



5N25

Power MOSFET

3.8A, 250V LOGIC N-CHANNEL MOSFET

DESCRIPTION

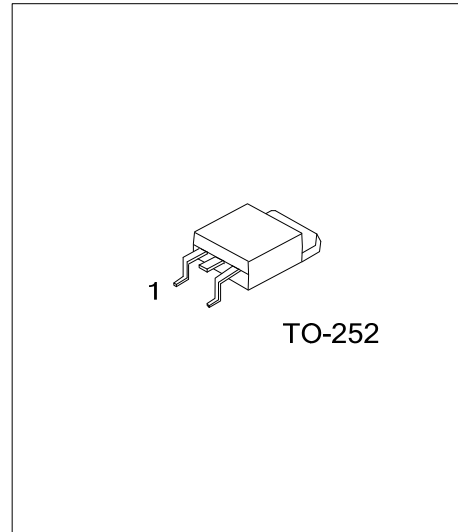
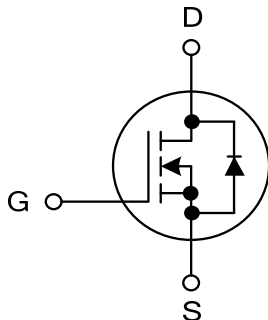
The UTC **5N25** is an N-Channel enhancement MOSFET, it uses UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed and low gate charge. It can also withstand high energy pulse in the avalanche and commutation modes.

The UTC **5N25** is suitable for high efficiency switching DC/DC converter, motor control and switch mode power supply.

FEATURES

- * $R_{DS(ON)} < 1.2\Omega @ V_{GS}=10V$
- * Low gate charge (Typ=14nC)
- * Low C_{RSS} (Typ=6.0pF)
- * High switching speed

SYMBOL



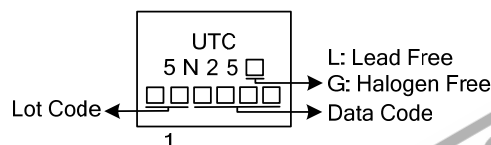
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N25L-TN3-T	5N25G-TN3-T	TO-252	G	D	S	Tube
5N25L-TN3-R	5N25G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>5N25L-TN3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TN3: TO-252</p> <p>(3) L: Lead Free, G: Halogen Free</p>
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MARKING



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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	250	V
Gate-Source Voltage	V_{GSS}	± 20	V
Drain Current	Continuous	I_D	3.8
	Pulsed (Note 2)	I_{DM}	9
Avalanche Current (Note 2)	I_{AR}	3.8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	85
	Repetitive (Note 2)	E_{AR}	3.7
Peak Diode Recovery dv/dt (Note 4)	dv/dt	5.5	V/ns
Power Dissipation	$T_A=25^\circ\text{C}$	P_D	2.5
	$T_C=25^\circ\text{C}$		37
	Derate above 25°C		0.29
Junction Temperature	T_J	-55~+150	$^\circ\text{C}$
Storage Temperature Range	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. $L=6.2\text{mH}$, $I_{AS}=3.8\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.

4. $I_{SD}\leq 4.5\text{A}$, $di/dt\leq 300\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$.

■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient (Note)	θ_{JA}	50	$^\circ\text{C}/\text{W}$
Junction to Ambient		110	$^\circ\text{C}/\text{W}$
Junction to Cas	θ_{JC}	3.4	$^\circ\text{C}/\text{W}$

Note: When mounted on the minimum pad size recommended (PCB Mount)

