

# 4V Drive Nch MOSFET

**RSD050N06FRA**

## ●Structure

Silicon N-channel MOSFET

## ●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Drive circuits can be simple.
- 3) Parallel use is easy.

## ●Applications

Switching

## ●Packaging specifications

Type	Package	CPT3
	Code	TL
	Basic ordering unit (pieces)	2500

## ●Absolute maximum ratings ( $T_a=25^{\circ}\text{C}$ )

Parameter		Symbol	Limits	Unit
Drain-source voltage		$V_{\text{DSS}}$	60	V
Gate-source voltage		$V_{\text{GSS}}$	$\pm 20$	V
Drain current	Continuous	$I_{\text{D}}$	$\pm 5.0$	A
	Pulsed	$I_{\text{DP}}$ *1	$\pm 15$	A
Source current (Body Diode)	Continuous	$I_{\text{S}}$	5.0	A
	Pulsed	$I_{\text{SP}}$ *1	15	A
Power dissipation		$P_{\text{D}}$ *2	15	W
Channel temperature		$T_{\text{ch}}$	150	$^{\circ}\text{C}$
Range of storage temperature		$T_{\text{stg}}$	-55 to +150	$^{\circ}\text{C}$

 \*1  $P_w \leq 10\mu\text{s}$ , Duty cycle  $\leq 1\%$ 

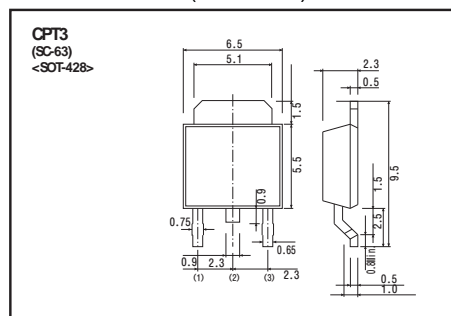
 \*2  $T_c = 25^{\circ}\text{C}$ 

## ●Thermal resistance

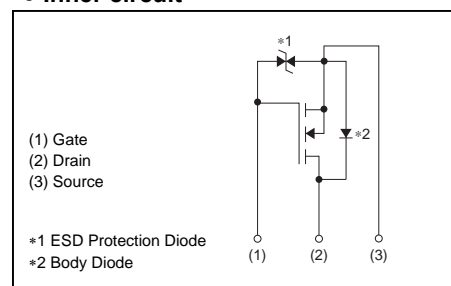
Parameter	Symbol	Limits	Unit
Channel to Case	$R_{\text{th (ch-c)}}$ *	8.33	$^{\circ}\text{C} / \text{W}$

 \*  $T_c = 25^{\circ}\text{C}$ 

## ●Dimensions (Unit : mm)



## ●Inner circuit


 \*1 ESD Protection Diode  
 \*2 Body Diode

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I <sub>GSS</sub>	-	-	±10	μA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	60	-	-	V	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V
Zero gate voltage drain current	I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V
Gate threshold voltage	V <sub>GS(th)</sub>	1.0	-	3.0	V	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA
Static drain-source on-state resistance	R <sub>DS(on)</sub> <sup>*</sup>	-	78	109	mΩ	I <sub>D</sub> =5.0A, V <sub>GS</sub> =10V
		-	94	131		I <sub>D</sub> =5.0A, V <sub>GS</sub> =4.5V
		-	100	140		I <sub>D</sub> =5.0A, V <sub>GS</sub> =4.0V
Forward transfer admittance	Y <sub>fs</sub>   <sup>*</sup>	3.5	-	-	S	I <sub>D</sub> =5.0A, V <sub>DS</sub> =10V
Input capacitance	C <sub>iss</sub>	-	290	-	pF	V <sub>DS</sub> =10V
Output capacitance	C <sub>oss</sub>	-	90	-	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	-	35	-	pF	f=1MHz
Turn-on delay time	t <sub>d(on)</sub> <sup>*</sup>	-	8	-	ns	I <sub>D</sub> =2.5A, V <sub>DD</sub> ≒ 30V
Rise time	t <sub>r</sub> <sup>*</sup>	-	17	-	ns	V <sub>GS</sub> =10V
Turn-off delay time	t <sub>d(off)</sub> <sup>*</sup>	-	26	-	ns	R <sub>L</sub> =12Ω
Fall time	t <sub>f</sub> <sup>*</sup>	-	8	-	ns	R <sub>G</sub> =10Ω
Total gate charge	Q <sub>g</sub> <sup>*</sup>	-	8.0	-	nC	V <sub>DD</sub> ≒ 30V
Gate-source charge	Q <sub>gs</sub> <sup>*</sup>	-	1.4	-	nC	I <sub>D</sub> =5.0A
Gate-drain charge	Q <sub>gd</sub> <sup>*</sup>	-	1.4	-	nC	V <sub>GS</sub> =10V

