



5N50K-TC

Preliminary

Power MOSFET

5.0A, 500V N-CHANNEL POWER MOSFET

DESCRIPTION

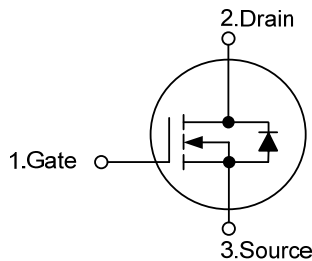
The UTC **5N50K-TC** is an N-channel power MOSFET adopting UTC's advanced technology to provide customers with DMOS, planar stripe technology. This technology is designed to meet the requirements of the minimum on-state resistance and perfect switching performance. It also can withstand high energy pulse in the avalanche and communication mode.

The UTC **5N50K-TC** can be used in applications, such as active power factor correction, high efficiency switched mode power supplies, electronic lamp ballasts based on half bridge topology.

FEATURES

- * $R_{DS(ON)} < 1.65\Omega @ V_{GS}=10V, I_D=2.5A$
- * 100% avalanche tested
- * High switching speed

SYMBOL

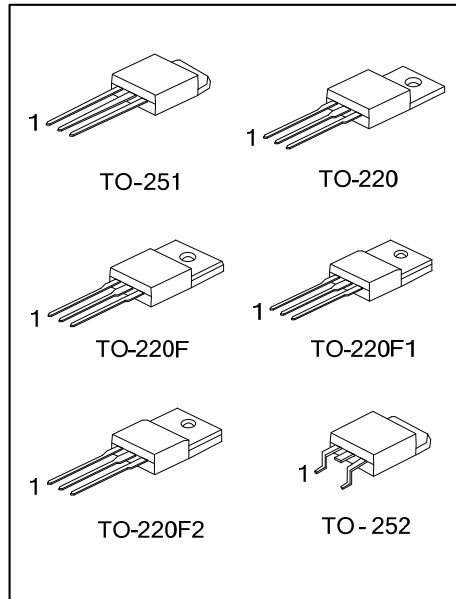


ORDERING INFORMATION

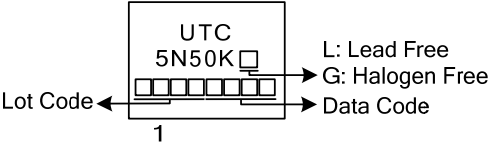
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N50KL-TA3-T	5N50KG-TA3-T	TO-220	G	D	S	Tube
5N50KL-TF1-T	5N50KG-TF1-T	TO-220F1	G	D	S	Tube
5N50KL-TF3-T	5N50KG-TF3-T	TO-220F2	G	D	S	Tube
5N50KL-TF3-T	5N50KG-TF3-T	TO-220F	G	D	S	Tube
5N50KL-TM3-T	5N50KG-TM3-T	TO-251	G	D	S	Tube
5N50KL-TN3-R	5N50KG-TN3-R	TO-252	G	D	S	Tape Reel

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

	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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MARKING



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■ ABSOLUTE MAXIMUM RATINGS ($T_c=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	5	A
	Pulsed (Note 2)	I_{DM}	20	A
Avalanche Current (Note 2)		I_{AR}	4.3	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	92	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.7	V/ns
Power Dissipation	TO-220	P_D	78	W
	TO-220F/TO-220F1		36	W
	TO-220F2		29	W
	TO-251/TO-252		54	W
Junction Temperature		T_J	+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. $L = 10\text{mH}$, $I_{AS} = 4.3\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 5.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

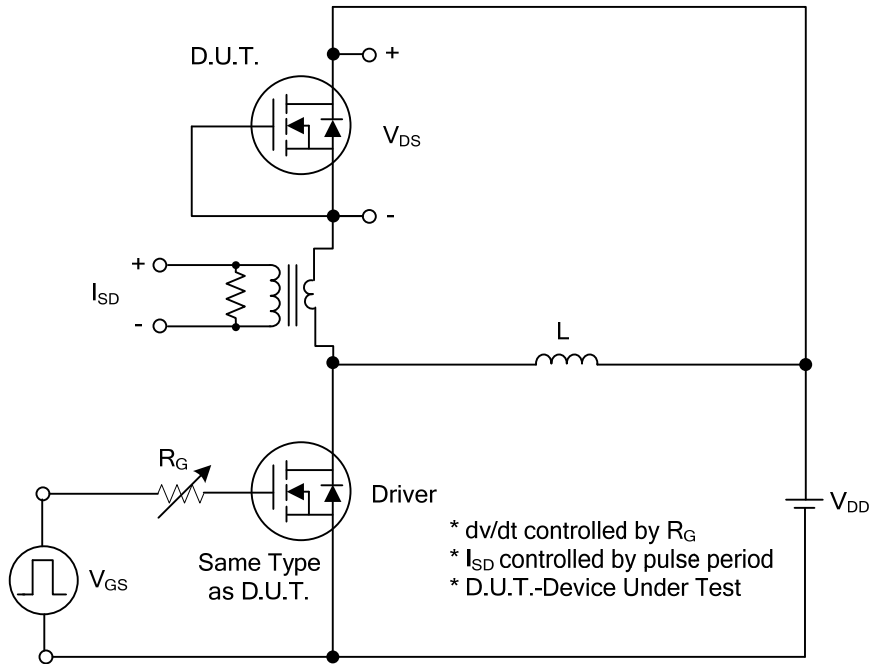
PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-251/TO-252			
Junction to Case	TO-220	θ_{JC}	1.16	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		4.2	$^\circ\text{C}/\text{W}$
	TO-220F2		4.18	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		2.3	$^\circ\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, unless otherwise specified)

