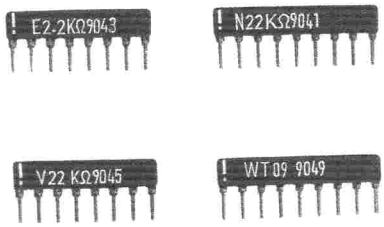
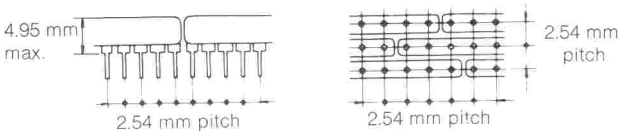
Resistor Networks, Low Profile
Series EXBF



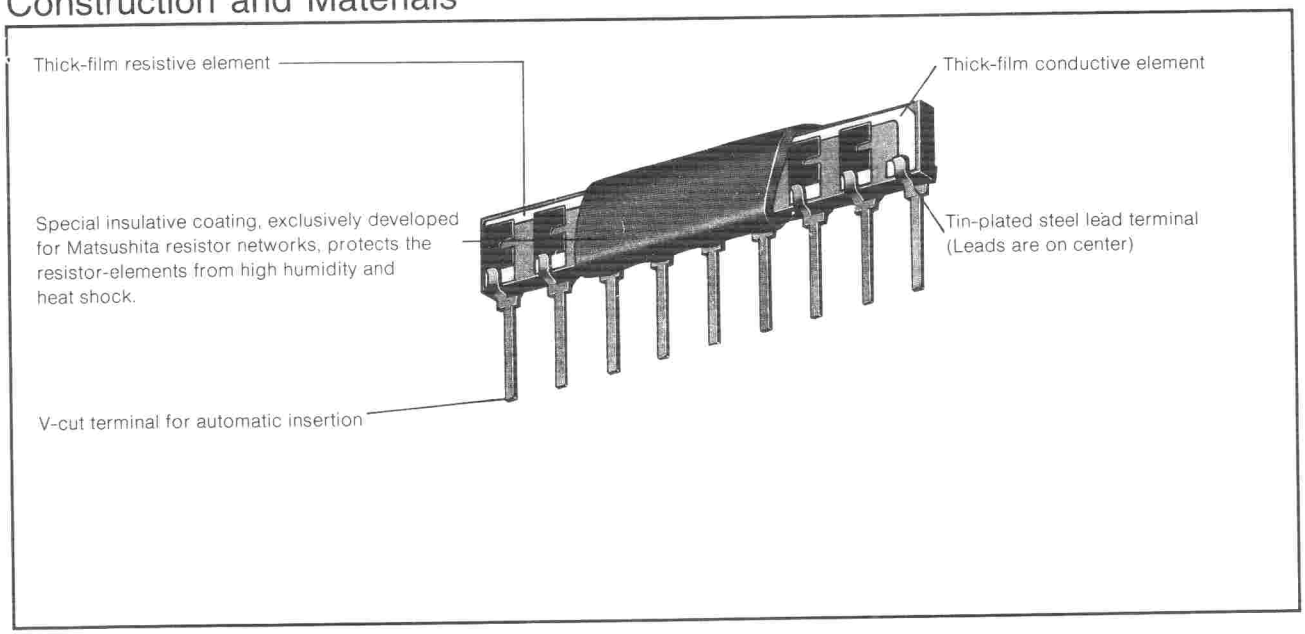
Features

- **Highly stable thick film**
  Equivalent to MIL-R-83401
- **Compact package**
  A short body length which can be inserted onto PC board at 2.54 mm pitch sequentially.



- **Automatic SIP insertion capability**
  Available for automatic insertion machine, packaged in either stick magazine or taped and box.
- **Low profile**
  4.95 mm max. seated height.
- **Low T.C.R.**
  ±200 ppm/°C (Standard), ±100 ppm/°C (Special)
  T.C. Tracking 50 ppm/°C typical.
- **Tough construction**
  Centralized clipping terminals on a thick alumina substrate.

Construction and Materials



Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11
E	X	B	F	8	E	4	7	2	G	

Common Code
Low Profile F Series

Number of pins	
Code	Pins
4	4 pins
5	5 pins
6	6 pins
7	7 pins
8	8 pins
9	9 pins
10	10 pins
11	11 pins
12	12 pins
13	13 pins
14	14 pins

Circuit Configuration	
Code	Type of circuit
E	Common terminal
V	Isolated
N	Series
B	Voltage divider
G	Voltage divider
W	Line terminator
L	Custom circuit
D	Ladder
C	Center common
T	Bothe ends common

Resistance Value	
The first two digits are significant figures of resistance value and the third one denotes the number of zeros following.	Example 330 Ω: 331 4.7 kΩ: 472 22 kΩ: 223 100 kΩ: 104

