Pch -45V -2A Small Signal MOSFET

V_{DSS}	-45V
R _{DS(on)} (Max.)	190mΩ
I _D	±2.0A
P_D	1.0W

1) Low on - resistance.

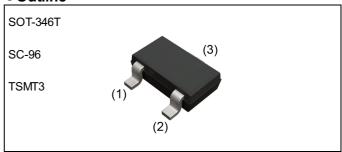
Features

- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (TSMT3).
- 4) Pb-free lead plating; RoHS compliant
- 5) AEC-Q101 Qualified

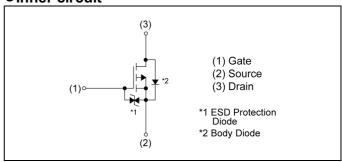
Application

Switching

Outline



•Inner circuit



Packaging specifications

	- i deitagnig epeemeanene				
	Packing	Embossed Tape			
	Reel size (mm)	180			
Туре	Tape width (mm)	8			
	Basic ordering unit (pcs)	3000			
	Taping code	TL			
	Marking	ZH			

● **Absolute maximum ratings** (T_a = 25°C ,unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-45	V
Continuous drain current	I _D *1	±2.0	Α
Pulsed drain current	I _{DP} *2	±8.0	Α
Gate - Source voltage	V_{GSS}	±20	V
Down discipation	P _D *3	1.0	W
Power dissipation	P _D *4	0.54	W
Junction temperature	T _j	150	°C
Operating junction and storage temperature range	T _{stg}	-55 to +150	°C

●Thermal resistance

Deremeter	Cumb of	Values			Lleit
Parameter	Symbol	Min.	Тур.	Max.	Unit
The word reciptores is unation, ambient	R _{thJA} *3	-	-	125	°C/W
Thermal resistance, junction - ambient	R _{thJA} *4	ı	1	232	°C/W

● Electrical characteristics (T_a = 25°C)

Darameter	Symbol	Conditions		Values		
Parameter	Parameter Symbol Conditions		Min.	Тур.	Max.	Unit
Drain - Source breakdown voltage	V _{(BR)DSS}	$V_{GS} = 0V$, $I_D = -1mA$	-45	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_{j}}$	I _D = -1mA referenced to 25°C	-	-50	-	mV/°C
Zero gate voltage drain current	I _{DSS}	V _{DS} = -45V, V _{GS} = 0V	1	-	-1	μA
Gate - Source leakage current I _{GSS} V		$V_{GS} = \pm 20V, V_{DS} = 0V$	1	-	±10	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = -10V, I_{D} = -1mA$	-1.0	-	-3.0	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_{j}}$	I _D = -1mA referenced to 25°C	-	3.3	-	mV/°C
		V _{GS} = -10V, I _D = -2.0A	-	130	190	
Static drain - source on - state resistance	R _{DS(on)} *5	$V_{GS} = -4.5V, I_D = -2.0A$	-	180	260	mΩ
		$V_{GS} = -4.0V, I_D = -2.0A$	1	200	280	
Gate resistance	R _G f = 1MHz, open drain		1	21	1	Ω
Forward Transfer Admittance	Y _{fs} *5	$V_{DS} = -10V, I_{D} = -2.0A$	1.2	4.0	-	S

^{*1} Limited only by maximum temperature allowed

^{*2} Pw \leq 10 μ s , Duty cycle \leq 1%

^{*3} Mounted on a ceramic board (30×30×0.8mm)

^{*4} Mounted on a FR4 (12×20×0.8mm)

^{*5} Pulsed

●Electrical characteristics (T_a = 25°C)

Daramatar	Cumbal	Conditions	Values			l leit
Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
Input capacitance	C _{iss}	V _{GS} = 0V	-	500	-	_
Output capacitance	C _{oss}	V _{DS} = -10V	-	80	-	pF
Reverse transfer capacitance	C _{rss}	f = 1MHz	1	40	-	
Turn - on delay time	t _{d(on)} *5	$V_{DD} \simeq -25V, V_{GS} = -10V$	1	8	-	
Rise time	t r*5	I _D = -1.0A	-	10	-	no
Turn - off delay time	t _{d(off)} *5	$R_L \simeq 25\Omega$	-	35	-	ns
Fall time	t _f *5	$R_G = 10\Omega$	-	10	-	

