



## F5N50K-TC

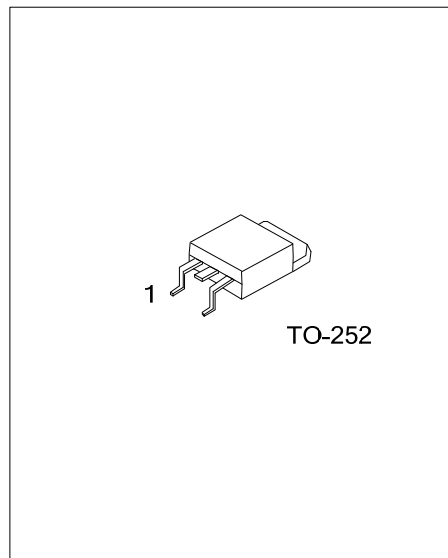
Power MOSFET

### 5.0A, 500V N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC **F5N50K-TC** is a 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.

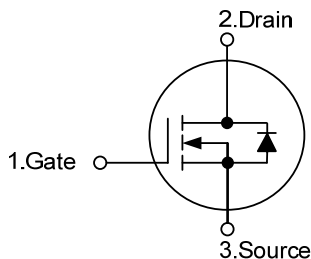
The UTC **F5N50K-TC** can be used in applications, such as active power factor correction, high efficiency switched mode power supplies, electronic lamp ballasts based on half bridge topology.



#### FEATURES

- \*  $R_{DS(ON)} \leq 1.8\Omega @ V_{GS}=10V, I_D=2.5A$
- \* 100% avalanche tested
- \* High switching speed

#### SYMBOL



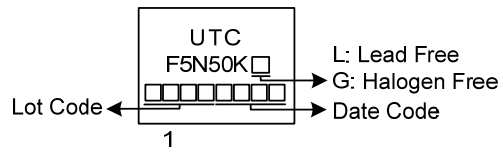
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
F5N50KL-TN3-R	F5N50KG-TN3-R	TO-252	G	D	S	Tape Reel

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

F5N50KG-TN3-R	(1)Packing Type	(1) R: Tape Reel
	(2)Package Type	(2) TN3: TO-252
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	5	A
	Pulsed (Note 2)	$I_{DM}$	20	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	104	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.3	V/ns
Power Dissipation		$P_D$	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.  $L = 16\text{mH}$ ,  $I_{AS} = 3.6\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , 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		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	110	$^{\circ}\text{C}/\text{W}$
Junction to Case		$\theta_{JC}$	2.3	$^{\circ}\text{C}/\text{W}$

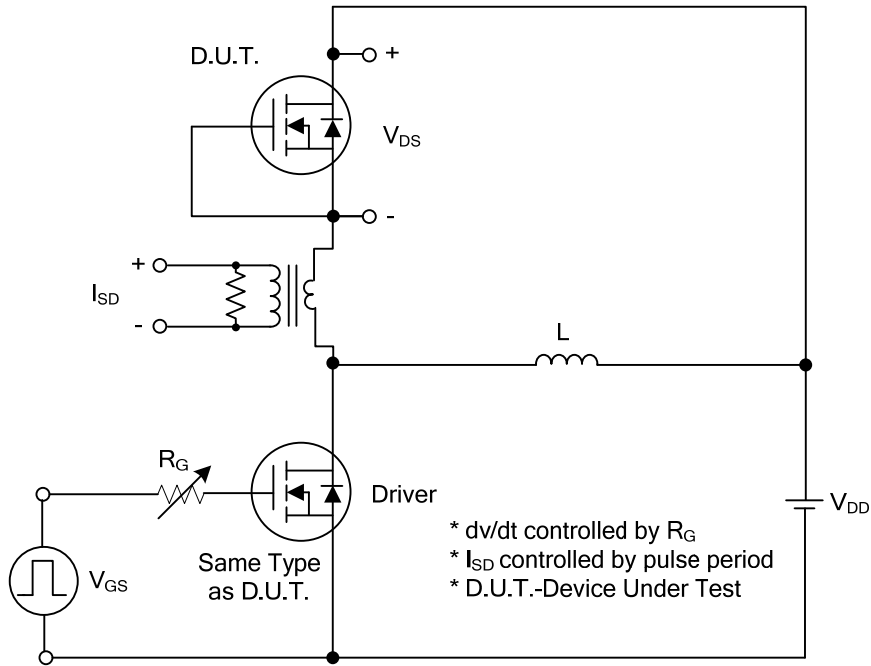
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
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	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS}=30\text{V}$ , $V_{DS}=0\text{V}$			100	nA
	Reverse		$V_{GS}=-30\text{V}$ , $V_{DS}=0\text{V}$			-100	nA
<b>ON CHARACTERISTICS</b>							
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		$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=2.5\text{A}$			1.8	$\Omega$
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance		$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		585		pF
Output Capacitance		$C_{OSS}$			58		pF
Reverse Transfer Capacitance		$C_{RSS}$			7.0		pF
<b>SWITCHING PARAMETERS</b>							
Total Gate Charge (Note 1)		$Q_G$	$V_{DS}=200\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=5.0\text{A}$ $I_G=1\text{mA}$ (Note 1, 2)		5.2		nC
Gate to Source Charge		$Q_{GS}$			2.8		nC
Gate to Drain Charge		$Q_{GD}$			1.1		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	$V_{DD}=30\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=0.75\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		7.6		ns
Rise Time		$t_R$			18.6		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			36		ns
Fall-Time		$t_F$			18		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
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)		$t_{rr}$	$I_S=5.0\text{A}$ , $V_{GS}=0\text{V}$			102	ns
Body Diode Reverse Recovery Charge		$Q_{rr}$	$di/dt=100\text{A}/\mu\text{s}$			0.33	$\mu\text{C}$