Custom Designed Number	
Custom designed part number of munufacturer is consist of three digits.	Example 188 219 413 939

Line Terminator Code Numbers			
Code	R_1/R_2	Code	R_1/R_2
T01	160/240	T05	330/470
T02	180/390	T07	330/680
T03	220/270	T08	1.5 k/3.3 k
T04	220/330	T09	3.0 k/6.2 k
T05	330/390		

Resistance Tolerance	
Code	Tol.
F	±1 %
G	±2 %
J	±5 %

Suffix for Special Requirements
Example: TCR 100 ppm: K Special marking: D Taped & boxed: Y Stick magazine: 5 to 8

Circuits

Standard Circuits

□ : Number of pins

Circuits	Common Terminal Circuits			Isolated Circuit	Series Circuit
Part Number	EXBF□E	EXBF□C	EXBF□T	EXBF□V	EXBF□N
Circit Configurations		Center common	Both end common		
No. of Resistors	n−1	n−1	n−2	n/2	n−1

Custom Circuits

Circuits	Voltage Divider	Line Terminator	Custom Designed
Part Numbers	EXBF□B EXBF□G	EXBF□W	EXBF□L
Circuit Configurations			Available on request
No. of Resistors	R_1, R_2 (n−1)/2	R_2, R_1 (n−2)	Depend on the circuit

Specifications

Ratings

Higher power type is available on request.

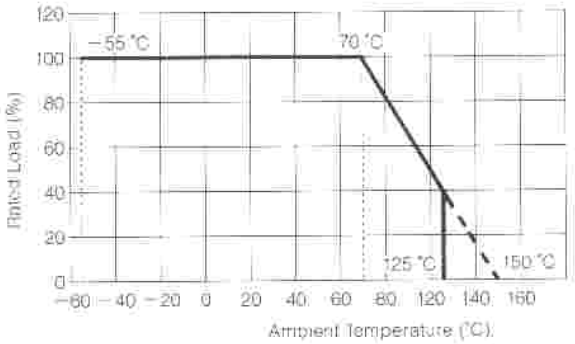
		Common Terminal Circuit EXBF□E	Isolated Circuit EXBF□V	Series Circuit EXBF□N	Line Terminator EXBF□W	Voltage Divider EXBF□B EXBF□G	Custom Designed Circuit EXBF□L
Number of Resistors		3 to 13	2 to 7	3 to 13	R_1, R_2 4 to 12	R_A, R_B 2 to 6	—
Power Rating at 70 °C	/Single Resistors	125 mW	200 mW	125 mW	125 mW	125 mW	—
	/Total Package	125 mW × (pins − 1)					
Resistance Range		Standard: 22 Ω to 1 MΩ (Special: 10 Ω to 5.6 MΩ)					
Resistance Tolerance		F: ±1 %, G: ±2 %, J: ±5 % (±1 Ω min., for values 100 Ω and lower)					
Temperature Coefficient		±200 ppm/°C (Special: ±100 ppm/°C)					
TC Tracking		50 ppm/°C (Same resistance)					
Maximum Rated Continuous Working Voltage*		100 V					
Maximum Overload Voltage**		150 V					
Operating Temperature Range		−55 °C to +125 °C					

*Rated Continuous Working Voltage (RCWV) shall be determined from RCWV = √Power rating × Resistance value, or maximum RCWV listed above, whichever less.

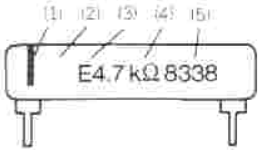
**Maximum Overload Voltage shall be the same as the maximum test voltage short time overload test.

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



Marking



(1) Bar identifying pin number 1, marking the difference below:
- ▮ : ±1% (F) type
- ▮ : ±2% (G) type
- ▮ : ±5% (J) type

(2) Manufacturers identification (Feasible 7-pin and longer)

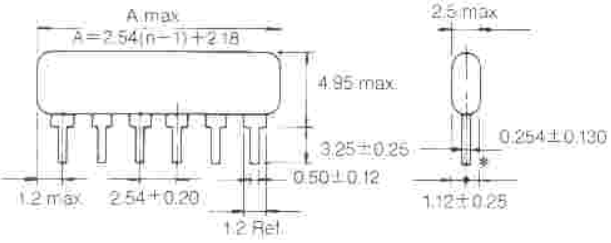
(3) The type of circuits

Code	Circuits
E	Common terminal
V	Isolated
N	Series
B	Voltage divider
G	Voltage divider
W	Line terminater
L	Custom circit
D	Ladder
C	Center common
T	Both end common

(4) Resistance value or custom designed number with three digits, or terminator code number