• Gate charge characteristics $(T_a = 25^{\circ}C)$

	\ a	,				
Parameter	Cumbal	Conditions	Values			Unit
raiametei	Symbol Conditions		Min.	Тур.	Max.	Offic
Total gate charge	Q_g^{*5}	V _{DD} ≃ - 25V.	-	4.5	-	
Gate - Source charge	Q _{gs} *5	$V_{DD} \approx -25V,$ $I_{D} = -2.0A,$ $V_{GS} = -4.5V$	-	1.6	-	nC
Gate - Drain charge	Q _{gd} *5	$V_{GS} = -4.5V$	-	1.2	-	

●Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Doromotor	Symbol	Conditions	Values			Unit
Parameter	Symbol Conditions -		Min.	Тур.	Max.	Offit
Continuous forward current	I _S	T - 25°C	-	-	-0.8	Α
Pulse forward current	I _{SP} *2	T _a = 25°C	-	-	-8.0	Α
Forward voltage	V _{SD} *5	V _{GS} = 0V, I _S = -2.0A	-	-	-1.2	V

• Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

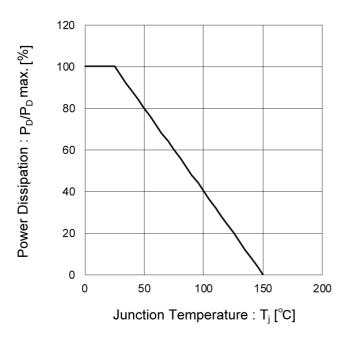
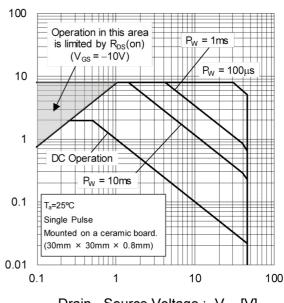


Fig.2 Maximum Safe Operating Area



Drain Current: -l_D [A]

Drain - Source Voltage: -V_{DS} [V]

Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

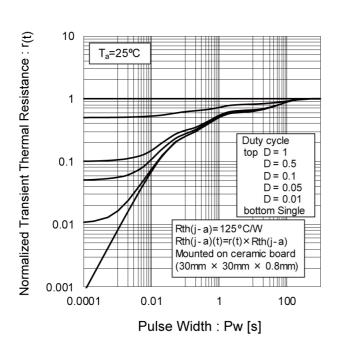
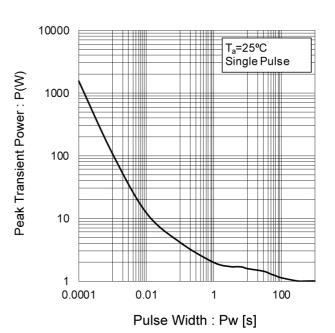


Fig.4 Single Pulse Maximum Power dissipation



• Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

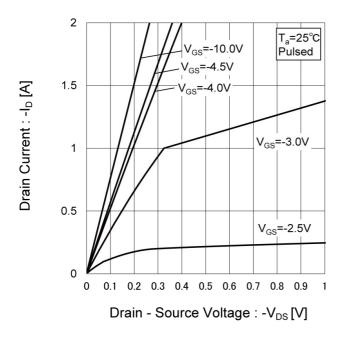
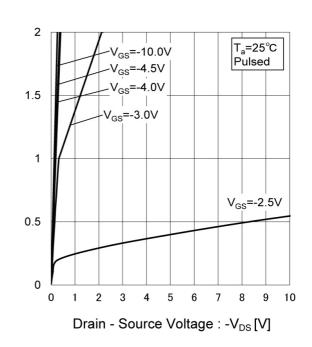


Fig.6 Typical Output Characteristics(II)



Drain Current: -I_D [A]

Fig.7 Breakdown Voltage vs.
Junction Temperature

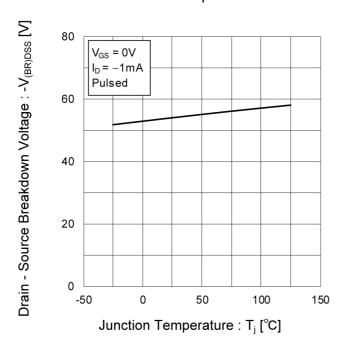
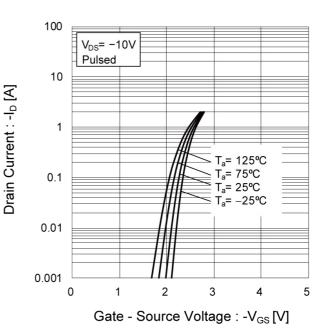


Fig.8 Typical Transfer Characteristics



Gate Threshold Voltage: -V_{GS(th)} [V]

• Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs.
Junction Temperature

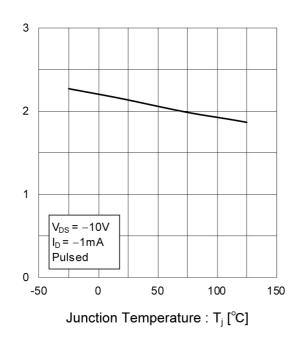


Fig.10 Forward Transfer Admittance vs.
Drain Current

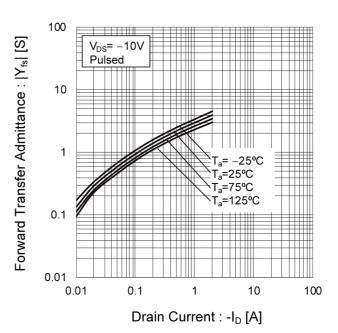


Fig.11 Drain Current Derating Curve

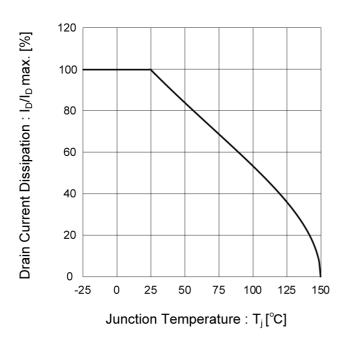
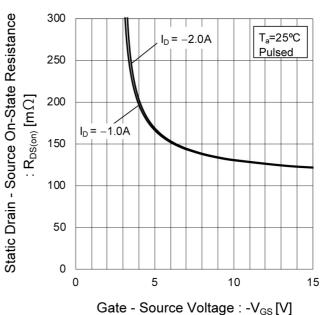


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



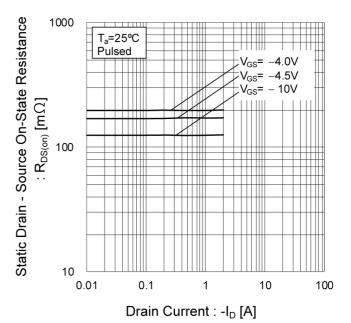
RSR020P05FRA

• Electrical characteristic curves

Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

250 Static Drain - Source On-State Resistance 200 $: R_{DS(on)} [m\Omega]$ 150 100 50 $V_{GS} = -10V$ $I_{D} = -2.0A$ Pulsed 25 50 100 125 150 -50 -25 75 Junction Temperature : T_i [°C]

Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)



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ROHM

Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Drain Current (II)

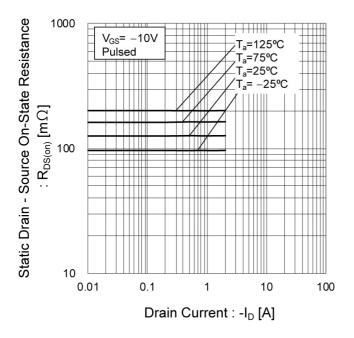


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current (III)

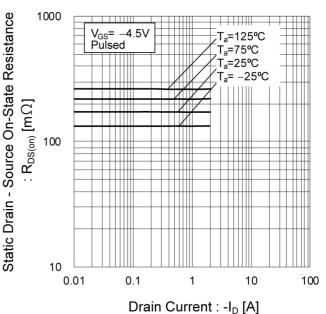
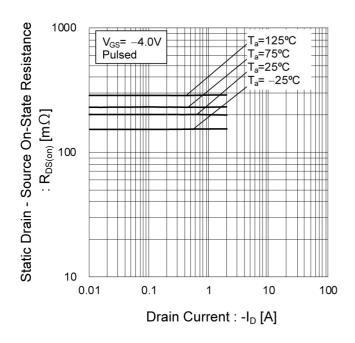


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current (IV)



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• Electrical characteristic curves

Fig.18 Typical Capacitance vs.