\*Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	V <sub>SD</sub> <sup>*</sup>	-	-	1.2	V	I <sub>S</sub> =5.0A, V <sub>GS</sub> =0V

\*Pulsed

●Electrical characteristic curves (Ta=25°C)

Fig.1 Typical Output Characteristics ( I )

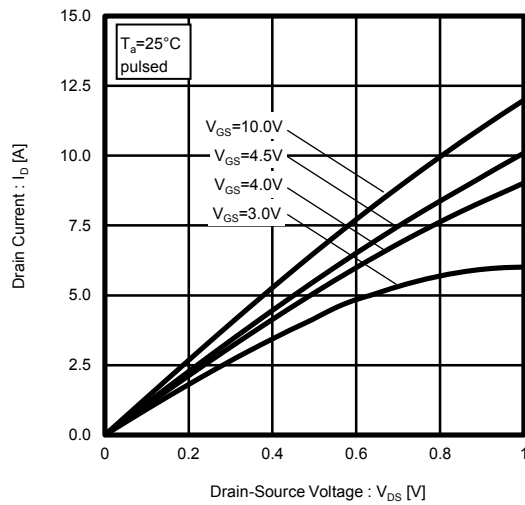


Fig.2 Typical Output Characteristics ( II )

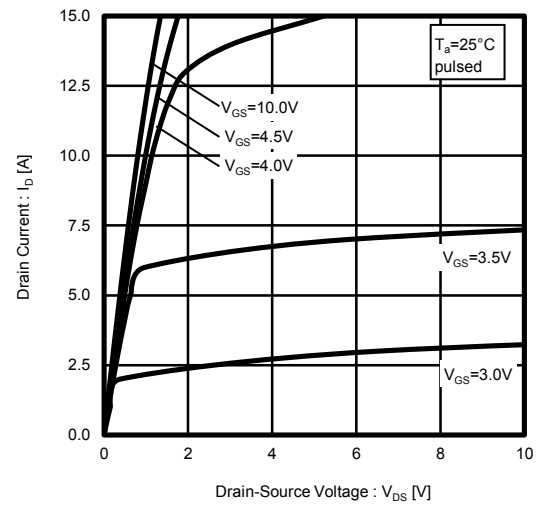


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

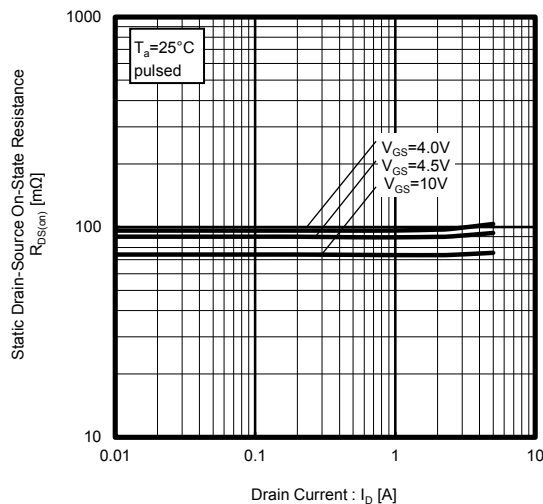


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

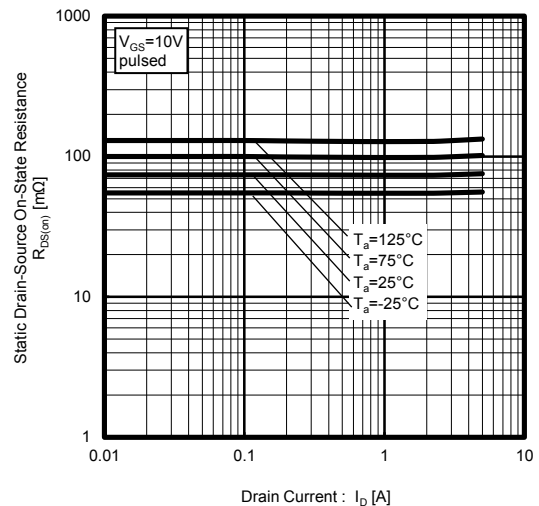


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

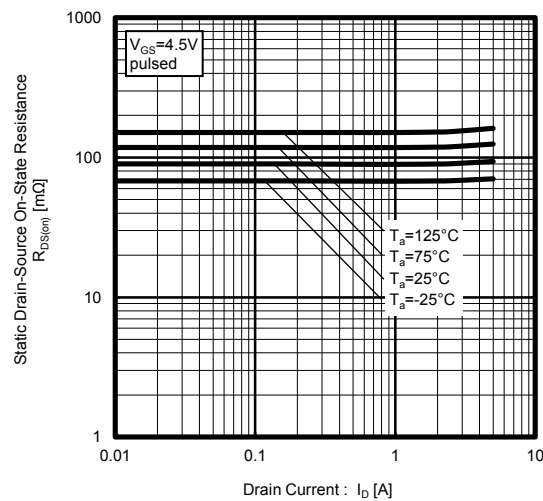


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

