* Ultra Low Gate Charge (Typical 29 nC)
* Low Reverse Transfer Capacitance (C_{RSS} = typical 16pF)
* Fast Switching Capability
* Avalanche Energy Tested
* Improved dv/dt Capability, High Ruggedness

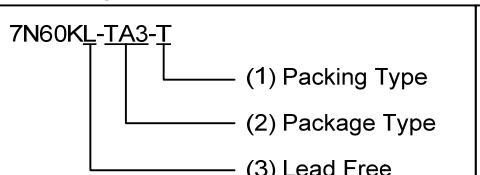
■ SYMBOL



■ ORDERING INFORMATION

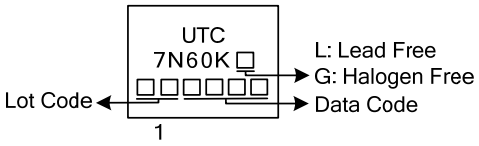
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N60KL-TA3-T	7N60KG-TA3-T	TO-220	G	D	S	Tube
7N60K L-TF3-T	7N60KG-TF3-T	TO-220F	G	D	S	Tube
7N60KL-TF1-T	7N60KG-TF1-T	TO-220F1	G	D	S	Tube
7N60KL-TF2-T	7N60KG-TF2-T	TO-220F2	G	D	S	Tube
7N60KL-TF3T-T	7N60KG-TF3T-T	TO-220F3	G	D	S	Tube
7N60KL-TQ2-T	7N60KG-TQ2-T	TO-263	G	D	S	Tube
7N60KL-TQ2-R	7N60KG-TQ2-R	TO-263	G	D	S	Tape Reel

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



(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF3: TO-220F, TQ2: TO-263
TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F3
(3) L: Lead Free, G: Halogen Free

■ MARKING INFORMATION

PACKAGE	MARKING
TO-220 TO-220F TO-220F1 TO-220F2 TO-220F3 TO-263	

■ 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}	7.4	A
Drain Current	Continuous	I_D	7.4	A
	Pulsed (Note 2)	I_{DM}	29.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	220	mJ
	Repetitive (Note 2)	E_{AR}	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220/TO-263	P_D	142	W
	TO-220F/TO-220F1 TO-220F3		48	
	TO-220F2		50	
Junction Temperature		T_J	+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 = 9mH, I_{AS} = 7A, V_{DD} = 90V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD}≤7.4A, di/dt≤200A/μs, V_{DD}≤BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

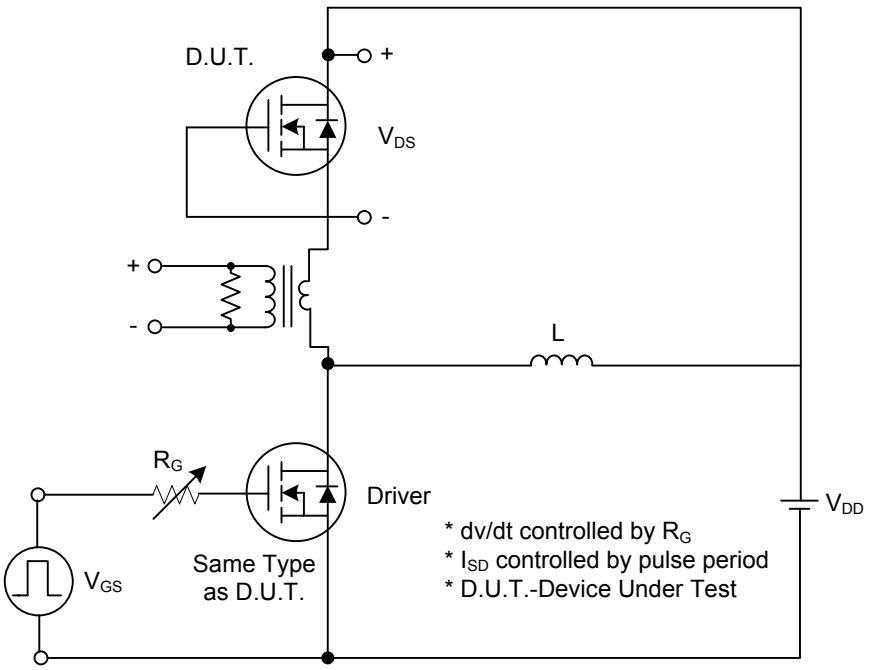
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	0.88	°C/W
	TO-220F/TO-220F1 TO-220F3		2.6	
	TO-220F2		2.5	

