

4A,500V N-Channel Power MOSFET

Features

4A, 500V, $R_{DS(on)} = 1.5\Omega(\text{MAX}) @V_{GS} = 10\text{ V}$

100% avalanche tested

High switching speed

TO-252



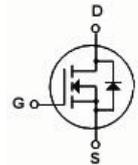
G D S

General Description

Package:TO-252

The RM4N500LD is an N-channel MOSFET adopting 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 RM4N500LD 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.



Absolute Maximum Ratings

Symbol	Parameter	Spec	Units
V_{DSS}	Drain-Source Voltage	500	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current -Continuous($T_c=25^\circ\text{C}$)	4	A
I_{DM}	Drain Current -Pulsed	24	A
I_{AR}	Avalanche Current	6	A
E_{AS}	Single Pulsed Avalanche Energy (Note 1)	300	mJ
E_{AR}	Repetitive Avalanche Energy	7.3	mJ
dv/dt	Peak Diode Recovery dv/dt	4.5	V/ns
P_D	Power Dissipation ($T_C=25^\circ\text{C}$)	54	W
	-Derate above 25°C	0.35	W/ $^\circ\text{C}$
T_J	Junction Temperature	+150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	—	2.1	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	—	110	$^\circ\text{C}/\text{W}$

Electrical Characteristics(Tc=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	500	—	—	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\mu A$, Referenced to 25°C	—	0.5	—	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=500V, V_{GS}=0V$	—	—	1	μA
		$V_{DS}=400V, T_C=125^\circ C$	—	—	10	μA
I_{GSS}	Gate-Body Leakage Current	Forward $V_{GS}=30V, V_{DS}=0V$	—	—	100	nA
		Reverse $V_{GS}=-30V, V_{DS}=0V$	—	—	-100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS_{TH}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0	—	4.0	V
R_{DSON}	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=2A$	—	1.1	1.5	Ω

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{jss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V,$ $f=1.0MHz$	—	480	625	pF
C_{oss}	Output Capacitance		—	80	105	pF
C_{rss}	Reverse Transfer Capacitance		—	15	20	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
t_{don}	Turn-On Delay Time	$V_{DD}=250V$ $I_D=4.0A$ $R_G=25\Omega$ (Note 2, 3)	—	12	35	ns
t_r	Turn-On Rise Time		—	46	100	ns
t_{doff}	Turn-Off Delay Time		—	50	110	ns
t_f	Turn-Off Fall Time		—	48	105	ns
Q_g	Total Gate Charge	$V_{DS}=400V$	—	18	24	nC
Q_{gs}	Gate-Source Charge	$I_D=4.0A$	—	2.2	—	nC
Q_{gd}	Gate-Drain Charge	$V_{GS}=10V$ (Note 2, 3)	—	9.7	—	nC

