

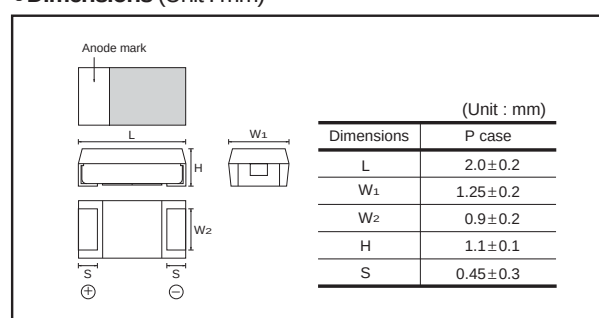
Chip tantalum capacitors

TC Series P Case

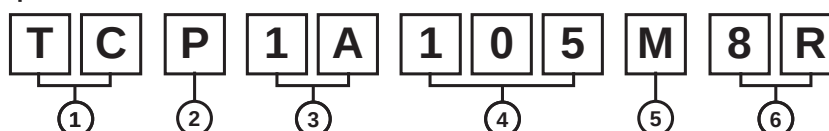
●Features (P)

- 1) Vital for all hybrid integrated circuits board application.
- 2) Wide capacitance range.
- 3) Screening by thermal shock.

●Dimensions (Unit : mm)



●Part No. Explanation



① Series name
TC

② Case style
TC.....P

③ Rated voltage

Rated voltage (V)	4	6.3	10	16	20	25
CODE	0G	0J	1A	1C	1D	1E

④ Nominal capacitance

Nominal capacitance in pF in 3 digits:
2 significant figures followed by the figure
representing the number of 0's.

⑤ Capacitance tolerance

M : ±20% K : ±10%

⑥ Taping

8 : Tape width
R : Positive electrode on the side opposite to sprocket hole

Tantalum capacitors

● Rated table

(μF)	Rated voltage (V)					
	4 0G	6.3 0J	10 1A	16 1C	20 1D	25 1E
1 (105)			P	P	P	P
1.5 (155)		P	P	*P		
2.2 (225)	P	P	P	*P		
3.3 (335)	P	P	P	*P		
4.7 (475)	P	P	P			
6.8 (685)	P	P	P			
10 (106)	P	P	P			
15 (156)	P	P				
22 (226)	P	P				
33 (336)						
47 (476)						
68 (686)						

Remark) Case size codes (P) in the above show products line-up.

* Under development

● Marking

The indications listed below should be given on the surface of a capacitor.

- (1) Polarity : The polarity should be shown by □ bar. (on the anode side)
 (2) Rated DC voltage : Due to the small size of P case, a voltage code is used as shown below.
 (3) Visual typical example (1) voltage code (2) capacitance code

Voltage Code	Rated DC Voltage (V)
g	4
j	6.3
A	10
C	16
D	20
E	25

Capacitance Code	Nominal Capacitance (μF)
A	1.0
E	1.5
J	2.2
N	3.3
S	4.7
W	6.8
a	10
e	15
j	22