(5) Lot number

Dimensions in mm (not to scale)

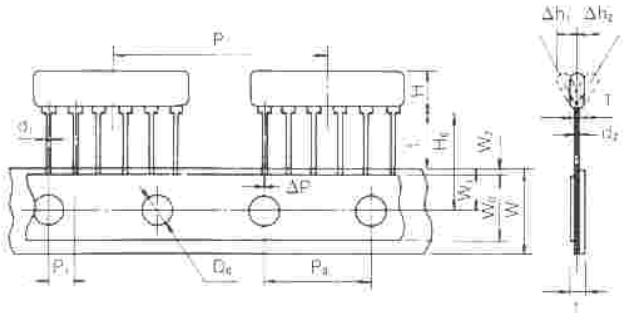


* Leads come down in the center of body thickness

Part No.	Pins	Dimension A max.
EXBF4	4	9.80
EXBF5	5	12.34
EXBF6	6	14.88
EXBF7	7	17.42
EXBF8	8	19.96
EXBF9	9	22.50
EXBF10	10	25.04
EXBF11	11	27.58
EXBF12	12	30.12
EXBF13	13	32.66
EXBF14	14	35.20

EXBF□○XXX△Y

Package Specifications Taped & Box Type (Standard) (Standard quantity 1000 pcs/box)

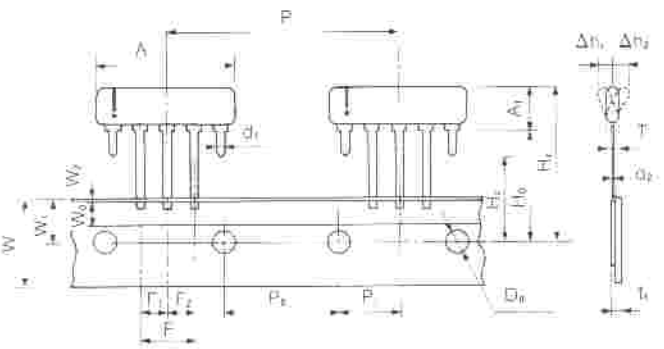


Code		Dimensions (mm)
P	4 to 7 pins	25.4−1.0
	8 to 12 pins	38.1±1.0
P_0		12.7−0.2
ΔP		0±0.5
H		4.95 max.
L		7.0±0.5
H_0		16.0±0.5
W		18.0±0.5
W_2		5 min.

Code	Dimensions (mm)
W_1	9.0±0.5
W_2	3.0 max.
P_1	2.54±0.25
d_1	0.50±0.12
d_2	0.25±0.13
D_0	4.1±0.2
$\Delta h_1, \Delta h_2$	2.0 max.
T	2.54 max.
t	0.7±0.2

EXBF□○XXX△YV

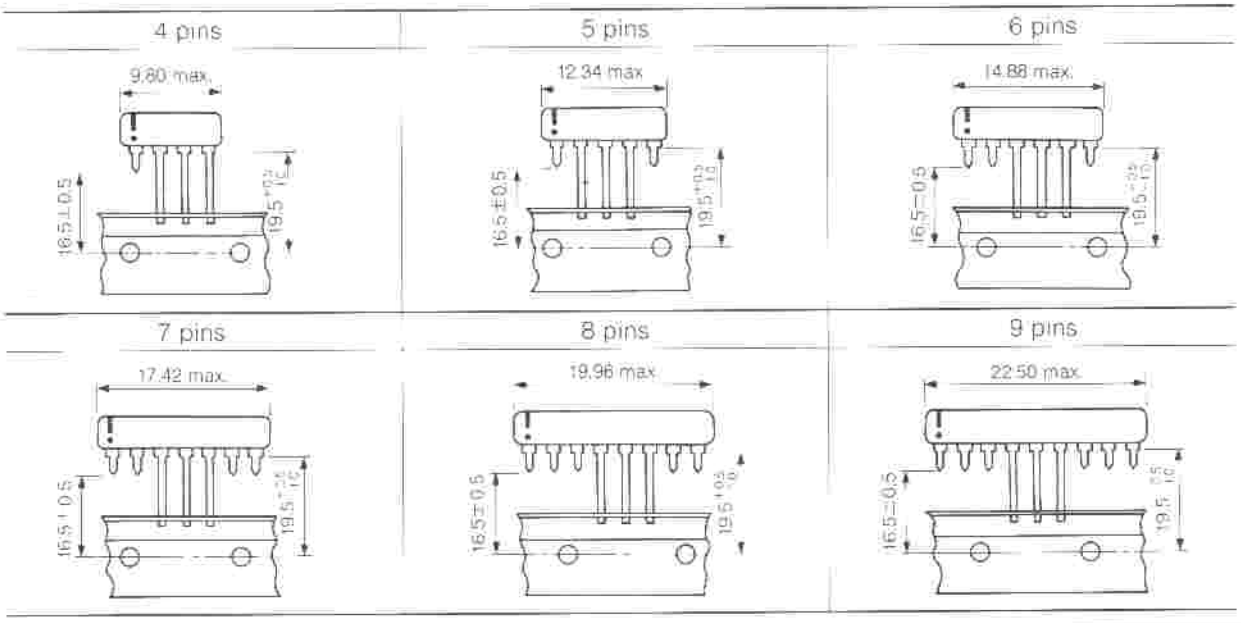
Package Specifications Taped & Box Type for Panasert RH (Standard quantity 1000 pcs/box)