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

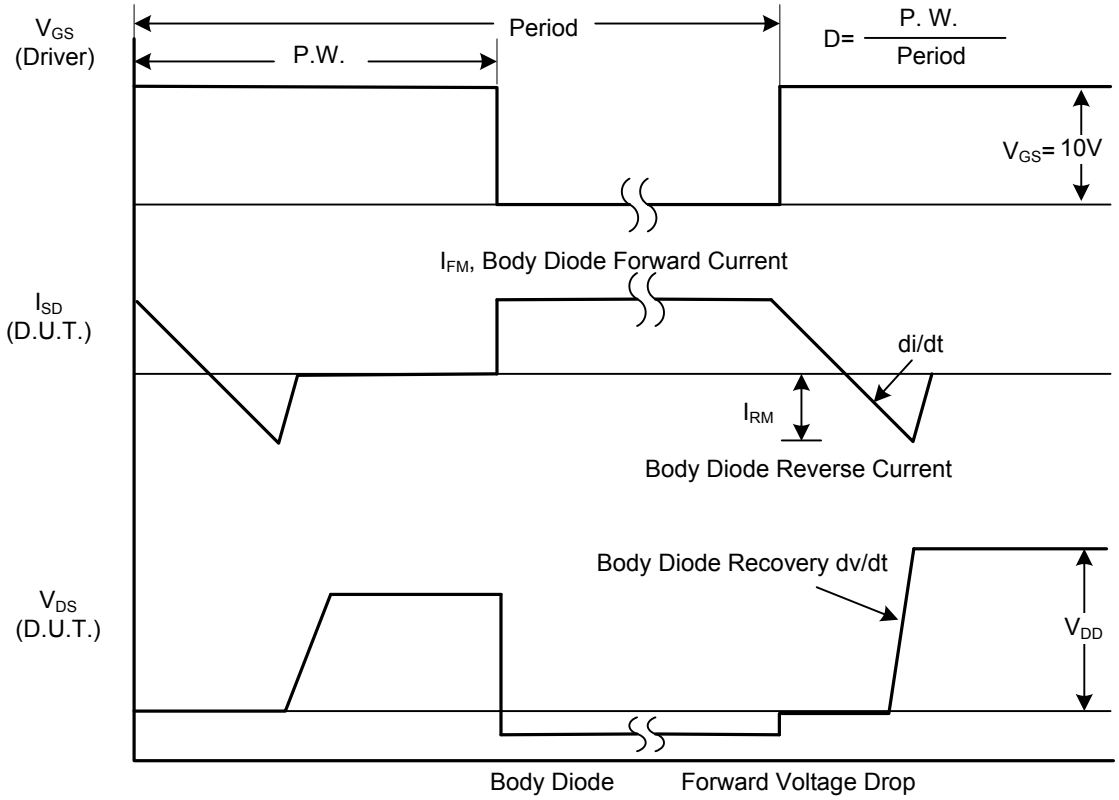
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 600V, V_{GS} = 0V			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA,Referenced to 25°C		0.67		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D = 3.7A		1.0	1.2	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0 MHz			1400	pF
Output Capacitance		C_{OSS}				180	pF
Reverse Transfer Capacitance		C_{RSS}			16	21	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD} =300V, I_D =7.4A, R_G =25Ω (Note 1, 2)			70	ns
Turn-On Rise Time		t_R			90	170	ns
Turn-Off Delay Time		$t_{D(OFF)}$				140	ns
Turn-Off Fall Time		t_F			55	130	ns
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}=480V, I_D=7.4A, V_{GS}=10V (Note 1, 2)		29	38	nC
Gate-Source Charge		Q_{GS}			7		nC
Gate-Drain Charge		Q_{GD}			14.5		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS} = 0V, I_S = 7.4 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				7.4	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				29.6	A
Reverse Recovery Time		t_{rr}	V_{GS} = 0V, I_S = 7.4 A, dI_F / dt = 100A/μs (Note 1)		320		ns
Reverse Recovery Charge		Q_{RR}			2.4		μC