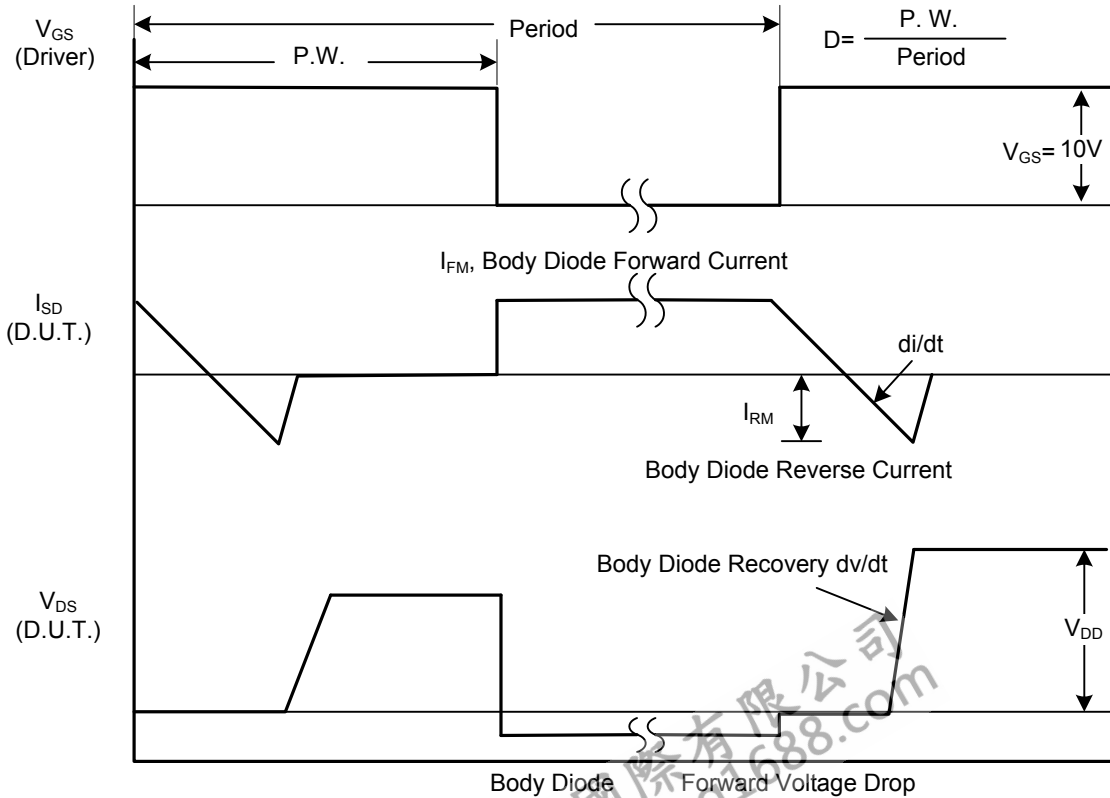
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

