

RSM002N06

## Nch 60V 250mA Small Signal MOSFET

## Datasheet

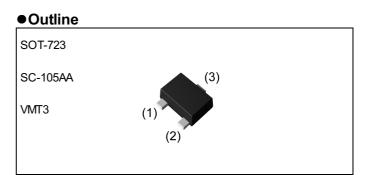
V <sub>DSS</sub>	60V
R <sub>DS(on)</sub> (Max.)	2.4Ω
Ι <sub>D</sub>	±250mA
P <sub>D</sub>	150mW

## Features

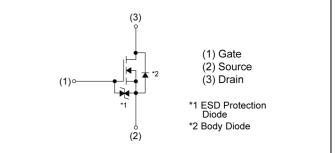
Application

Switching

- 1) High speed switching
- 2) Small package(VMT3)
- 3) Low voltage drive(2.5V drive)



#### ●Inner circuit



## Packaging specifications

	Packing	Embossed Tape
	Reel size (mm)	180
Туре	Tape width (mm)	8
	Basic ordering unit (pcs)	8000
	Taping code	T2L
	Marking	RK

### • Absolute maximum ratings (T<sub>a</sub> = 25°C ,unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V <sub>DSS</sub>	60	V
Continuous drain current	Ι <sub>D</sub>	±250	mA
Pulsed drain current	I <sub>DP</sub> *1	±1	А
Gate - Source voltage	V <sub>GSS</sub>	±20	V
Power dissipation	P <sub>D</sub> <sup>*2</sup>	150	mW
Junction temperature	Tj	150	°C
Operating junction and storage temperature range	T <sub>stg</sub>	-55 to +150	°C

#### •Thermal resistance

Parameter	Sumbol	Values			Linit
Farameter	Symbol	Min.	Тур.	Max.	Unit
Thermal resistance, junction - ambient	${\sf R}_{\sf thJA}^{*2}$	-	-	833	°C/W

## • Electrical characteristics (T<sub>a</sub> = 25°C)

Deremeter	Symbol Conditions		Values			1.1:4
Parameter			Min.	Тур.	Max.	Unit
Drain - Source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA	60	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I <sub>D</sub> = 1mA referenced to 25°C	-	63.7	-	mV/°C
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V	-	-	1	μA
Gate - Source leakage current	I <sub>GSS</sub>	$V_{GS}$ = ±20V, $V_{DS}$ = 0V	-	-	±10	μA
Gate threshold voltage	$V_{GS(th)}$	V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA	1.0	-	2.3	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	I <sub>D</sub> = 1mA referenced to 25°C	-	-2.8	-	mV/°C
		V <sub>GS</sub> = 10V, I <sub>D</sub> = 250mA	-	1.7	2.4	
Static drain - source	D *3	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 250mA	-	2.1	3.0	
on - state resistance	$R_{DS(on)}^{*3}$	V <sub>GS</sub> = 4.0V, I <sub>D</sub> = 250mA	-	2.3	3.2	Ω
		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 10mA	-	3.0	12.0	
Forward Transfer Admittance	Y <sub>fs</sub>  * <sup>3</sup>	V <sub>DS</sub> = 10V, I <sub>D</sub> = 250mA	250	-	-	mS

\*1 Pw $\leq$ 10µs, Duty cycle $\leq$ 1%

\*2 Each terminal mounted on a reference land.

\*3 Pulsed





# • Electrical characteristics ( $T_a = 25^{\circ}C$ )

Deremeter	Sumphal	Conditions	Values			Linit	
Parameter	Symbol Conditions -		Min.	Тур.	Max.	Unit	
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0V	-	15	-		
Output capacitance	C <sub>oss</sub>	V <sub>DS</sub> = 25V	-	4.5	-	pF	
Reverse transfer capacitance	C <sub>rss</sub>	f = 1MHz	-	2.0	-		
Turn - on delay time	t <sub>d(on)</sub> *3	$V_{DD} \simeq 30V, V_{GS}$ = 10V	-	3.5	-		
Rise time	t <sub>r</sub> *3	I <sub>D</sub> = 100mA	-	5	-	20	
Turn - off delay time	$t_{d(off)}^{*3}$	$R_L \simeq 300 \Omega$	-	18	-	ns	
Fall time	t <sub>f</sub> *3	R <sub>G</sub> = 10Ω	-	28	-		