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

■ TEST CIRCUITS AND WAVEFORMS

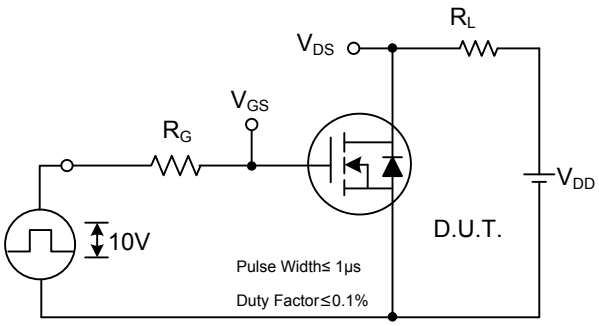


Peak Diode Recovery dv/dt Test Circuit

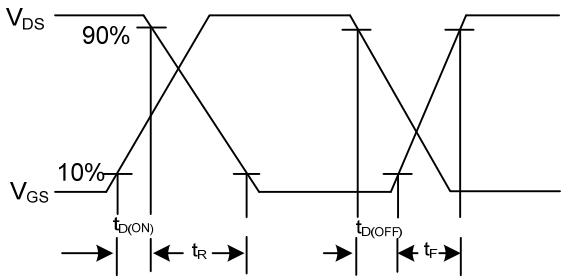


Peak Diode Recovery dv/dt Waveforms

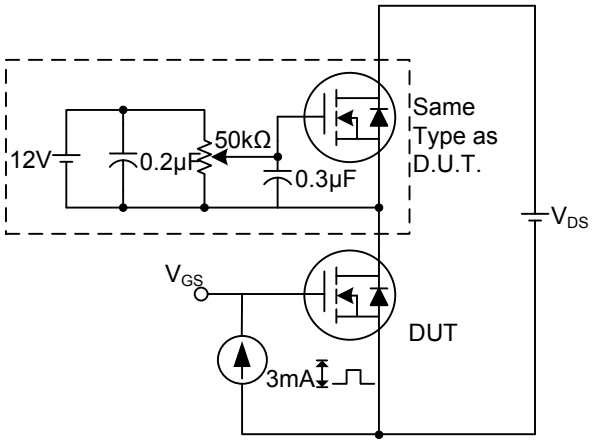
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