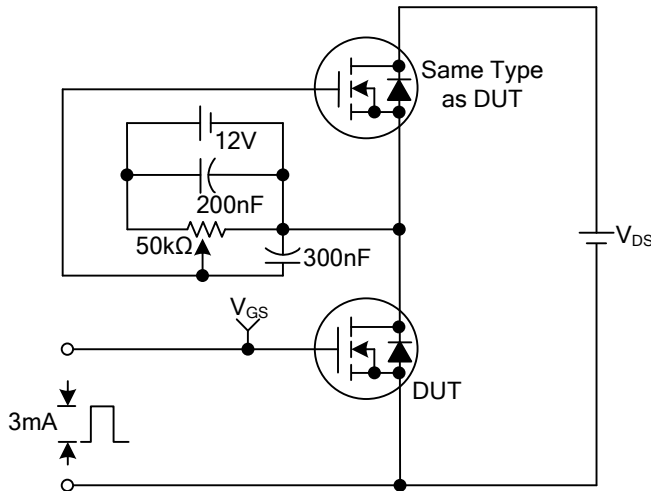


**Peak Diode Recovery  $dv/dt$  Test Circuit**

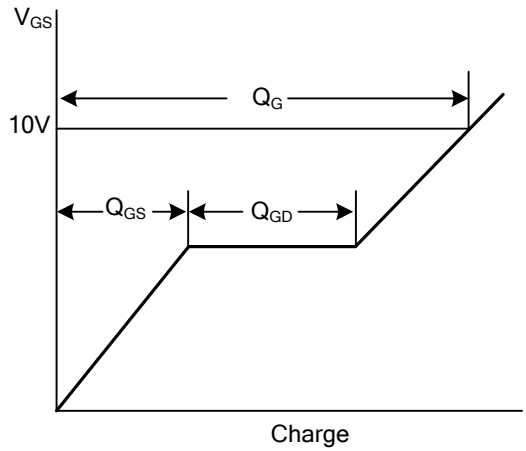


**Peak Diode Recovery  $dv/dt$  Waveforms**

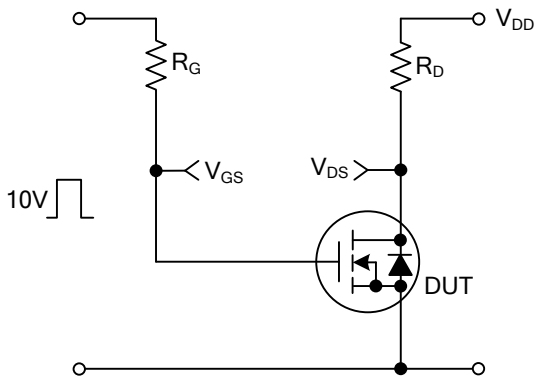
## TEST CIRCUITS AND WAVEFORMS



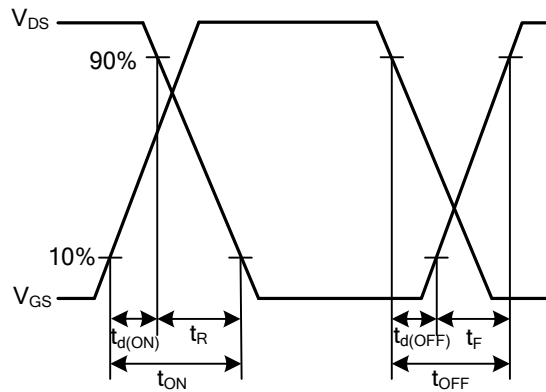
Gate Charge Test Circuit



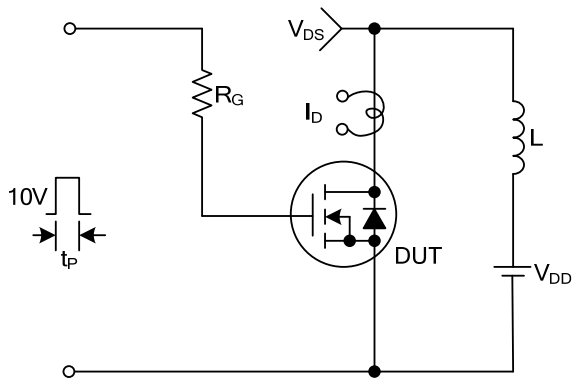
Gate Charge Waveforms



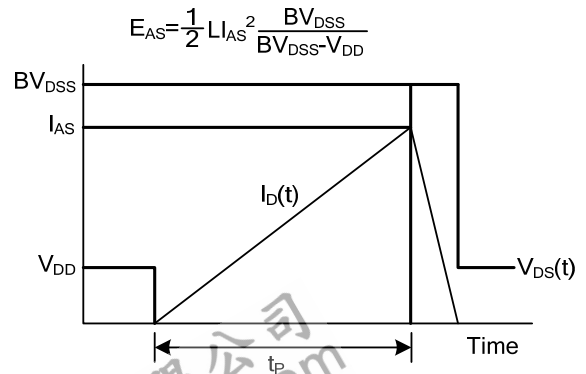
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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