

UNISONIC TECHNOLOGIES CO., LTD

5N50 **Preliminary Power MOSFET**

500V N-CHANNEL POWER **MOSFET**

DESCRIPTION

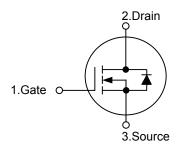
The UTC 5N50 is an N-channel MOSFET adopting UTC's advanced technology to provide customers with DMOS, planar stripe technology. This technology is designed to meet the requirements of the minimum on-state resistance and perfect switching performance. It also can withstand high energy pulse in the avalanche 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, $R_{DS(on)} = 1.4\Omega @V_{GS} = 10 \text{ V}$
- * 100% avalanche tested
- * High switching speed

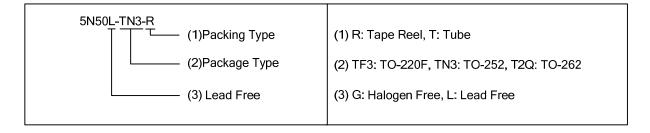
SYMBOL



ORDERING INFORMATION

Ordering Number		Dookogo	Pin Assignment			Dooking
Lead Free	Halogen Free	Package	1	2	3	Packing
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



TO-220F TO-262 TO-252

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■ ABSOLUTE MAXIMUM RATINGS (T_C=25°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	Α
Piairi Current	Pulsed (Note 1)	I_{DM}	20	Α
Avalanche Current (Note 1)		I_{AR}	5	Α
IAValanche Energy E	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
	TO-220F		38	W
Power Dissipation	TO-252	P_{D}	54	W
	TO-262		125	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55~+150	°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
	TO-220F		62.5	°C/W
Junction to Ambient	TO-252	θ_{JA}	110	°C/W
	TO-262		62.5	°C/W
	TO-220F		3.25	°C/W
Junction to Case	TO-252	θ_{JC}	2.13	°C/W
	TO-262		1	°C/W

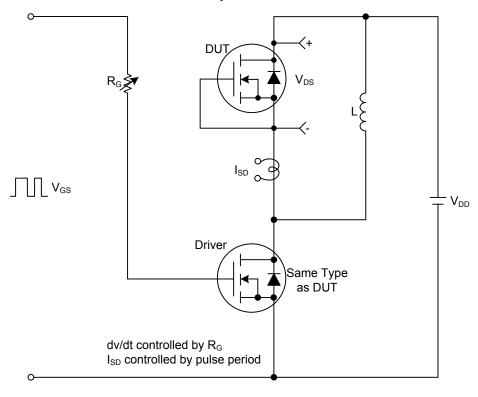
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

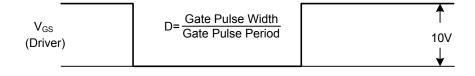
OFF CHARACTERISTICS Drain-Source Breakdown Voltage BV _{DSS} I _D =250μA, V _{GS} =0V 500 Breakdown Voltage Temperature Coefficient ΔBV _{DSS} /ΔTJ Reference to 25°C, I _D =250μA 0.5 Drain-Source Leakage Current Gate-Source Gate-Source Current Gate-Source Current Gate-Source Current Gate-Source Gate-Source Current Gate-Source Gate-Source Current Gate-Source Gate-Source Current Gate-Source Gate-Source Gate-Source Current Gate-Source Gate-S	1 10 100 -100	V V/°C µA nA nA
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	10 100 -100	nA
$ \begin{array}{ c c c c c } \hline \text{Gate-Source Leakage Current} & \hline & Forward \\ \hline \text{Reverse} & I_{GSS} & \hline & V_{GS}=30\text{V}, V_{DS}=0\text{V} \\ \hline \hline \textbf{ON CHARACTERISTICS} \\ \hline \text{Gate Threshold Voltage} & V_{GS(TH)} & V_{DS}=V_{GS}, I_{D}=250\mu\text{A} & 2.0 \\ \hline \text{Static Drain-Source On-State Resistance} & R_{DS(ON)} & V_{GS}=10\text{V}, I_{D}=2.5\text{A} & 1.14 \\ \hline \text{Forward Transconductance (Note 4)} & g_{FS} & V_{DS}=40\text{V}, I_{D}=2.5\text{A} & 5.2 \\ \hline \textbf{DYNAMIC PARAMETERS} \\ \hline \textbf{Input Capacitance} & C_{ISS} & V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz} & 80 \\ \hline \text{Reverse Transfer Capacitance} & C_{RSS} & V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz} & 80 \\ \hline \textbf{SWITCHING PARAMETERS} & 15 \\ \hline \textbf{SWITCHING PARAMETERS} & Q_{G} & V_{GS}=10\text{V}, V_{DS}=400\text{V}, I_{D}=5\text{A} & 2.2 \\ \hline \textbf{Gate to Source Charge (Note 4,5)} & Q_{GS} & V_{GS}=10\text{V}, V_{DS}=400\text{V}, I_{D}=5\text{A} & 2.2 \\ \hline \textbf{Gate to Drain Charge (Note 4,5)} & Q_{GD} & 9.7 \\ \hline \textbf{Turn-ON Delay Time (Note 4,5)} & t_{D(ON)} & 12 \\ \hline \textbf{Rise Time (Note 4,5)} & t_{R} & V_{DD}=250\text{V}, I_{D}=5\text{A}, R_{G}=25\Omega} & 50 \\ \hline \textbf{Fall-Time (Note 4,5)} & t_{F} & 48 \\ \hline \textbf{Auter Charge (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OFF Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OFF Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OFF Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OFF Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OFF Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OFF Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline \textbf{Curn-OND Delay Time (Note 4,5)} & t_{D} & 48 \\ \hline Curn-$	100	
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	4.0	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	4.0	V
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.4	Ω
$\begin{array}{ c c c c c }\hline \text{Input Capacitance} & C_{ISS} & V_{GS}=0V, V_{DS}=25V, f=1.0\text{MHz} & 80\\\hline \text{Reverse Transfer Capacitance} & C_{RSS} & 15\\\hline \textbf{SWITCHING PARAMETERS} & & & & 15\\\hline \textbf{SWITCHING PARAMETERS} & & & & & & & \\\hline \textbf{Total Gate Charge (Note 4,5)} & Q_G & & & & & & & \\\hline \textbf{Gate to Source Charge (Note 4,5)} & Q_{GS} & V_{GS}=10V, V_{DS}=400V, I_D=5A & 2.2\\\hline \textbf{Gate to Drain Charge (Note 4,5)} & Q_{GD} & & & & & \\\hline \textbf{Turn-ON Delay Time (Note 4,5)} & t_{D(ON)} & & & & & \\\hline \textbf{Rise Time (Note 4,5)} & t_R & & & & & \\\hline \textbf{Turn-OFF Delay Time (Note 4,5)} & t_D(OFF) & & & & \\\hline \textbf{Fall-Time (Note 4,5)} & t_F & & & & & \\\hline \textbf{480} & & & & & & \\\hline \textbf{A80} & & & & & \\\hline \textbf{A80} & & & & & & \\\hline \textbf{A80} & & & & & & \\\hline \textbf{A80} & & & & & \\\hline \textbf{A80} & & & & & & \\\hline \textbf{A80} & & & $		S
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	625	pF
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	105	pF
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	20	pF
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	24	nC
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		nC
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		nC
Turn-OFF Delay Time (Note 4,5) $t_{D(OFF)}$ V_{DD} =250V, I_{D} =5A, R_{G} =25 Ω 50 Fall-Time (Note 4,5) t_{F} 48	35	ns
	100	ns
Fall-Time (Note 4,5)	110	ns
SOURCE DRAIN DIODE DATINGS AND CHARACTERISTICS	105	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS		
Maximum Continuous Drain-Source Diode	5	_
Forward Current	5	Α
Maximum Pulsed Drain-Source Diode Forward Current	20	Α
Drain-Source Diode Forward Voltage V _{SD} I _S =5A, V _{GS} =0V	1.4	V
Reverse Recovery Time (Note 4)		ns
Reverse Recovery Charge (Note 4) Q_{RR} $I_S=5A$, $V_{GS}=0V$, $dI_F/dt=100A/\mu s$ 1.9		μC