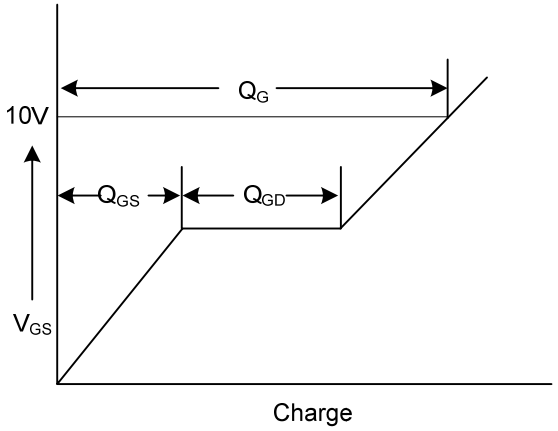
Switching Test Circuit



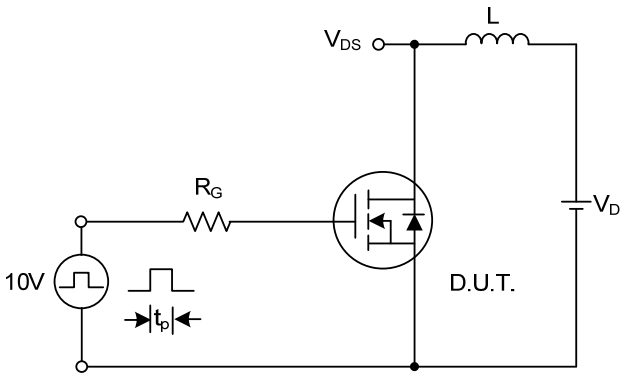
Switching Waveforms



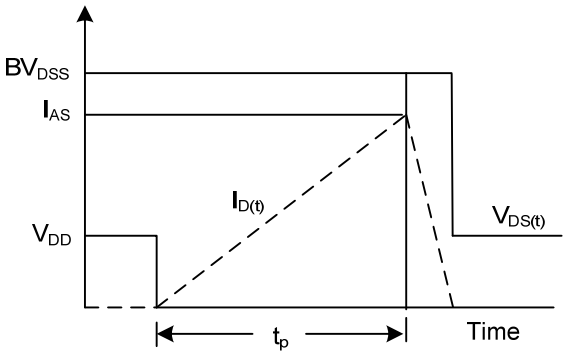
Gate Charge Test Circuit



Gate Charge Waveform



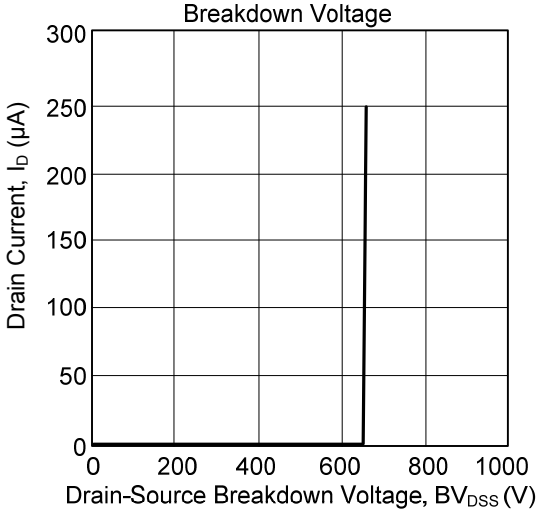
Unclamped Inductive Switching Test Circuit



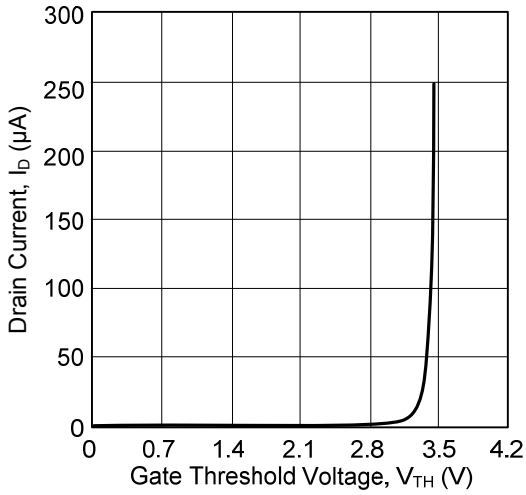
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

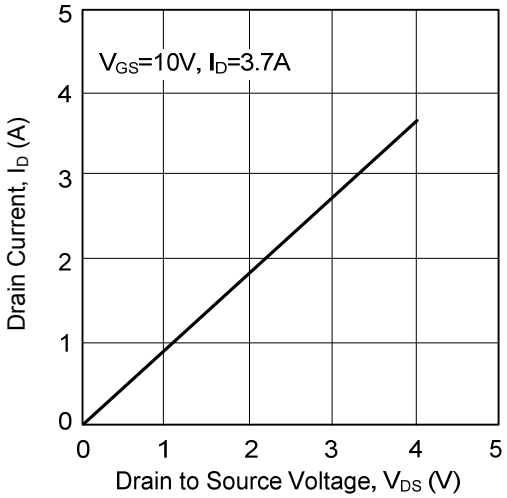
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain Current vs. Source to Drain Voltage