[P case] note 1) $\frac{j}{(1)}$ $\frac{J}{(2)}$



note 2) voltage code and capacitance code are variable with parts number

Tantalum capacitors

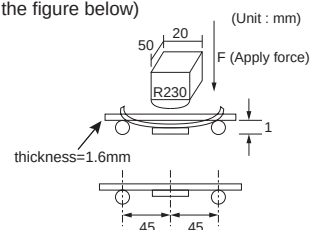
● Characteristics

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Operating Temperature		-55°C to +125°C	Voltage reduction when temperature exceeds +85°C
Maximum operating temperature with no voltage derating		+85°C	
Rated voltage (VDC)		4 6.3 10 16 20 25	at 85°C
Category voltage (VDC)		2.5 4 6.3 10 13 16	at 125°C
Surge voltage (VDC)		5.0 8 13 20 26 32	at 85°C
DC Leakage current		0.5 μ A or 0.01CV whichever is greater Shown in " Standard list "	As per 4.9 JIS C 5101-1 As per 4.5.1 JIS C 5101-3 Voltage : Rated voltage for 1min
Capacitance tolerance		Shall be satisfied allowance range. $\pm 10\%$, $\pm 20\%$	As per 4.7 JIS C 5101-1 As per 4.5.2 JIS C 5101-3 Measuring frequency : 120 $\pm$ 12Hz Measuring voltage : 0.5Vrms +1.5 to 2V.DC Measuring circuit : DC Equivalent series circuit
Tangent of loss angle (Df, tan δ)		Shall be satisfied the voltage on " Standard list "	As per 4.8 JIS C 5101-1 As per 4.5.3 JIS C 5101-3 Measuring frequency : 120 $\pm$ 12Hz Measuring voltage : 0.5Vrms +1.5 to 2V.DC Measuring circuit : DC Equivalent series circuit
Impedance		Shall be satisfied the voltage on " Standard list "	As per 4.10 JIS C 5101-1 As per 4.5.4 JIS C 5101-3 Measuring frequency : 100 $\pm$ 10kHz Measuring voltage : 0.5Vrms or less Measuring circuit : DC Equivalent series circuit
Resistance to Soldering heat	Appearance	There should be no significant abnormality. The indications should be clear.	As per 4.14 JIS C 5101-1 As per 4.6 JIS C 5101-3 Dip in the solder bath Solder temp : 260 $\pm$ 5°C Duration : 5 $\pm$ 0.5s Repetition : 1 After the specimens, leave it at room temperature for over 24h and then measure the sample.
	L.C.	Less than initial limit	
	$\Delta C / C$	TCP0J226□ : Within $\pm 20\%$ of initial value TCP1A106□ : Within $\pm 20\%$ of initial value Others : Within $\pm 10\%$ of initial value	
	Df (tan δ)	Less than 150% of initial limit	
Temperature cycle	Appearance	There should be no significant abnormality. The indications should be clear.	As per 4.16 JIS C 5101-1 As per 4.10 JIS C 5101-3 Repetition : 5 cycles (1 cycle : steps 1 to 4) without discontinuation.
	L.C.	TCP0J226□ : Less than 150% of initial limit Others : Less than initial limit	
	$\Delta C / C$	1 to 10 μ F : Within $\pm 10\%$ of initial value 15 to 22 μ F : Within $\pm 20\%$ of initial value TCP1A106□ : Within $\pm 20\%$ of initial value	
	Df (tan δ)	Less than 150% of initial limit	
Moisture resistance	Appearance	There should be no significant abnormality. The indications should be clear.	As per 4.22 JIS C 5101-1 As per 4.12 JIS C 5101-3 After leaving the sample under such atmospheric condition that the temperature and humidity are 60 $\pm$ 2°C and 90 to 95% RH, respectively, for 500 $\pm$ 12h leave it at room temperature for over 24h and then measure the sample.
	L.C.	TCP0J226□ : Less than 150% of initial limit Others : Less than initial limit	
	$\Delta C / C$	Within $\pm 20\%$ of initial value	
	Df (tan δ)	Less than 150% of initial limit	

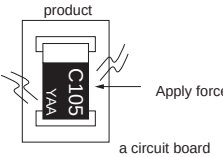
	Temp.	Time
1	-55 $\pm$ 3°C	30 $\pm$ 3min.
2	Room temp.	3min.or less
3	125 $\pm$ 2°C	30 $\pm$ 3min.
4	Room temp.	3min.or less