Drain-Source Diode Characteristics and Maximum Ratings

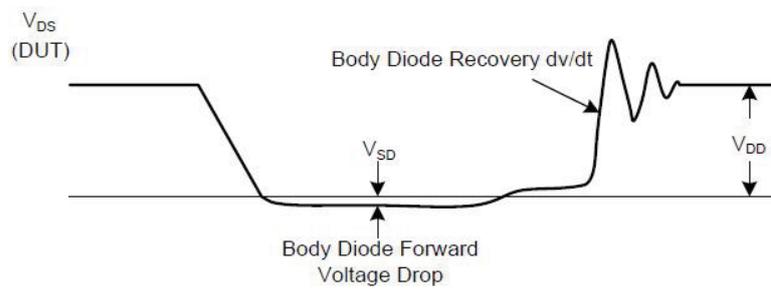
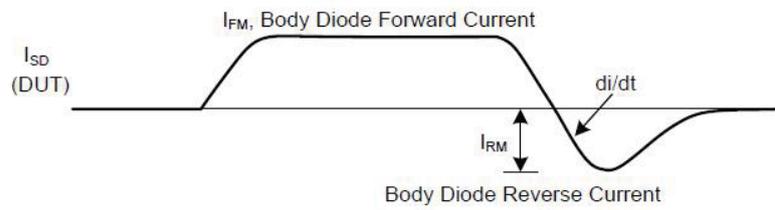
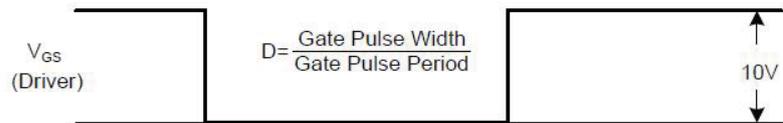
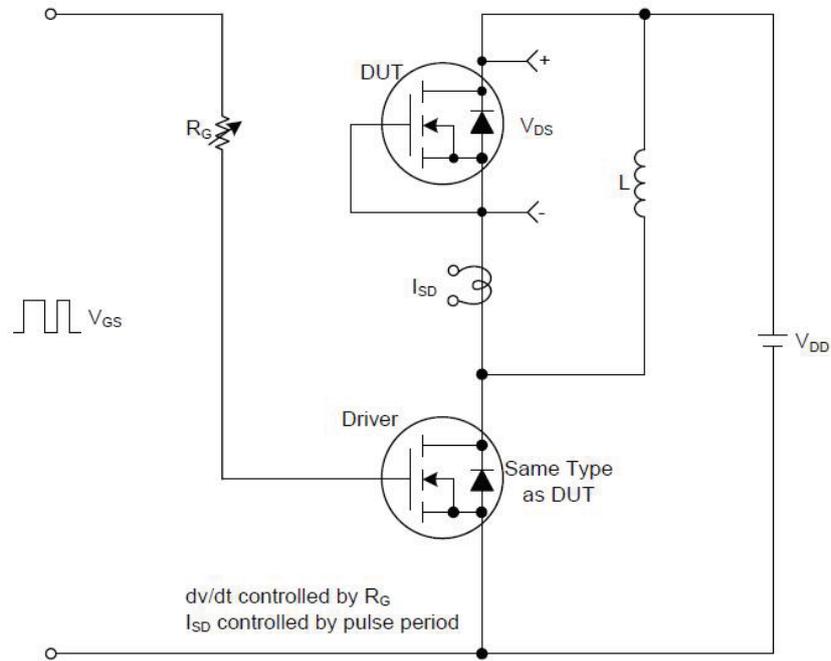
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Drain-source diode forward current		—	—	6.0	A
I_{sm}	Maximum pulsed drain-source diode forward current		—	—	20	A
V_{sd}	Drain-source diode forward Voltage	$V_{GS}=0V, I_S=6.0A$	—	—	1.4	V
T_{rr}	Reverse Recovery Time	$V_{GS}=0V, I_S=6.0A$	—	263	—	ns
Q_{rr}	Reverse Recovery charge	$dif/dt=100A/\mu s$	—	1.9	—	μc

Notes:

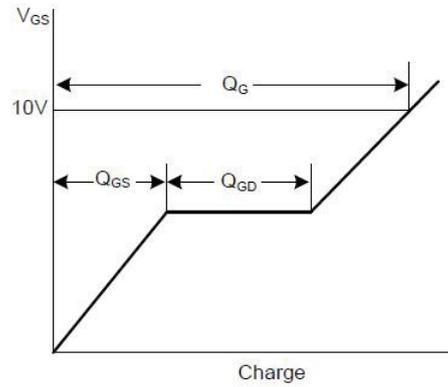
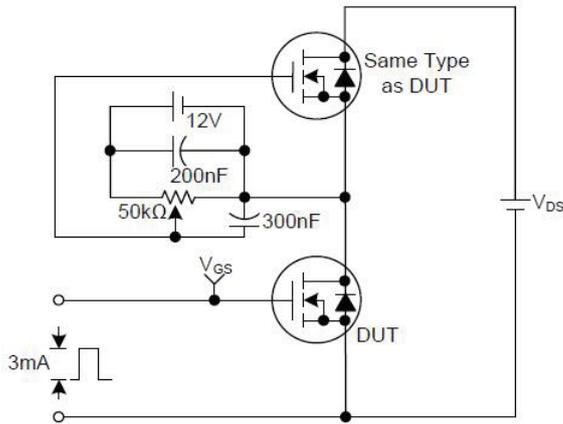
1. Test condition: $L=20mH, I_{AS}=3A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^\circ C$
2. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
3. Essentially independent of operating temperature