Drain - Source Voltage

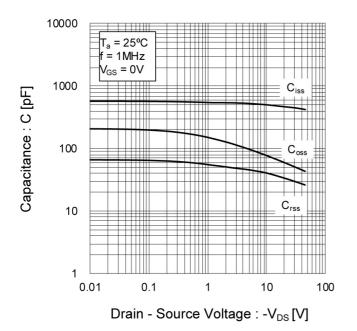


Fig.19 Switching Characteristics

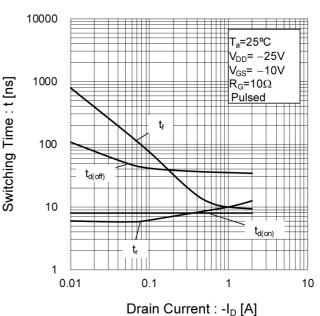


Fig.20 Dynamic Input Characteristics

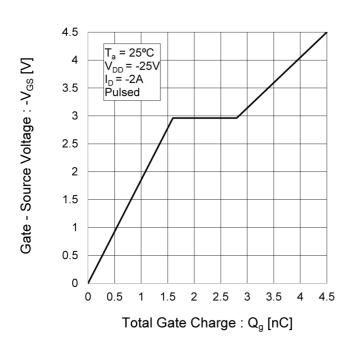
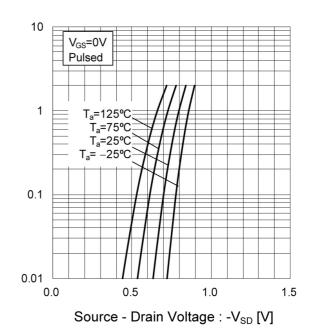


Fig.21 Source Current vs.

Source Drain Voltage



Source Current : -I_s [A]

Measurement circuits

Fig. 1-1 SWITCHING TIME MEASUREMENT CIRCUIT

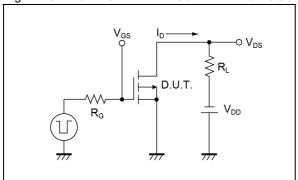


Fig. 2-1 GATE CHARGE MEASUREMENT CIRCUIT

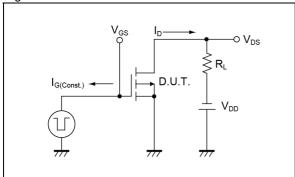


Fig. 1-2 SWITCHING WAVEFORMS

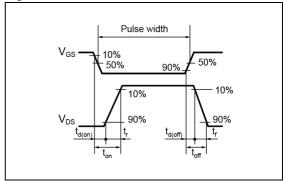
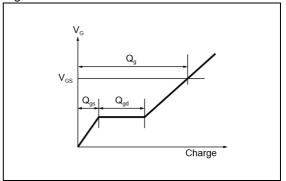
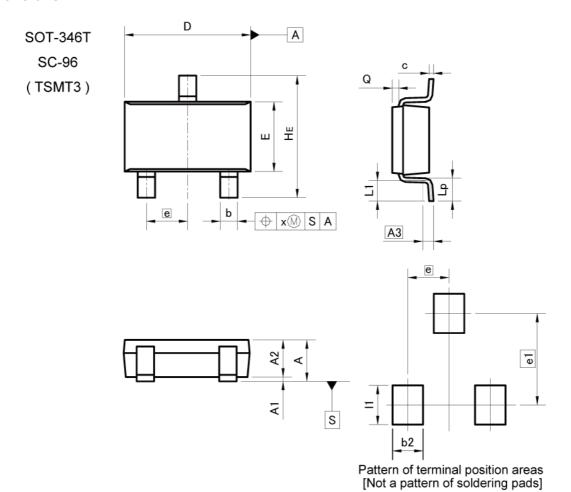


Fig. 2-2 GATE CHARGE WAVEFORM



Dimensions



DIM	DIM MILIME		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	-	1.00	-	0.039
A1	0.00	0.10	0.000	0.004
A2	0.75	0.95	0.030	0.037
A3	0.:	25	0.0	10
b	0.35	0.50	0.014	0.020
С	0.10	0.26	0.004	0.010
D	2.80	3.00	0.110	0.118
Е	1.50	1.80	0.059	0.071
е	0.9	95	0.0	37
HE	2.60	3.00	0.102	0.118
L1	0.30	0.60	0.012	0.024
Lp	0.40	0.70	0.016	0.028
Q	0.05	0.25	0.002	0.010
×		0.20	===	0.008

DIM	MILIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
b2		0.70	-	0.028
e1	2.10		0.0	83
I1	- -2	0.90		0.035

Dimension in mm/inches



Notice

Precaution on using ROHM Products

1. If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), aircraft/spacecraft, nuclear power controllers, 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

JAPAN	USA	EU	CHINA
CLASSⅢ	OL ACOM	CLASS II b	ОГУООШ
CLASSIV	CLASSⅢ	CLASSⅢ	CLASSⅢ

- 2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
 - [a] Installation of protection circuits or other protective devices to improve system safety
 - [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure
- 3. Our Products are not designed under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
 - [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 Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [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
 - If 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.
- 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
- 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.

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

Precaution for Disposition

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

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Notice-PAA-E Rev.003



RSR020P05FRA - Web Page

Distribution Inventory

Part Number	RSR020P05FRA
Package	TSMT3
Unit Quantity	3000
Minimum Package Quantity	3000
Packing Type	Taping
Constitution Materials List	inquiry
RoHS	Yes