Tantalum capacitors

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Temperature Stability	Temp.	-55°C	As per 4.29 JIS C 5101-1 As per 4.13 JIS C 5101-3
	$\Delta C / C$	Within 0/-15% of initial value	
	Df (tan δ)	Shall be satisfied the voltage on " Standard list "	
	L.C.	—	
	Temp.	+85°C	
	$\Delta C / C$	Within +15/0% of initial value	
	Df (tan δ)	Shall be satisfied the voltage on " Standard list "	
	L.C.	5 μ A or 0.1CV whichever is greater	
	Temp.	+125°C	
	$\Delta C / C$	Within +20/0% of initial value	
	Df (tan δ)	Shall be satisfied the voltage on " Standard list "	
	L.C.	6.3 μ A or 0.125CV whichever is greater	
Surge voltage	Appearance	There should be no significant abnormality.	As per 4.26 JIS C 5101-1 As per 4.14 JIS C 5101-3 Apply the specified surge voltage every 5 $\pm$ 0.5 min. for 30 $\pm$ 5 s. each time in the atmospheric condition of 85 $\pm$ 2°C. Repeat this procedure 1,000 times. After the specimens, leave it at room temperature for over 24h and then measure the sample.
	L.C.	Shall be satisfied the voltage on " Standard list "	
	$\Delta C / C$	TCP0J226□ : Within $\pm$ 20% of initial value Others : Within $\pm$ 10% of initial value	
	Df (tan δ)	Less than 150% of initial limit	
Loading at High temperature	Appearance	There should be no significant abnormality.	As per 4.23 JIS C 5101-1 As per 4.15 JIS C 5101-3 After applying the rated voltage for 1000+36/0 h without discontinuation via the serial resistance of 3 Ω or less at a temperature of 85 $\pm$ 2°C, leave the sample at room temperature / humidity for over 24h and measure the value.
	L.C.	TJP0J226□ : Less than 150% of initial limit Others : Less than initial limit	
	$\Delta C / C$	TJP0J226□ : Within $\pm$ 20% of initial value Others : Within $\pm$ 10% of initial value	
	Df (tan δ)	Less than 150% of initial limit	
Terminal strength	Capacitance	The measured value should be stable.	As per 4.35 JIS C 5101-1 As per 4.9 JIS C 5101-3 A force is applied to the terminal until it bends to 1mm and by a prescribed tool maintain the condition for 5s. (See the figure below)
	Appearance	There should be no significant abnormality.	



Tantalum capacitors

Item		Performance	Test conditions (JIS C 5101-1 and JIS C 5101-3)
Adhesiveness		The terminal should not come off.	As per 4.34 JIS C 5101-1 As per 4.8 JIS C 5101-3 Apply force of 5N in the two directions shown in the figure below for 10±1s after mounting the terminal on a circuit board. 
Dimensions		Refer to "External dimensions"	Measure using a caliper of JIS B 7507 Class 2 or higher grade.
Resistance to solvents		The indication should be clear	As per 4.32 JIS C 5101-1 As per 4.18 JIS C 5101-3 Dip in the isopropyl alcohol for 30±5s, at room temperature.
Solderability		3/4 or more surface area of the solder coated terminal dipped in the soldering bath should be covered with the new solder.	As per 4.15.2 JIS C 5101-1 As per 4.7 JIS C 5101-3 Dip speed=25±2.5mm / s Pre-treatment(accelerated aging): Leave the sample on the boiling distilled water for 1 h. Solder temp. : 245±5°C Duration : 3±0.5s Solder : M705 Flux : Rosin 25% IPA 75%
Vibration	Capacitance	Measure value should not fluctuate during the measurement.	As per 4.17 JIS C 5101-1 Frequency : 10 to 55 to 10Hz/min. Amplitude : 1.5mm
	Appearance	There should be no significant abnormality.	Time : 2h each in X and Y directions Mounting : The terminal is soldered on a print circuit board.