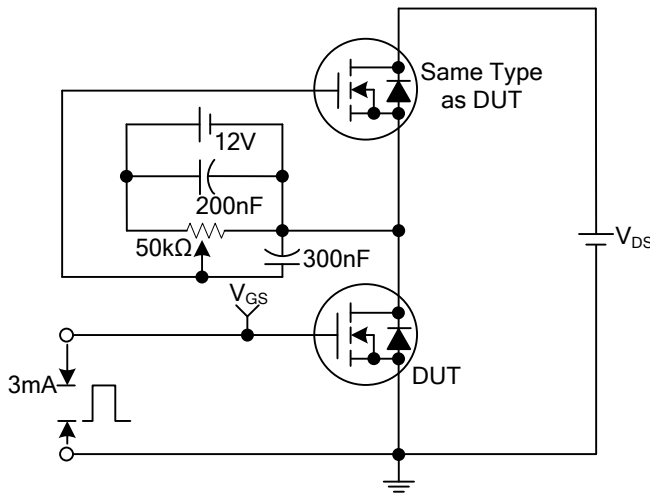
■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	250			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C , $I_D=250\mu\text{A}$		0.18		$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=250\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}			+100	nA
		Reverse			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2		4	V
Static Drain-Source On-State Resistance (Note 1)	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=1.9\text{A}$		0.74	1.2	Ω
		$V_{GS}=5\text{V}$, $I_D=1.9\text{A}$		0.92	1.25	Ω
Forward Transconductance	g_{FS}	$V_{DS}=30\text{V}$, $I_D=1.9\text{A}$		3.35		S
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		250	325	pF
Output Capacitance	C_{OSS}			40	50	pF
Reverse Transfer Capacitance	C_{RSS}			6	8	pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{GS}=5\text{V}$, $V_{DS}=160\text{V}$, $I_D=4.5\text{A}$ (Note 1, 2)		14	20	nC
Gate to Source Charge	Q_{GS}			1.2		nC
Gate to Drain Charge	Q_{GD}			2.4		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=100\text{V}$, $I_D=4.5\text{A}$, $R_G=25\Omega$ (Note 1, 2)		28	40	ns
Rise Time	t_R			24	80	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			80	110	ns
Fall-Time	t_F			20	90	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				3.8	A
Maximum Body-Diode Pulsed Current	I_{SM}				9	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=3.8\text{A}$, $V_{GS}=0\text{V}$			1.5	V
Body Diode Reverse Recovery Time	t_{RR}	$I_S=4.5\text{A}$, $V_{GS}=0\text{V}$, $dI_F/dt=100\text{A}/\mu\text{s}$		95		ns
Body Diode Reverse Recovery Charge	Q_{RR}	(Note 1)		0.3		μC

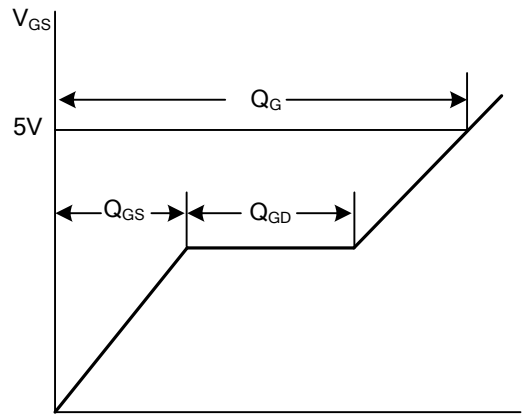
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycles $\leq 2\%$