## •Body diode electrical characteristics (Source-Drain) (T<sub>a</sub> = 25°C)

Parameter	Symbol	Conditions	Values			Unit
	Symbol Conditions		Min.	Тур.	Max.	Unit
Continuous forward current	۱ <sub>s</sub>	$T = 25^{\circ}$	-	-	125	mA
Pulse forward current	$I_{SP}^{*1}$	T <sub>a</sub> = 25°C	-	-	1	А
Forward voltage	$V_{SD}^{*3}$	V <sub>GS</sub> = 0V, I <sub>S</sub> = 250mA	-	-	1.2	V



120

100

80

60

40

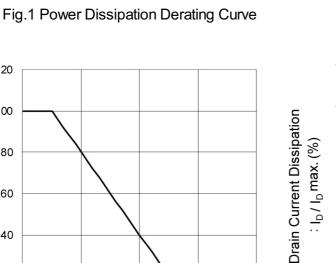
20

0

0

50

Power Dissipation :  $P_D/P_D$  max. [%]

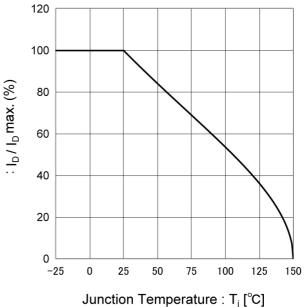


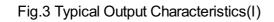
150

200

4/10

Fig.2 Drain Current Derating Curve

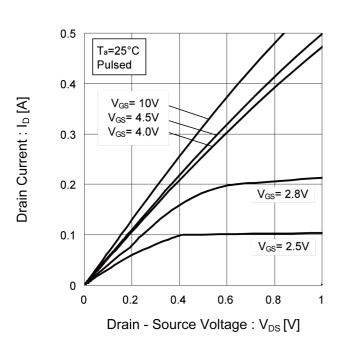


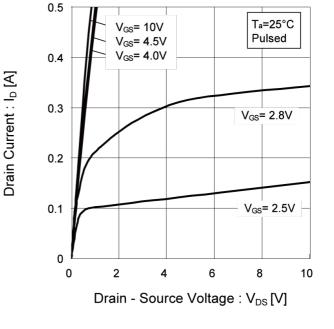


100

Junction Temperature : T<sub>i</sub> [°C]

Fig.4 Typical Output Characteristics(II)







20160808 - Rev.001

## • Electrical characteristic curves

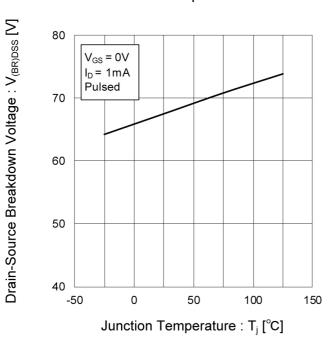


Fig.5 Breakdown Voltage vs. Junction Temperature

Fig.6 Typical Transfer Characteristics

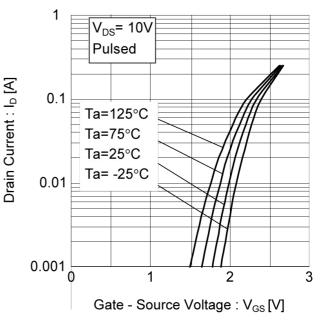
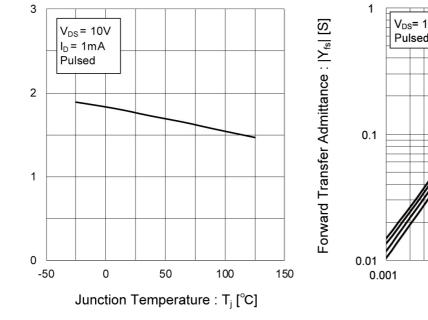
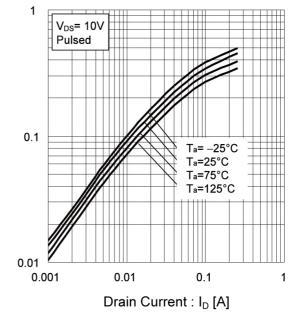