Tantalum capacitors

● Standard products list, TC series A case

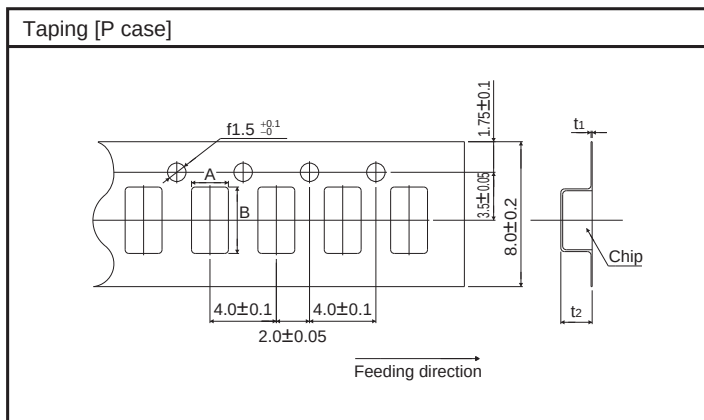
Part No.	Rated voltage 85°C (V)	Category voltage 125°C (V)	Surge voltage 85°C (V)	Cap. 120Hz (μF)	Tolerance (%)	Leakage current 25°C 1WV.60s (μA)	Df 120Hz (%)			Impedance 100kHz (Ω)
							-55°C	25°C 85°C	125°C	
TC P 0G 225 □	4	2.5	5	2.2	±20, 10	0.5	15	10	15	17.5
TC P 0G 335 □	4	2.5	5	3.3	±20, 10	0.5	30	20	30	17.5
TC P 0G 475 □	4	2.5	5	4.7	±20, 10	0.5	30	20	30	14.4
TC P 0G 685 □	4	2.5	5	6.8	±20, 10	0.5	30	20	30	11.8
TC P 0G 106 □	4	2.5	5	10	±20, 10	0.5	30	20	30	9.3
TC P 0G 156 □	4	2.5	5	15	±20, 10	0.6	30	20	30	8.3
TC P 0G 226 □	4	2.5	5	22	±20, 10	0.9	30	20	30	7.7
TC P 0J 155 □	6.3	4	8	1.5	±20, 10	0.5	15	10	15	17.5
TC P 0J 225 □	6.3	4	8	2.2	±20, 10	0.5	30	20	30	17.5
TC P 0J 335 □	6.3	4	8	3.3	±20, 10	0.5	30	20	30	14.4
TC P 0J 475 □	6.3	4	8	4.7	±20, 10	0.5	30	20	30	11.8
TC P 0J 685 □	6.3	4	8	6.8	±20, 10	0.5	30	20	30	9.3
TC P 0J 106 □	6.3	4	8	10	±20, 10	0.6	30	20	30	8.3
TC P 0J 156 □	6.3	4	8	15	±20, 10	0.9	30	20	30	7.7
TC P 0J 226 □	6.3	4	8	22	±20, 10	1.4	38	25	38	5.0
TC P 1A 105 □	10	6.3	13	1.0	±20, 10	0.5	15	10	15	17.5
TC P 1A 155 □	10	6.3	13	1.5	±20, 10	0.5	30	20	30	16.1
TC P 1A 225 □	10	6.3	13	2.2	±20, 10	0.5	30	20	30	14.4
TC P 1A 335 □	10	6.3	13	3.3	±20, 10	0.5	30	20	30	11.8
TC P 1A 475 □	10	6.3	13	4.7	±20, 10	0.5	30	20	30	9.3
TC P 1A 685 □	10	6.3	13	6.8	±20, 10	0.7	30	20	30	9.3
TC P 1A 106 □	10	6.3	13	10	±20, 10	1.0	30	20	30	8.3
TC P 1C 105 □	16	10	20	1.0	±20, 10	0.5	15	10	15	16.1
TC P 1D 105 □	20	13	26	1.0	±20, 10	0.5	15	10	15	16.1
TC P 1E 105 □	25	16	32	1.0	±20, 10	0.6	30	20	30	9.3

□=Tolerance (M : ±20%, K : ±10%)

