



5N50

Preliminary

Power MOSFET

500V N-CHANNEL POWER MOSFET

DESCRIPTION

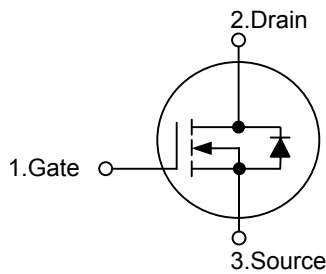
The UTC **5N50** is an N-channel MOSFET adopting UTC's advanced technology to provide customers with DMOS, planar stripe technology. This technology is designed to meet the requirements of the minimum on-state resistance and perfect switching performance. It also can withstand high energy pulse in the avalanche and communication mode.

The UTC **5N50** 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

- * 5A, 500V, $R_{DS(on)} = 1.4\Omega @ V_{GS} = 10V$
- * 100% avalanche tested
- * High switching speed

SYMBOL

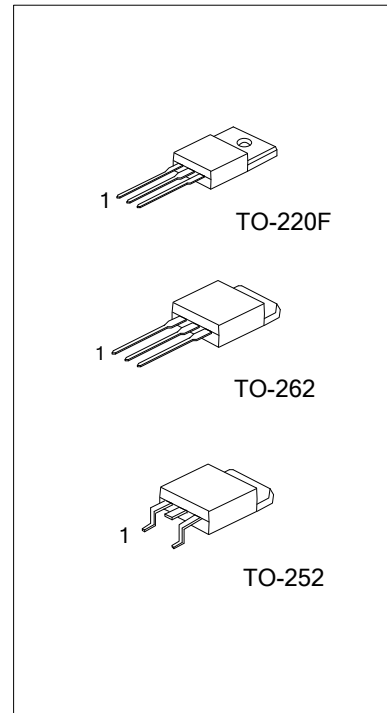


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N50L-TF3-T	5N50G-TF3-T	TO-220F	G	D	S	Tube
5N50L-TN3-R	5N50G-TN3-R	TO-252	G	D	S	Tape Reel
5N50L-T2Q-T	5N50G-T2Q-T	TO-262	G	D	S	Tube

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

<p>5N50L-TN3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) TF3: TO-220F, TN3: TO-252, T2Q: TO-262</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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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 1)	I_{DM}	20	A
Avalanche Current (Note 1)		I_{AR}	5	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	300	mJ
	Repetitive (Note 1)	E_{AR}	7.3	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F	P_D	38	W
	TO-252		54	W
	TO-262		125	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55~+150	$^\circ\text{C}$

Note : 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.

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-252		110	$^\circ\text{C/W}$
	TO-262		62.5	$^\circ\text{C/W}$
Junction to Case	TO-220F	θ_{JC}	3.25	$^\circ\text{C/W}$
	TO-252		2.13	$^\circ\text{C/W}$
	TO-262		1	$^\circ\text{C/W}$

■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, 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
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C , $I_D=250\mu\text{A}$		0.5		$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=500\text{V}$, $V_{GS}=0\text{V}$			1	μA
		$V_{DS}=400\text{V}$, $T_C=125^\circ\text{C}$			10	
Gate- Source Leakage Current	Forward	$V_{GS}=30\text{V}$, $V_{DS}=0\text{V}$			100	nA
	Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-100	nA
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=2.5\text{A}$		1.14	1.4	Ω
Forward Transconductance (Note 4)	g_{FS}	$V_{DS}=40\text{V}$, $I_D=2.5\text{A}$		5.2		S
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		480	625	pF
Output Capacitance	C_{OSS}			80	105	pF
Reverse Transfer Capacitance	C_{RSS}			15	20	pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 4,5)	Q_G	$V_{GS}=10\text{V}$, $V_{DS}=400\text{V}$, $I_D=5\text{A}$		18	24	nC
Gate to Source Charge (Note 4,5)	Q_{GS}			2.2		nC
Gate to Drain Charge (Note 4,5)	Q_{GD}			9.7		nC
Turn-ON Delay Time (Note 4,5)	$t_{D(ON)}$	$V_{DD}=250\text{V}$, $I_D=5\text{A}$, $R_G=25\Omega$		12	35	ns
Rise Time (Note 4,5)	t_R			46	100	ns
Turn-OFF Delay Time (Note 4,5)	$t_{D(OFF)}$			50	110	ns
Fall-Time (Note 4,5)	t_F			48	105	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				5	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				20	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=5\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time (Note 4)	t_{RR}	$I_S=5\text{A}$, $V_{GS}=0\text{V}$, $dI_F/dt=100\text{A}/\mu\text{s}$		263		ns
Reverse Recovery Charge (Note 4)	Q_{RR}				1.9	

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. $L = 21.5\text{mH}$, $I_{AS} = 5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