Fig.7 Gate Threshold Voltage vs. Junction Temperature





## Fig.8 Forward Transfer Admittance vs. Drain Current





## • Electrical characteristic curves

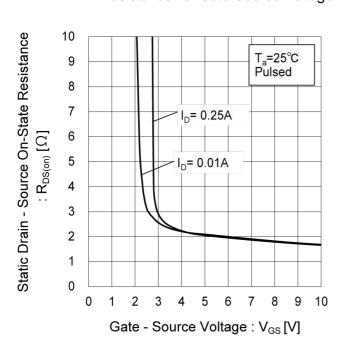


Fig.9 Static Drain - Source On - State Resistance vs. Gate Source Voltage

Fig.10 Static Drain - Source On - State Resistance vs. Junction Temperature

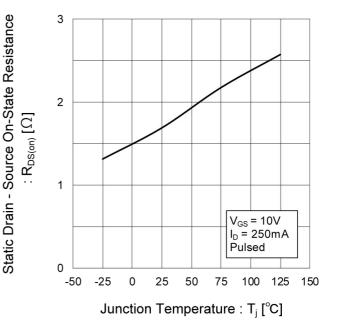
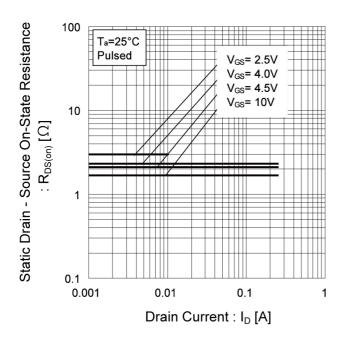


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current (I)





### Electrical characteristic curves

Fig.12 Static Drain - Source On - State

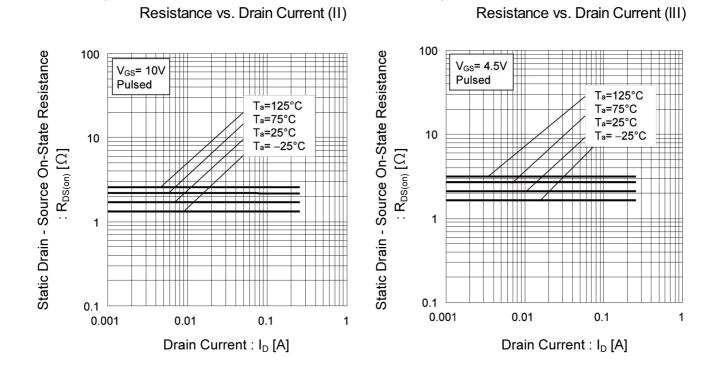
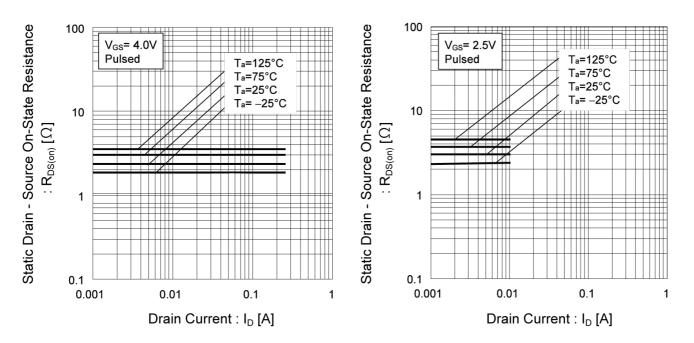


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (IV) Fig.15 Static Drain - Source On - State Resistance vs. Drain Current (V)

Fig.13 Static Drain - Source On - State







#### • Electrical characteristic curves

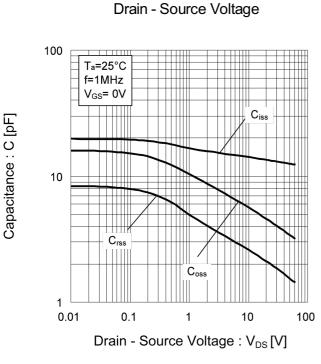


Fig.16 Typical Capacitance vs.