Tantalum capacitors

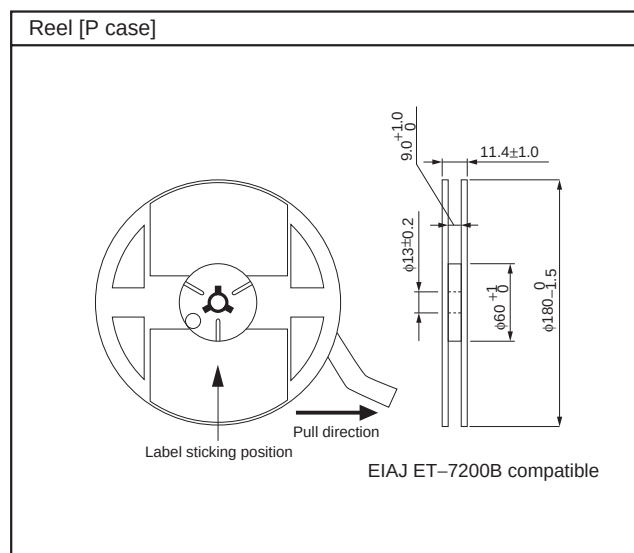
● Packaging specifications

Case code	A $\pm$ 0.1	B $\pm$ 0.1	t ₁ $\pm$ 0.05	t ₂ $\pm$ 0.1
P	1.55	2.3	0.25	1.5



● Packaging style

Case code	Packaging	Packaging style		Symbol	Basic ordering units
P case	Taping	plastic taping	φ180mm Reel	R	3,000pcs



Tantalum capacitors

●Recommended condition of reflow soldering

(1) Leakage current-to-voltage ratio

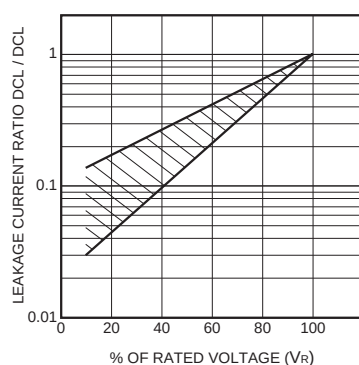


Fig.1

(2) Derating voltage as function of temperature

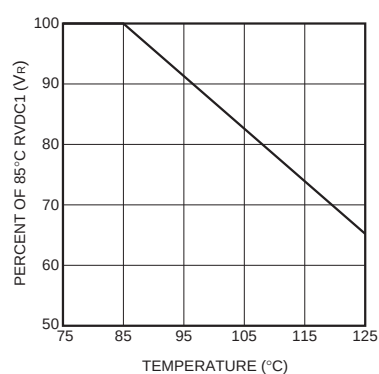


Fig.2

85°C		125°C	
Rated Voltage (V.DC)	Surge Voltage (V.DC)	Category Voltage (V.DC)	Surge Voltage (V.DC)
4	5	2.5	3.2
6.3	8	4	5
10	13	6.3	8
16	20	10	13
20	26	13	16

(3) Reliability

The malfunction rate of tantalum solid state electrolytic capacitors varies considerably depending on the conditions of usage (ambient temperature, applied voltage, circuit resistance).

Formula for calculating malfunction rate

$$\lambda_p = \lambda_b \times (\pi_E \times \pi_{SR} \times \pi_Q \times \pi_{CV})$$

λ_p : Malfunction rate stemming from operation

λ_b : Basic malfunction rate

π_E : Environmental factors

π_{SR} : Series resistance

π_Q : Level of malfunction rate

π_{CV} : Capacitance

For details on how to calculate the malfunction rate stemming from operation, see the tantalum solid state electrolytic capacitors column in MIL-HDBK-217.