2. Essentially independent of operating temperature.

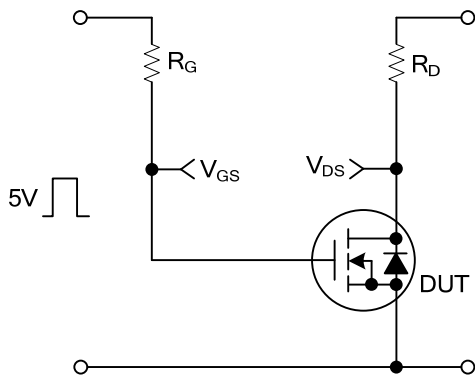
■ TEST CIRCUITS AND WAVEFORMS



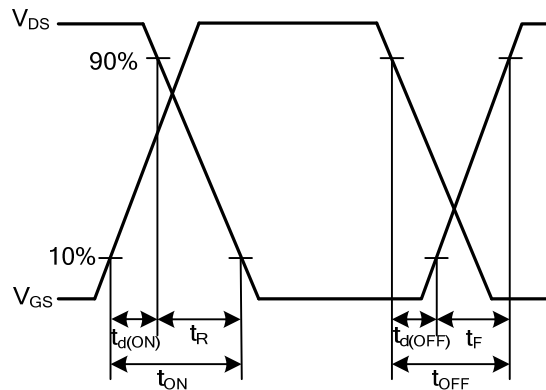
Gate Charge Test Circuit



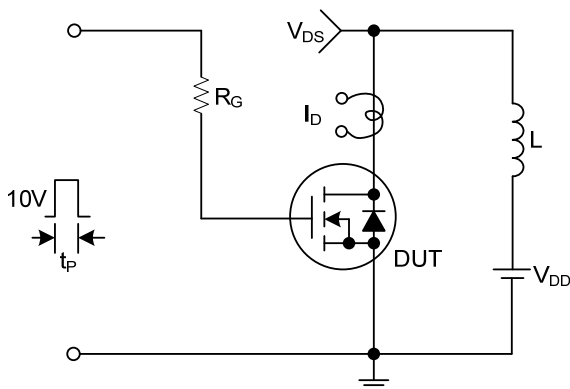
Gate Charge Waveforms



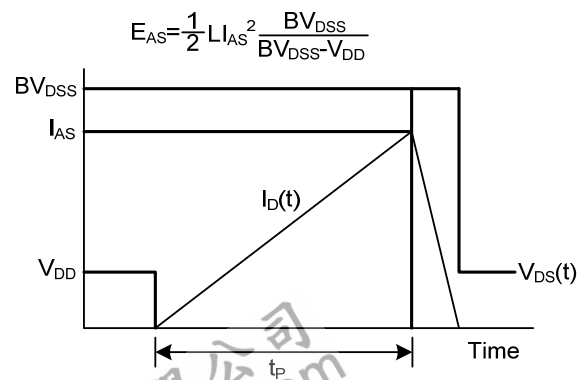
Resistive Switching Test Circuit



Resistive Switching Waveforms



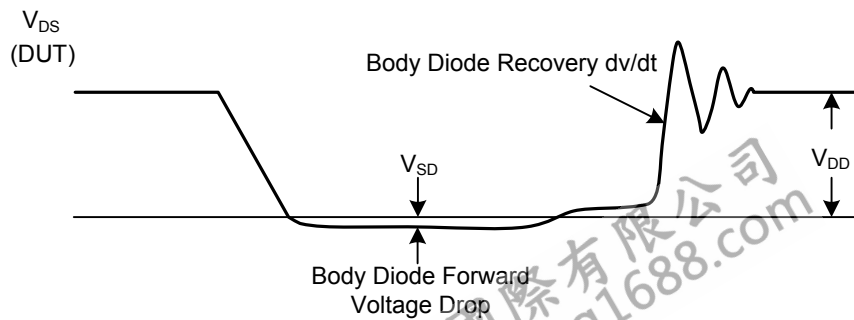
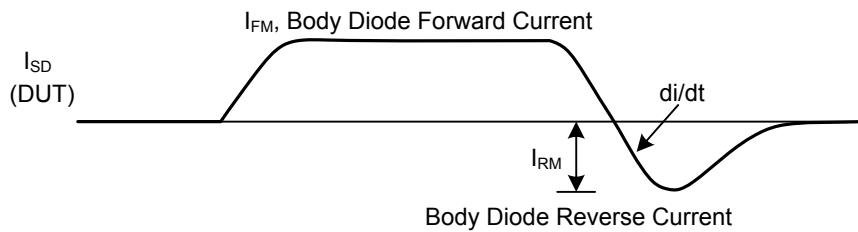
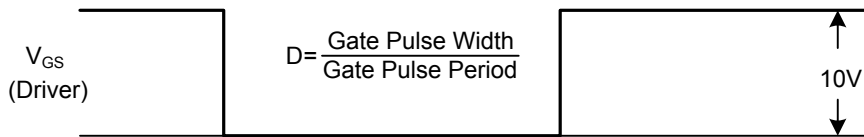
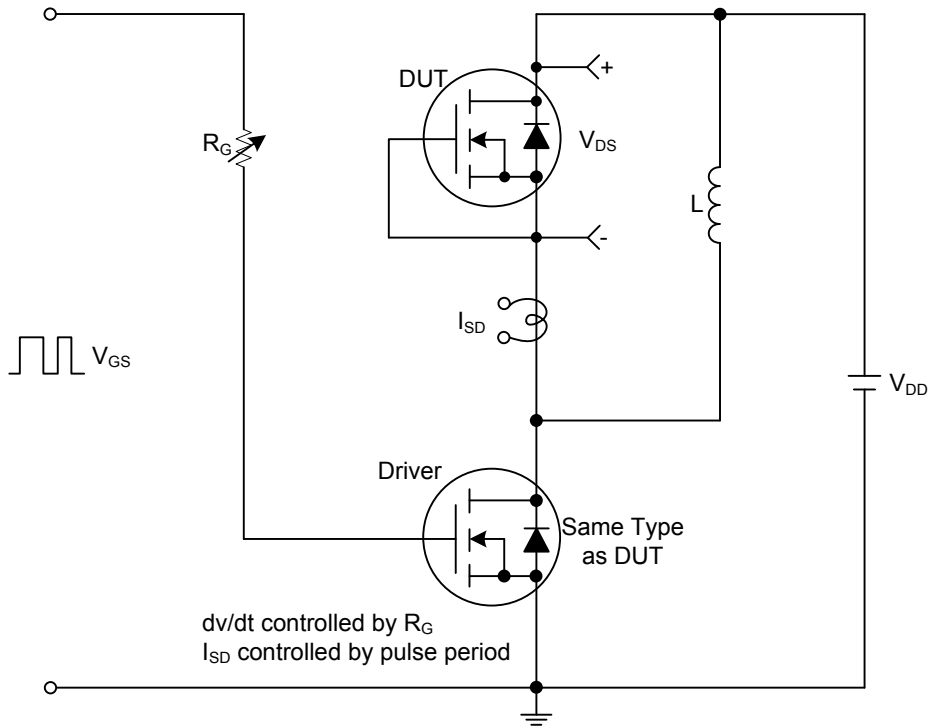
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