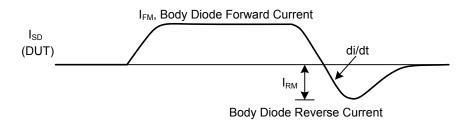
- Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature
 - 2. L = 21.5mH, I_{AS} = 5A, V_{DD} = 50V, R_{G} = 25 Ω , Starting T_{J} = 25 $^{\circ}$ C
 - 3. $I_{SD} \le 5A$, di/dt $\le 200A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25^{\circ}C$
 - 4. Pulse Test: Pulse width ≤ 300µs, Duty cycle ≤ 2%
 - 5. Essentially independent of operating temperature

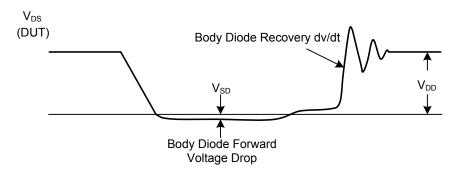
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test Circuit & Waveforms



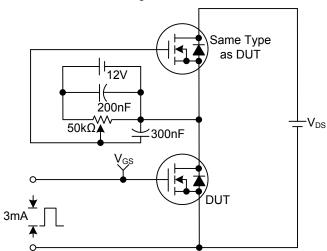




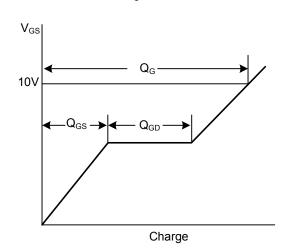


■ TEST CIRCUITS AND WAVEFORMS(Cont.)

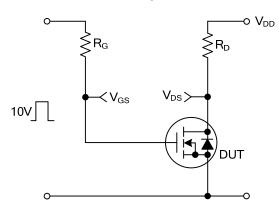
Gate Charge Test Circuit



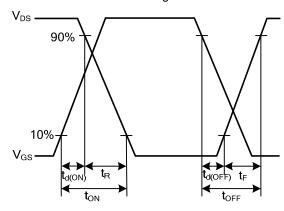
Gate Charge Waveforms



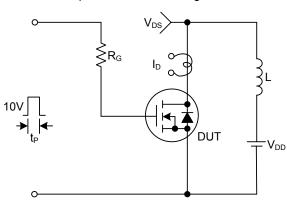
Resistive Switching Test Circuit



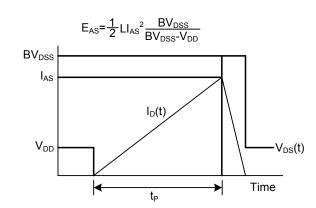
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



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