Tantalum capacitors

Malfunction rate as function of operating temperature and rated voltage

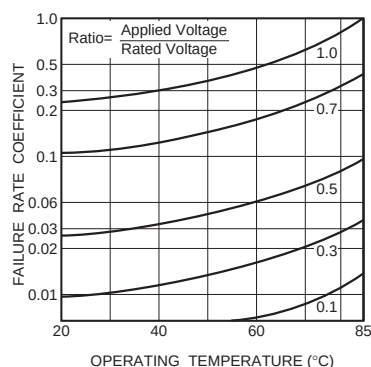


Fig.3

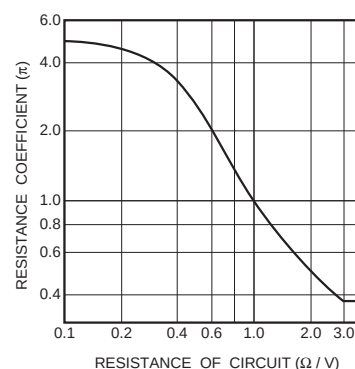
Malfunction rate as function of circuit resistance (Ω/V)

Fig.4

(4) Maximum power dissipation

Warming of the capacitor due to ripple voltage balances with warming caused by Joule heating and by radiated heat. Maximum allowable warming of the capacitor is to 5°C above ambient temperature. When warming exceeds 5°C, it can damage the dielectric and cause a short circuit.

$$\text{Power dissipation (P)} = I^2 \bullet R$$

Ripple current

P : As shown in table at right

R : Equivalent series resistance

Notes:

1. Please be aware that when case size is changed, maximum allowable power dissipation is reduced.
2. Maximum power dissipation varies depending on the package. Be sure to use a case which will keep warming within the limits shown in the table below.

Allowable power dissipation (W) and maximum temperature rising

Temp.	+25°C	+55°C	+85°C	+125°C
Case				
P case (2012)	0.025	0.022	0.020	0.010
A case (3216)	0.070	0.063	0.056	0.028
Max. Temp Rise [°C]	5	5	5	2