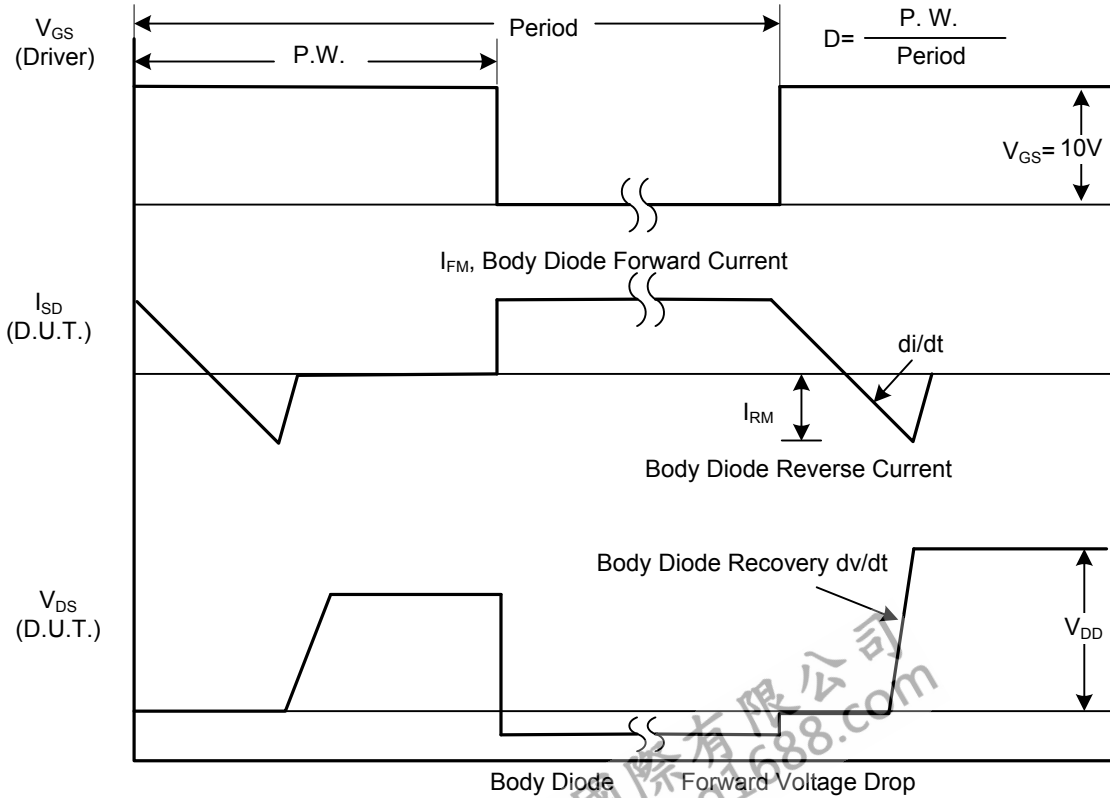
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	500			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 500\text{V}$, $V_{GS} = 0\text{V}$			1	μA
Gate- Source Leakage Current	Forward	$V_{GS} = 30\text{V}$, $V_{DS} = 0\text{V}$ $V_{GS} = -30\text{V}$, $V_{DS} = 0\text{V}$			100	nA
	Reverse				-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$, $I_D = 2.5\text{A}$			1.65	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1.0\text{MHz}$		565		pF
Output Capacitance	C_{OSS}			68		pF
Reverse Transfer Capacitance	C_{RSS}			5.5		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q_G	$V_{DS} = 50\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 1.3\text{A}$ $I_G = 100\mu\text{A}$ (Note 1, 2)		39		nC
Gate to Source Charge	Q_{GS}			3.2		nC
Gate to Drain Charge	Q_{GD}			3.6		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 0.5\text{A}$, $R_G = 25\Omega$ (Note 1, 2)		35		ns
Rise Time	t_R			26		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			110		ns
Fall-Time	t_F			31		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				5	A
Maximum Body-Diode Pulsed Current	I_{SM}				20	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S = 5.0\text{A}$, $V_{GS} = 0\text{V}$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S = 5.0\text{A}$, $V_{GS} = 0\text{V}$,		280		ns
Body Diode Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{A}/\mu\text{s}$		1.2		μC

Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

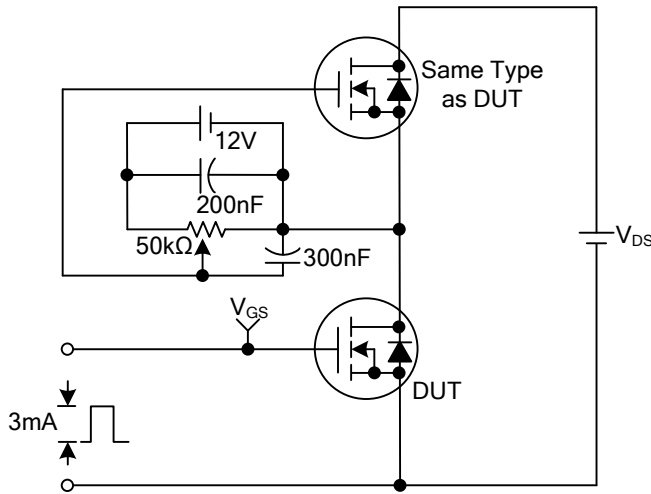


Peak Diode Recovery dv/dt Test Circuit

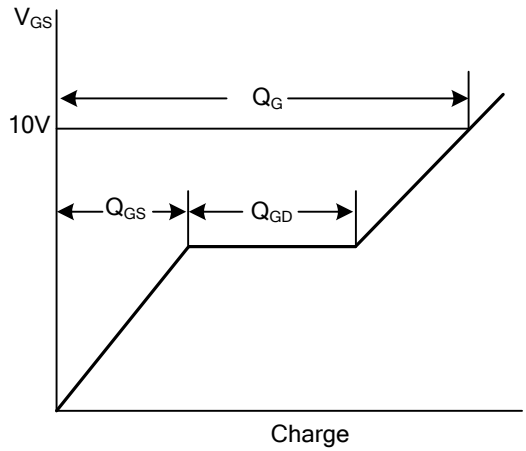


Peak Diode Recovery dv/dt Waveforms

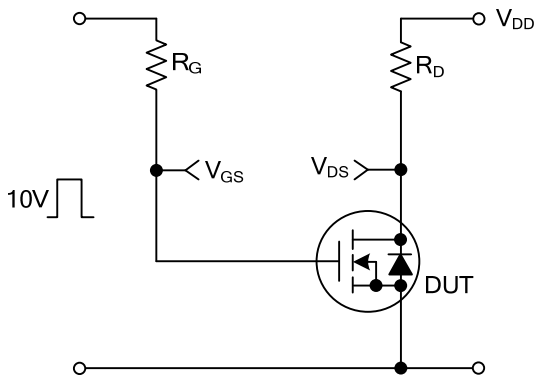
TEST CIRCUITS AND WAVEFORMS



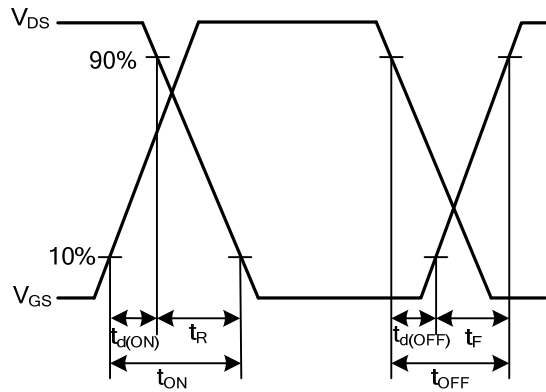
Gate Charge Test Circuit



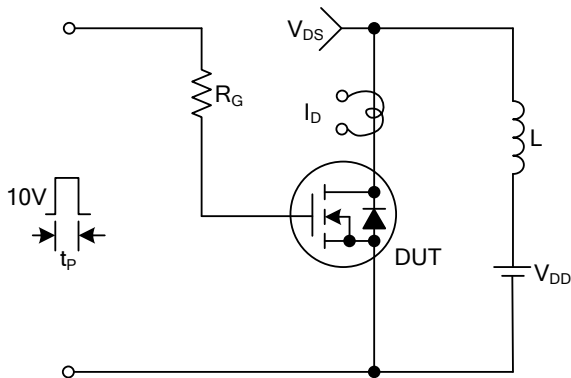
Gate Charge Waveforms



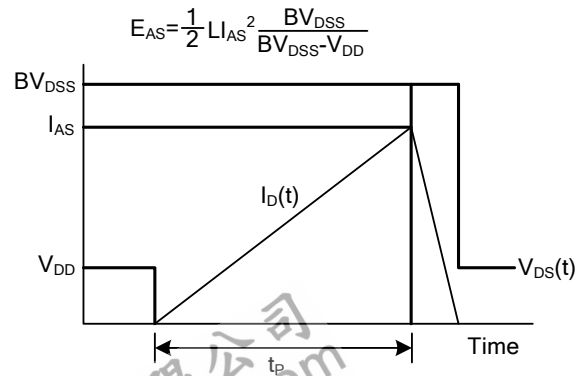
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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