Test circuits and waveforms

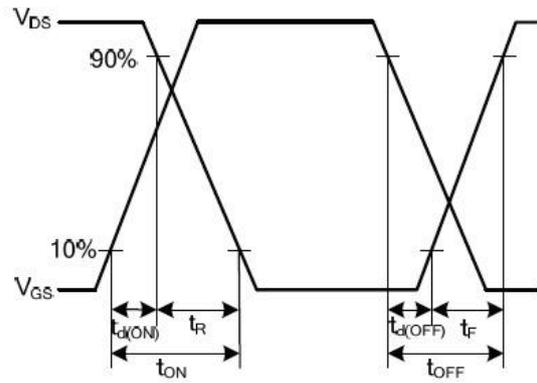
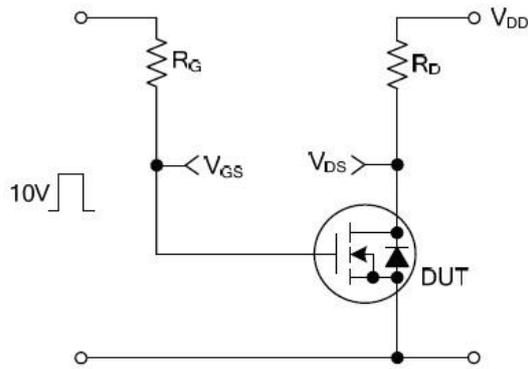
Peak Diode Recovery dv/dt Circuit & Waveforms



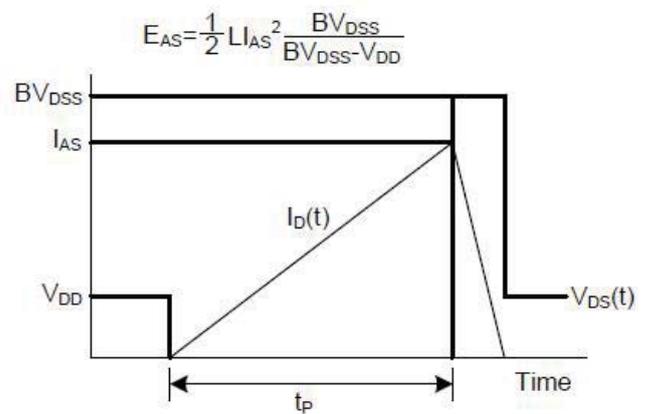
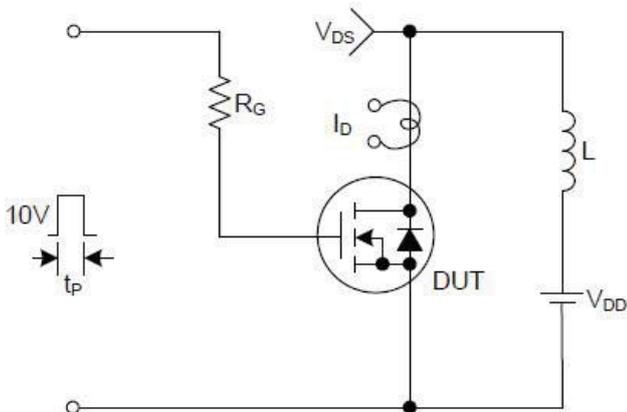
Gate Charge Test Circuit & Waveform



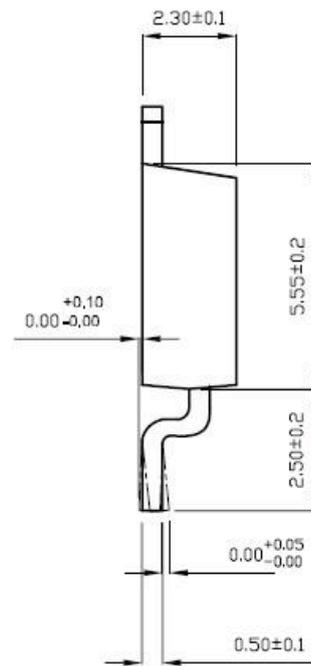
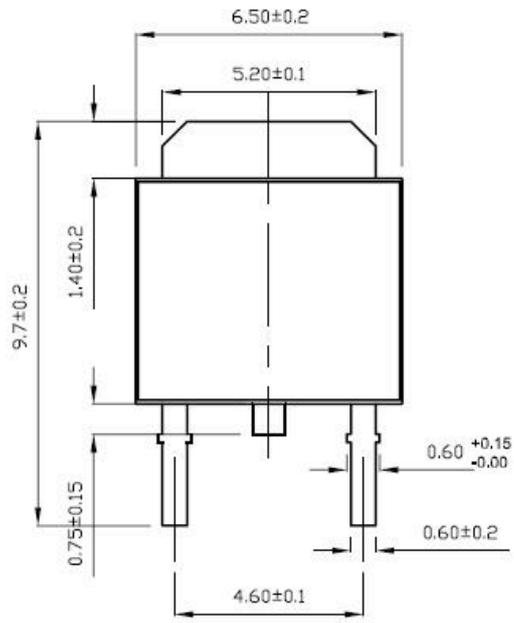
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions



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