

5A, 600V N-CHANNEL POWER MOSFET

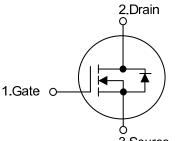
DESCRIPTION

The UTC 5N60K-MT 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 power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)}$ < 2.2 Ω @ V_{GS} =10V, I_D = 2.5A
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

SYMBOL



3.Source

ORDERING INFORMATION

Ordering Number			Pin Assignment			Desting	
Halogen Free	Раскаде	1	2	3	Packing		
5N60KG-TF3-T	TO-220F	G	D	S	Tube		
5N60KG-TF1-T	TO-220F1	G	D	S	Tube		
5N60KG-TF2-T	TO-220F2	G	D	S	Tube		
5N60KG-TF3T-T	TO-220F3	G	D	S	Tube		
5N60KG-TM3-T	TO-251	G	D	S	Tube		
5N60KG-TMS-T	TO-251S	G	D	S	Tube		
5N60KG-TN3-R	TO-252	G	D	S	Tape Reel		
5N60KG-TND-R	TO-252D	G	D	S	Tape Reel		
Note: Pin Assignment: G: Gate D: Drain S: Source							
5N60KL-TF3-T (1)Packing Type (2)Package Type (3)Green Package			 (1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TF1: TO-220F1, TF1: TO-220F2 TF3T: TO-220F3, TM3: TO-251, TMS: TO-251S TN3: TO-252, TND: TO-252D 				
	Halogen Free 5N60KG-TF3-T 5N60KG-TF1-T 5N60KG-TF2-T 5N60KG-TF3T-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TMS-T 5N60KG-TN3-R 5N60KG-TND-R te D: Drain Sister (1)Packing Type	Halogen Free 5N60KG-TF3-T 5N60KG-TF1-T 5N60KG-TF2-T 5N60KG-TF3T-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-T 5N60KG-TM3-R 5N60KG-TN3-R 5N60KG-TND-R te D: Drain S: Source (1)Packing Type (1) T: Tu (2)Package Type TF3T (3)Groon Package TN3:	Halogen Free Package 5N60KG-TF3-T TO-220F1 5N60KG-TF1-T TO-220F2 5N60KG-TF2-T TO-220F2 5N60KG-TF3-T TO-220F3 5N60KG-TF3T-T TO-220F3 5N60KG-TM3-T TO-251 5N60KG-TMS-T TO-251S 5N60KG-TN3-R TO-252 5N60KG-TND-R TO-252D te D: Drain S: Source (1)Packing Type (1) T: Tube, R: Tape F (2)Package Type (1) T: TO-220F3, T (3)Groon Package TO-252, TND	Halogen Free Package 1 5N60KG-TF3-T TO-220F G 5N60KG-TF1-T TO-220F1 G 5N60KG-TF2-T TO-220F2 G 5N60KG-TF3T-T TO-220F3 G 5N60KG-TF3T-T TO-220F3 G 5N60KG-TM3-T TO-251S G 5N60KG-TMS-T TO-251S G 5N60KG-TN3-R TO-252 G 5N60KG-TND-R TO-252D G te D: Drain S: Source (1)Packing Type (1) T: Tube, R: Tape Reel (2) TF3: TO-220F3, TM3: TO-252, TND: TO-252, TND: TO-252, TND: TO-252, TND: TO-252, TND: TO-252, TND: TO-250,	Halogen Free Package 1 2 5N60KG-TF3-T TO-220F G D 5N60KG-TF1-T TO-220F1 G D 5N60KG-TF2-T TO-220F2 G D 5N60KG-TF3T-T TO-220F3 G D 5N60KG-TM3-T TO-251S G D 5N60KG-TMS-T TO-251S G D 5N60KG-TN3-R TO-252 G D 5N60KG-TN3-R TO-251S G D 5N60KG-TND-R TO-252D G D 5N60KG-TND-R TO-252D G D te D: Drain S: Source (1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TF1: TO-220F1, TF3T: TO-220F3, TM3: TO-251, TS1: TO-220F3, TM3: TO-251, TN3: TO-252, TND: TO-252D	Halogen Free Package 1 2 3 5N60KG-TF3-T TO-220F G D S 5N60KG-TF1-T TO-220F1 G D S 5N60KG-TF2-T TO-220F2 G D S 5N60KG-TF3T-T TO-220F3 G D S 5N60KG-TM3-T TO-251 G D S 5N60KG-TM3-T TO-251S G D S 5N60KG-TN3-R TO-252 G D S 5N60KG-TND-R TO-252D G D S 5N60KG-TND-R TO-252D G D S 1) Packing Type (1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TF1: TO-220F1, TF1: T (2) Package Type (1) T: Tube, R: Tape Reel (2) TF3: TO-220F3, TM3: TO-251, TMS: T	



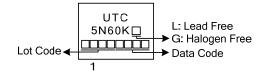
TO-220F TO-220F1 TO-220F2 TO-220F3 TO-251 TO-251S

TO-252D

TO-252

Power MOSFET

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
Continuous Drain Current		I _D 5		А
Pulsed Drain Current (Note 2)		I _{DM} 20		А
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	220	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F/TO-220F1 TO-220F3		36	W
	TO-220F2	PD	38	W
	TO-251/TO-251S TO-252/TO-252D		54	w
Junction Temperature		TJ	+150	°C
Operation 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. Pulse width limited by $T_{J(MAX)}$