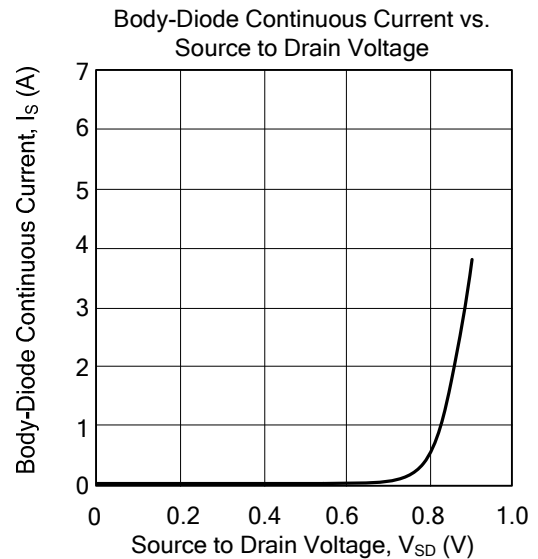
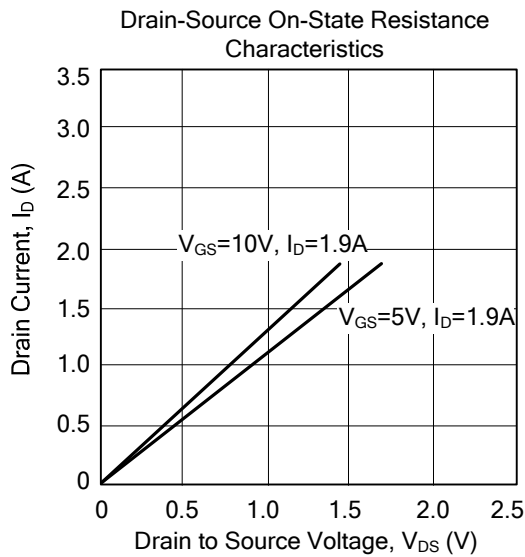
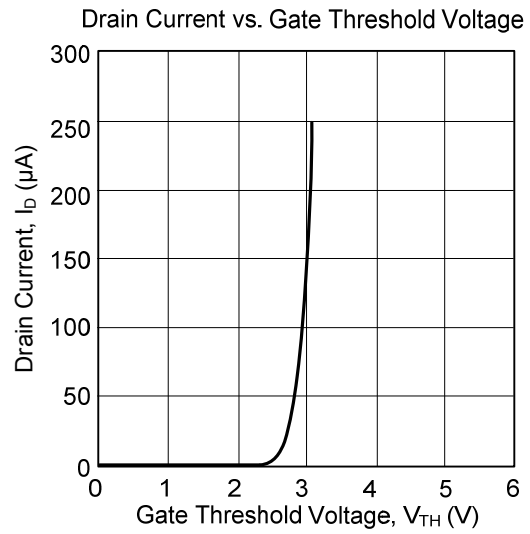
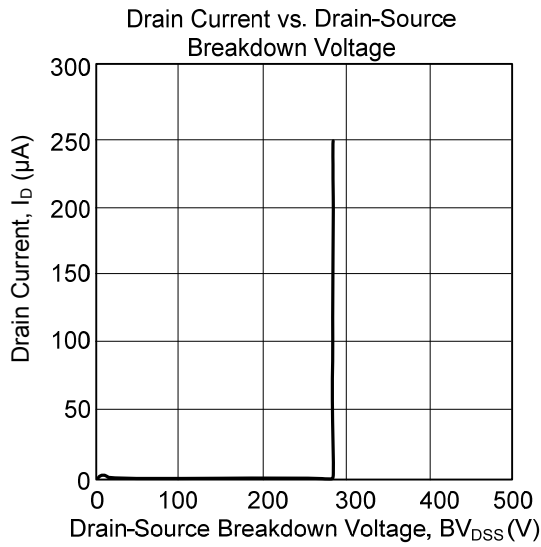
$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit and Waveforms

■ TYPICAL CHARACTERISTICS



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