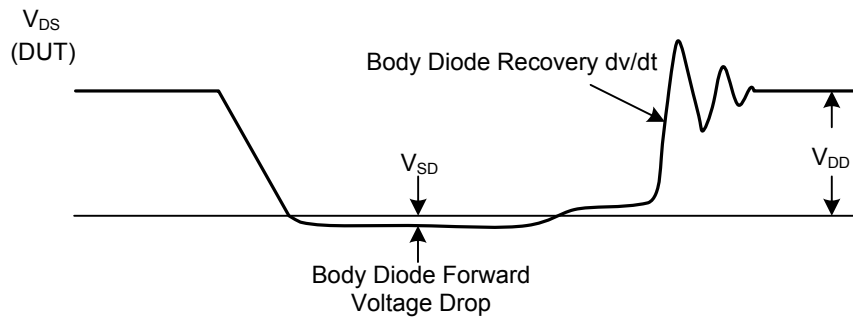
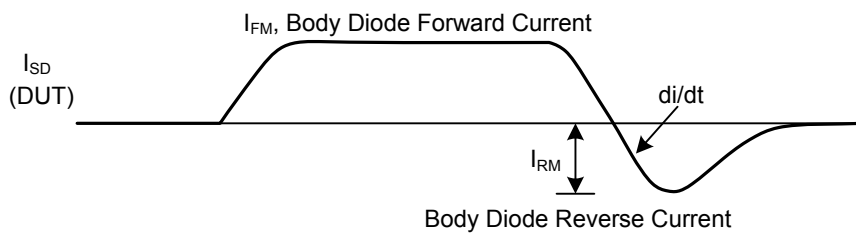
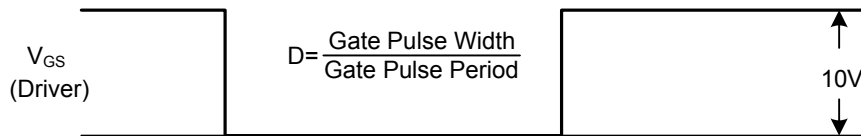
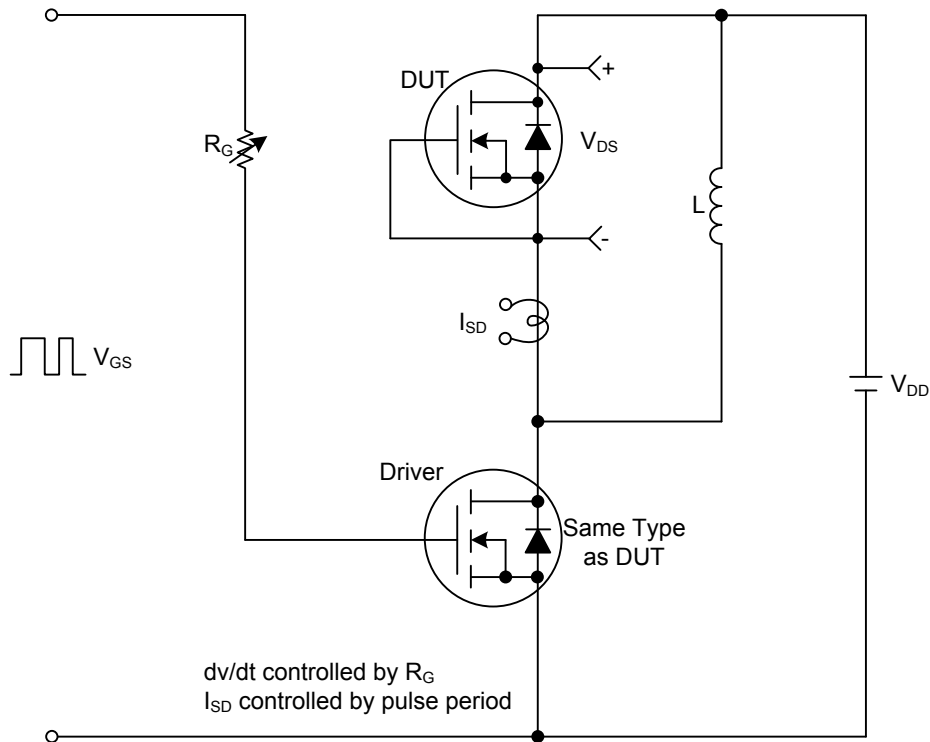
3. $I_{SD} \leq 5\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