Tantalum capacitors

(5) Impedance frequency characteristics

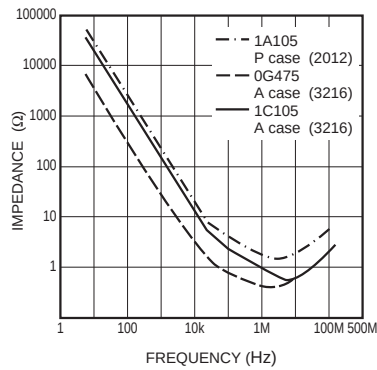


Fig.5

(6) ESR frequency characteristics

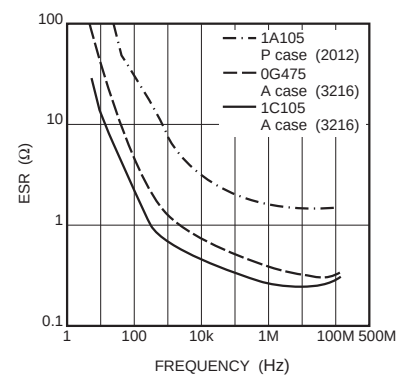


Fig.6

(7) Temperature characteristics

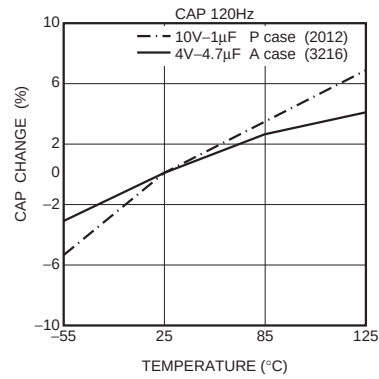


Fig.7

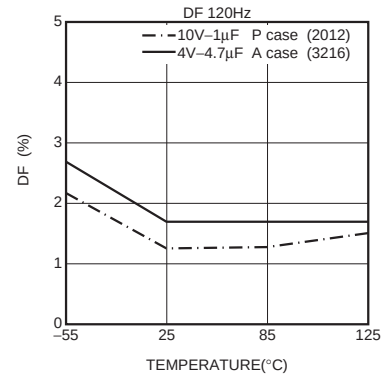


Fig.8

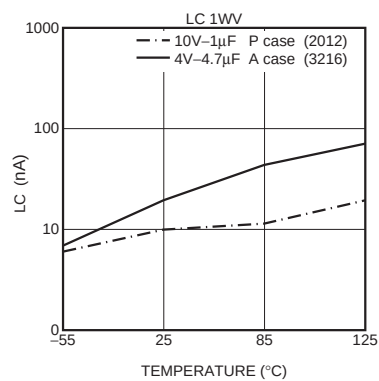


Fig.9

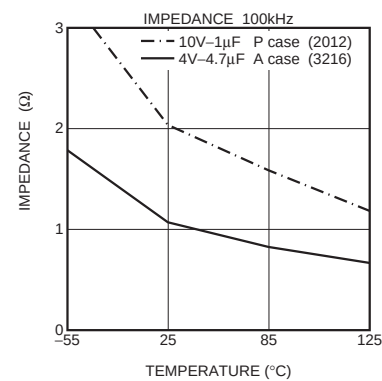


Fig.10

Tantalum capacitors

Rush current

The rush current is in inverse proportion to the ESR.
The excessive rush current may cause a damage.

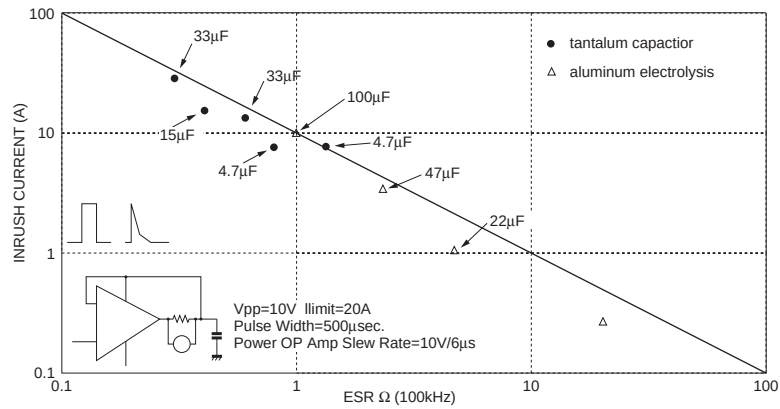


Fig. 11 Max. rush current and ESR

The rush current may be reduced by the protection resistors

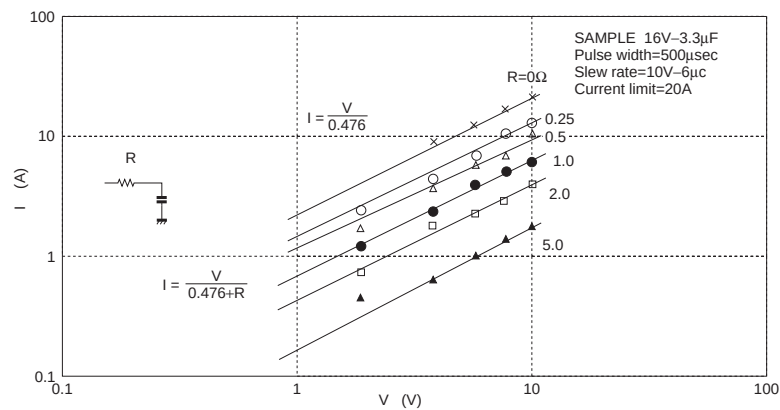


Fig. 12 Change in I max by protection resistors

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).

Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

It is our top priority to supply products with the utmost quality and reliability. However, there is always a chance of failure due to unexpected factors. Therefore, please take into account the derating characteristics and allow for sufficient safety features, such as extra margin, anti-flammability, and fail-safe measures when designing in order to prevent possible accidents that may result in bodily harm or fire caused by component failure. ROHM cannot be held responsible for any damages arising from the use of the products under conditions out of the range of the specifications or due to non-compliance with the NOTES specified in this catalog.

Thank you for your accessing to ROHM product informations.

More detail product informations and catalogs are available, please contact your nearest sales office.

ROHM Customer Support System

THE AMERICAS / EUROPE / ASIA / JAPAN

www.rohm.com

Contact us : webmaster@rohm.co.jp

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А