3. L = 17.6mH, $I_{AS} = 5A$, $V_{DD} = 50V$, $R_G = 25 \Omega$, Starting $T_J = 25^{\circ}C$ 4. $I_{SD} \le 5A$, di/dt $\le 200A/\mu$ s, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25^{\circ}C$

THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT	
Junction to Ambient	TO-220F/TO-220F1/ TO-220F2/TO-220F3	0	62.5	°C/W	
	TO-251/TO-251S TO-252/TO-252D	θ_{JA}	160	°C/W	
Junction to Case	TO-220F/TO-220F1 TO-220F3		3.47	°C/W	
	TO-220F2	θ _{JC}	3.28	°C/W	
	TO-251/TO-251S TO-252/TO-252D		2.30	°C/W	



Output Capacitance

Turn-On Delay Time

Turn-On Rise Time

Turn-Off Delay Time

Turn-Off Fall Time

Total Gate Charge

Gate-Source Charge

Reverse Transfer Capacitance

SWITCHING CHARACTERISTICS

90

12

70

8

50

60

120

35

18

6.7

pF

pF

ns

ns

ns

ns

nC

nC

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	0.000	V _{GS} =30V, V _{DS} = 0V			100	n A
	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		0.6		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 = 2.5A		1.5	2.2	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		CISS			460	620	pF
Output Capacitance		Casa	$V_{DS} = 25V, V_{GS} = 0V,$		70	۹N	nE

Coss

C_{RSS}

t_{D(ON)}

t_R

t_{D(OFF)}

t_F

 Q_{G}

Q_{GS}

f = 1.0MHz

(Note 1, 2)

(Note 1, 2)

 V_{DD} =30V, I_{D} =0.5A, R_{G} =25 Ω

V_{DS}=50V, I_D=1.3A, V_{GS}=10V

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

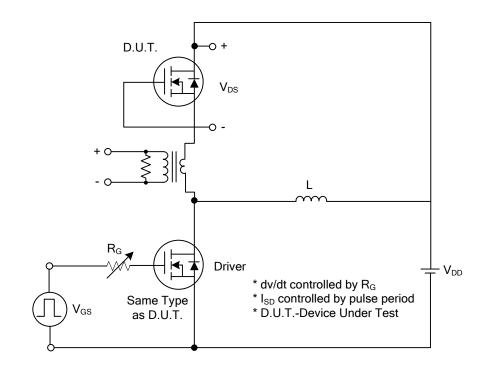
Gate-Drain Charge 4.5 nC Q_{GD} DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS Drain-Source Diode Forward Voltage V_{SD} V_{GS} = 0 V, I_S = 5A 1.4 V Maximum Continuous Drain-Source Diode ls 5 А Forward Current Maximum Pulsed Drain-Source Diode 20 А I_{SM} Forward Current

Note: 1. Pulse Test: Pulse width \leq 300µs, Duty cycle \leq 2%

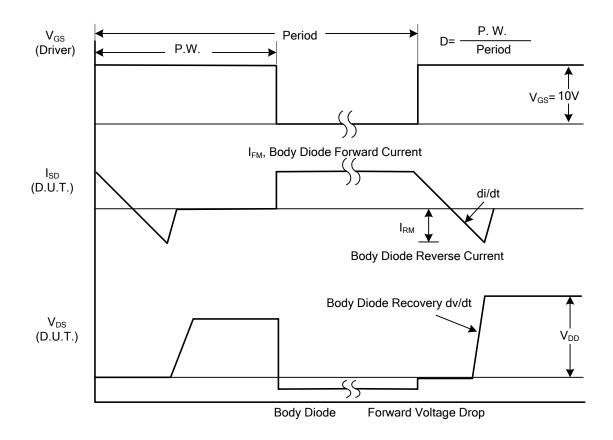
2. Essentially independent of operating temperature



TEST CIRCUITS AND WAVEFORMS



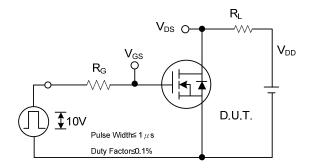
Peak Diode Recovery dv/dt Test Circuit



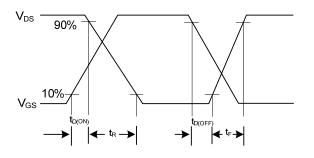
Peak Diode Recovery dv/dt Waveforms



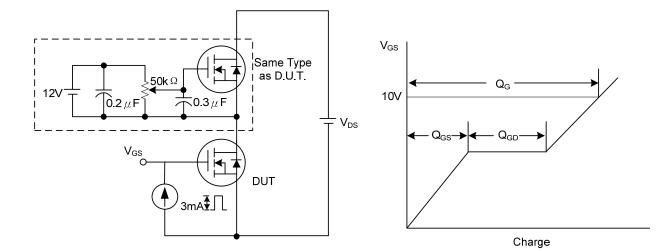
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



Switching Test Circuit

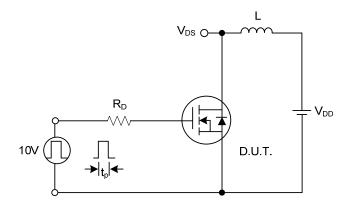


Switching Waveforms

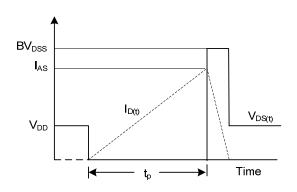


Gate Charge Test Circuit

Gate Charge Waveform



Unclamped Inductive Switching Test Circuit







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