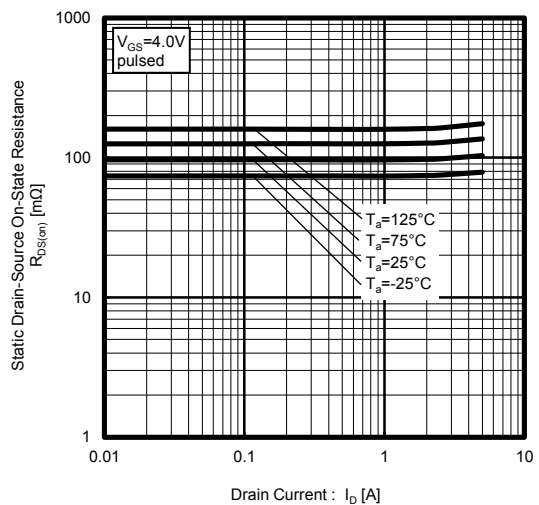


Fig.7 Forward Transfer Admittance vs. Drain Current

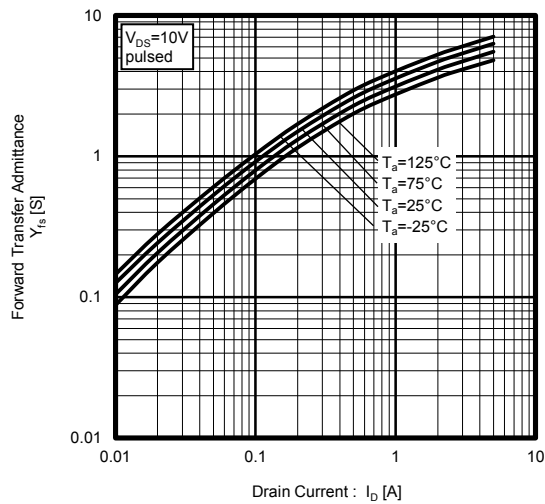


Fig.8 Typical Transfer Characteristics

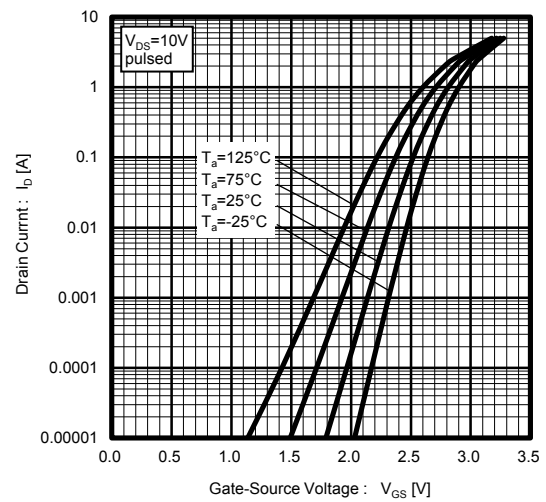


Fig.9 Source Current vs. Source-Drain Voltage

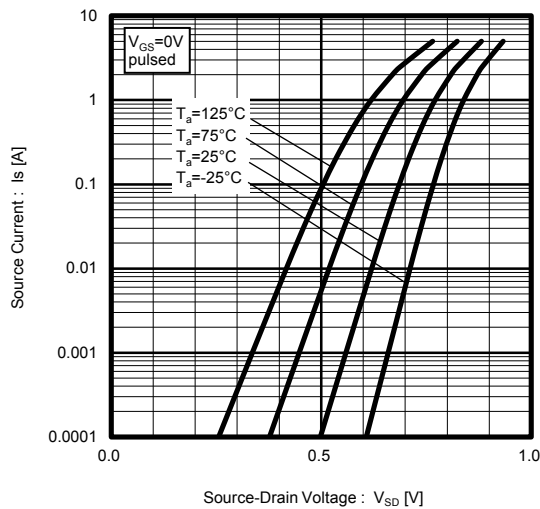


Fig.10 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

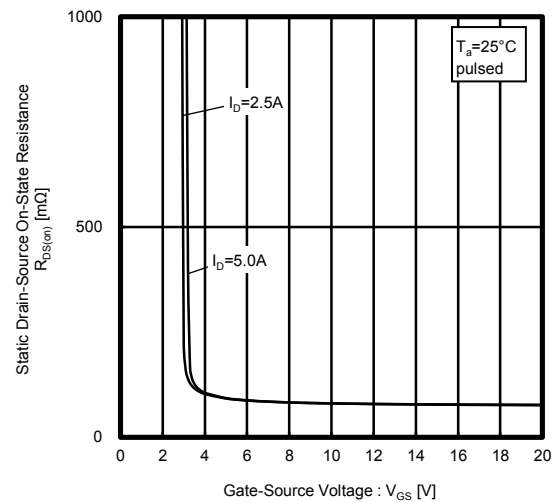


Fig.11 Switching Characteristics

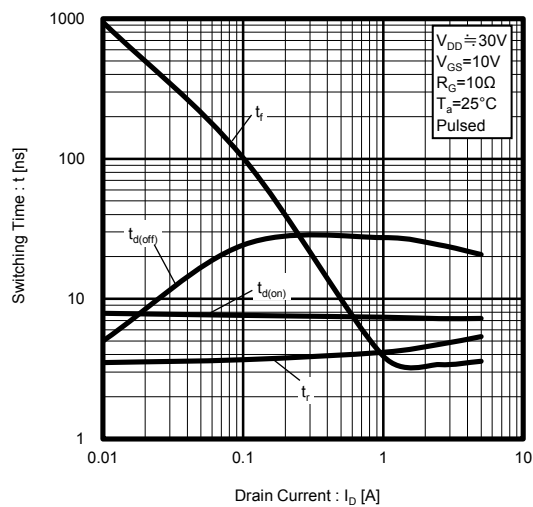


Fig.12 Dynamic Input Characteristics

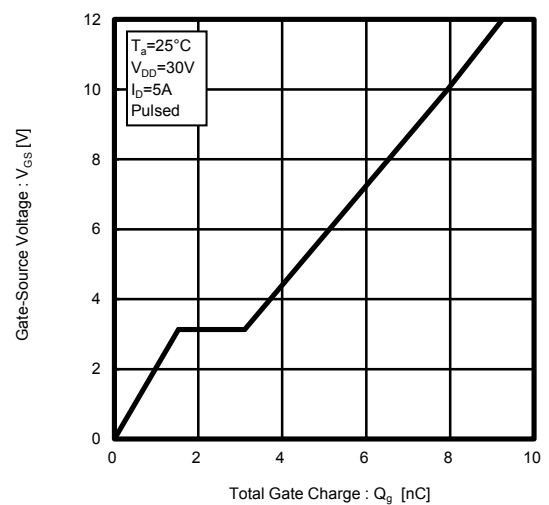


Fig.13 Typical Capacitance vs. Drain-Source Voltage

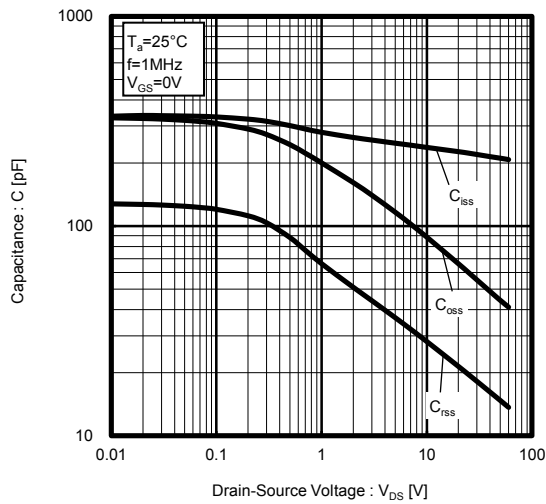


Fig.14 Maximum Safe Operating Area

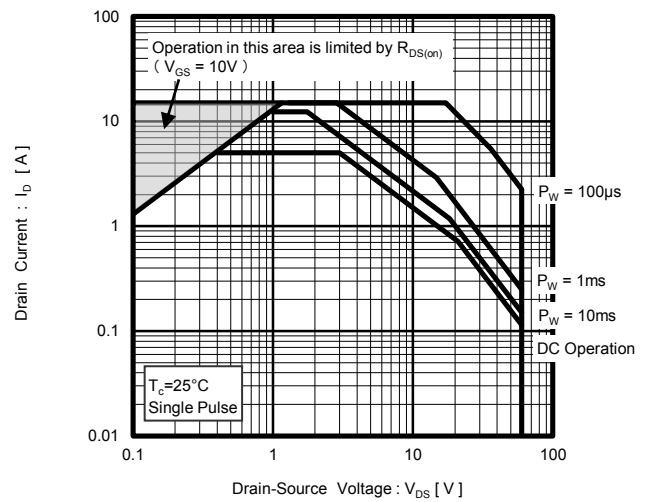