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

5. Essentially independent of operating temperature

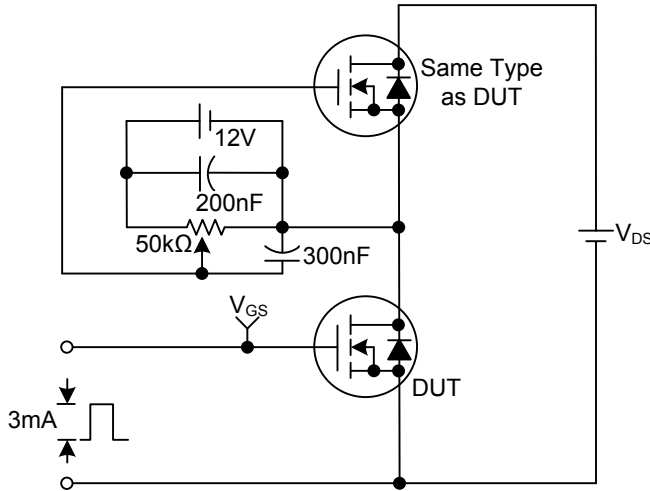
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test Circuit & Waveforms

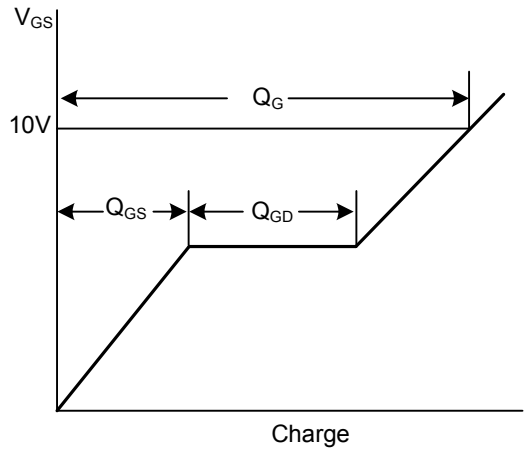


■ TEST CIRCUITS AND WAVEFORMS(Cont.)

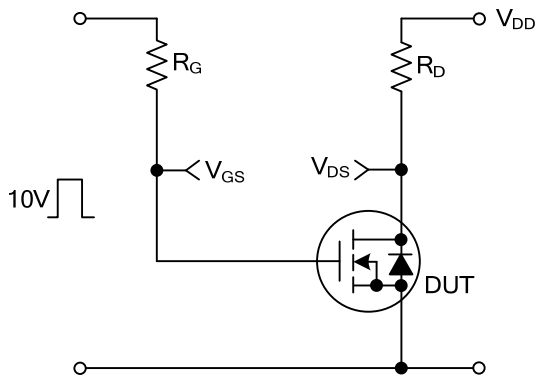
Gate Charge Test Circuit



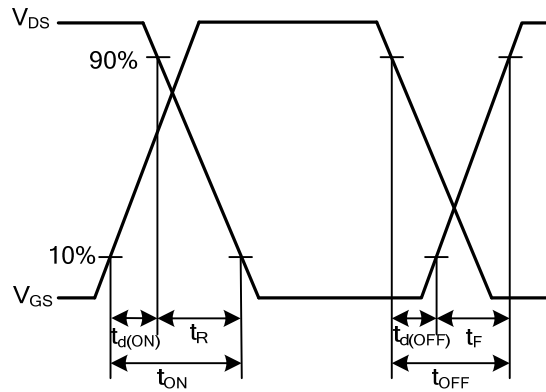
Gate Charge Waveforms



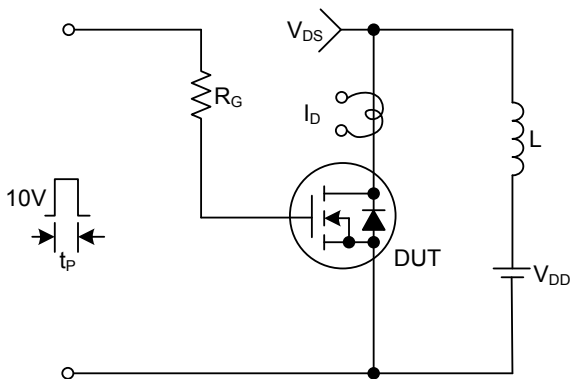
Resistive Switching Test Circuit



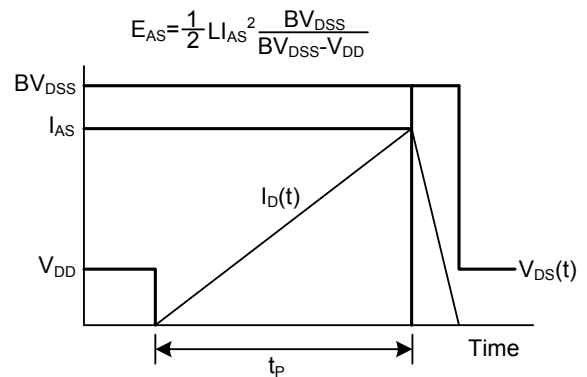
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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