#### Fig.17 Switching Characteristics

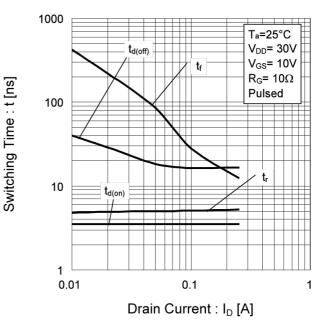
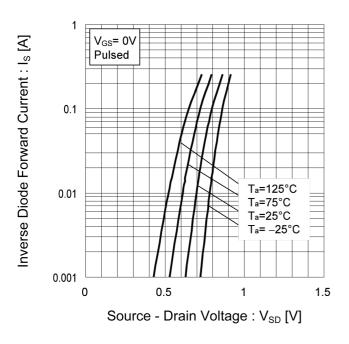
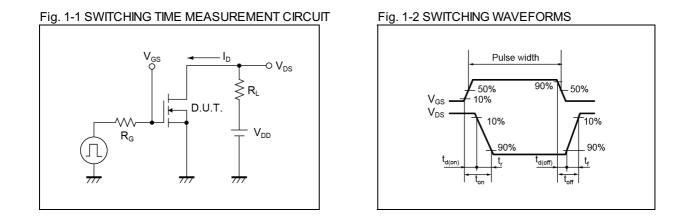


Fig.18 Source Current vs. Source Drain Voltage





#### Measurement circuits



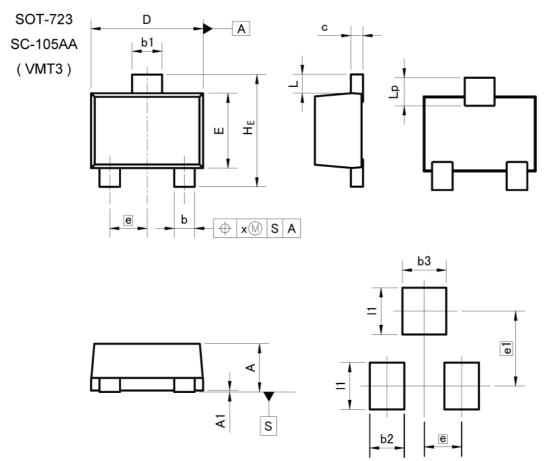
#### Notice

This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.



#### RSM002N06

#### Dimensions



Pattern of terminal position areas [Not a pattern of soldering pads]

DIM	MILIM	ETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
A	0.45	0.55	0.018	0.022
A1	0.00	0.10	0.000	0.004
b	0.17	0.27	0.007	0.011
b1	0.27	0.37	0.011	0.015
с	0.08	0.18	0.003	0.007
D	1.10	1.30	0.043	0.051
E	0.70	0.90	0.028	0.035
е	0.4	40	0.02	
HE	1.10	1.30	0.043	0.051
L	0.10	0.30	0.004	0.012
Lp	0.20	0.40	0.008	0.016
x	T	0.10	-	0.004
			60 60	
DIM	MILIM	ETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
b2	-	0.37	-	0.015
b3	_	0.47	—	0.019
e1	0.80		0.031	
1		0.50		0.020

Dimension in mm/inches



# Notice

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1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment <sup>(Note 1)</sup>, transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications
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JÁPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASS II b	CLASSII
CLASSⅣ	CLASSIII	CLASSⅢ	CLASSI

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  - [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
  - [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
  - [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
  - [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
  - [f] Sealing or coating our Products with resin or other coating materials
  - [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
  - [h] Use of the Products in places subject to dew condensation
- 4. The Products are not subject to radiation-proof design.
- 5. Please verify and confirm characteristics of the final or mounted products in using the Products.
- 6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.
- 8. Confirm that operation temperature is within the specified range described in the product specification.
- 9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

#### Precaution for Mounting / Circuit board design

- 1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- 2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

#### Precautions Regarding Application Examples and External Circuits

- 1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
- 2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

#### **Precaution for Electrostatic**

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of lonizer, friction prevention and temperature / humidity control).

#### Precaution for Storage / Transportation

- 1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
  - [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
  - [b] the temperature or humidity exceeds those recommended by ROHM
  - [c] the Products are exposed to direct sunshine or condensation
  - [d] the Products are exposed to high Electrostatic
- 2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
- 3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

#### **Precaution for Product Label**

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

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When disposing Products please dispose them properly using an authorized industry waste company.

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# RSM002N06 - Web Page

**Distribution Inventory** 

Part Number	RSM002N06
Package	VMT3
Unit Quantity	8000
Minimum Package Quantity	8000
Packing Type	Taping
Constitution Materials List	inquiry
RoHS	Yes