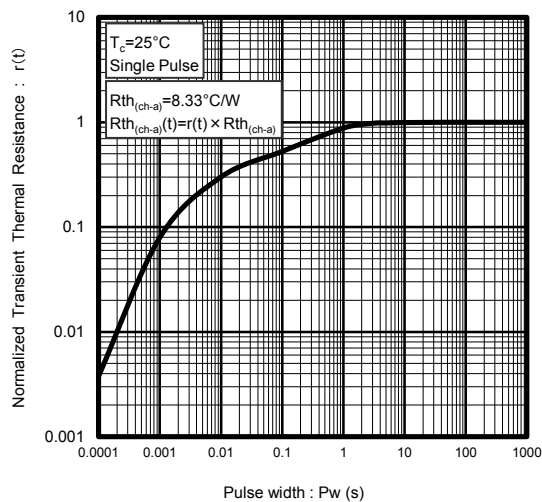


Fig.15 Normalized Transient Thermal Resistance v.s. Pulse Width



## ● Measurement circuits

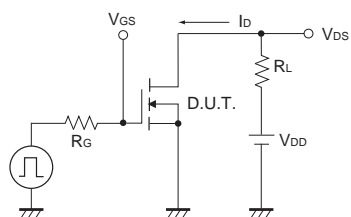


Fig.1-1 Switching Time Measurement Circuit

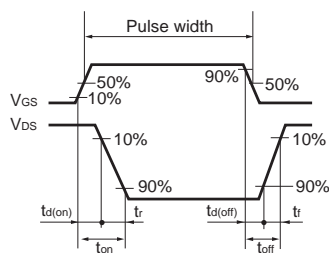


Fig.1-2 Switching Waveforms

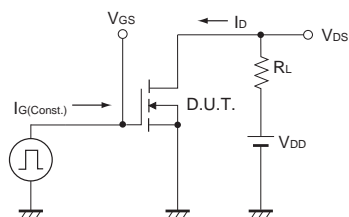


Fig.2-1 Gate Charge Measurement Circuit

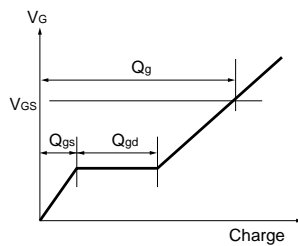


Fig.2-2 Gate Charge Waveform

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JAPAN	USA	EU	CHINA
CLASS III	CLASS III	CLASS II b	CLASS III
CLASS IV		CLASS III	

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  - [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
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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 (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient 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

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## 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 ionizer, 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 Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - [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.

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RSD050N06FRA - Web Page

Part Number	RSD050N06FRA
Package	CPT3
Unit Quantity	2500
Minimum Package Quantity	2500
Packing Type	Taping
Constitution Materials List	inquiry
RoHS	Yes