Code	Dimensions (mm)
A	Fig. 1
A_1	4.95 max.
d_1	0.50±0.12
d_2	$0.25^{+0.13}$
P	25.4±1.0
P_0	12.7±0.3
P_1	6.35±0.70
F_1, F_2	$2.54^{+0.25}$
F	5.08±0.30
Δh_1, Δh_2	1.0 max.

Code	Dimensions (mm)
H_0	$19.5^{+0.5}_{-1.0}$
H_1	23.95 max.
H_2	16.5±0.5
W	18.0±0.5
W_0	5.0 min.
W_1	$9.0^{+0.5}$
W_2	1.0 max.
D_0	4.0±0.3
T	2.54 max.

Fig. 1 Pin dimensions in mm (not to scale)



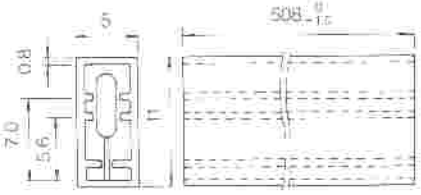
Cartridge type

The top of leads are cut V shape available for verious kinds of magazins for insert machines.

Dimensions in mm (not to scale)

Example: No. 5 Stick for Panasert

EXBF□ ○×××△5



Part No.	Pins	Pcs /stick
EXBF4	4	51
EXBF5	5	41
EXBF6	6	34
EXBF7	7	28
EXBF8	8	25
EXBF9	9	22
EXBF10	10	20
EXBF11	11	18
EXBF12	12	16
EXBF13	13	15
EXBF14	14	14

<table>
<tr><th>Characteristics</th><th>Specifications</th><th>Test Methods</th></tr>
<tr><td>DC Resistance</td><td>DC resistance value shall be within the specified tolerance.
<table><tr><th>Code</th><th>Resistance tolerance</th></tr><tr><td>F</td><td>±1 %</td></tr><tr><td>G</td><td>±2 %</td></tr><tr><td>J</td><td>±5 %</td></tr></table></td><td>DC resistance value measured at the test voltage specified below.
<table><tr><th>Nominal resistance</th><th>Maximum DC test voltage</th></tr><tr><td>10 Ω to 999 Ω incl.</td><td>1 V</td></tr><tr><td>1000 Ω to 9999 Ω incl.</td><td>3 V</td></tr><tr><td>10000 Ω to 99999 Ω incl.</td><td>10 V</td></tr><tr><td>100000 Ω and higher</td><td>30 V</td></tr></table></td></tr>
<tr><td>Temperature Coefficient</td><td>T.C.R.: ±200 ppm/°C
(Special: ±100 ppm/°C)
Tracking:
50 ppm/°C max.
(1 package, Same resistance)</td><td>Natural resistance change per temperature degree centigrade.
$T.C.R. = \frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 (ppm/°C)$
R_1 : Resistance value at reference temperature (t_1)
R_2 : Resistance value at test temperature (t_2)
<table><tr><td>Test temperature</td><td>t_1</td><td>t_2</td><td>t_2</td></tr><tr><td>Cold</td><td>25 °C →</td><td>−55 °C</td><td></td></tr><tr><td>Hot</td><td>25 °C →</td><td>75 °C →</td><td>125 °C</td></tr></table></td></tr>
<tr><td>Heat Shock</td><td>With no evidence of mechanical damage.</td><td>Resistance change after continuous 100 cycles for duty cycle specified below.
<table><tr><th>Step</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>-65^{0}_{-5} °C</td><td>30 min</td></tr><tr><td>2</td><td>25^{+10}_{-5} °C</td><td>Within 10 s</td></tr><tr><td>3</td><td>125^{+3}_{0} °C</td><td>30 min</td></tr><tr><td>4</td><td>25^{+10}_{-5} °C</td><td>Within 10 s</td></tr></table></td></tr>
<tr><td>Low Temperature Operation</td><td>With no evidence of mechanical damage.</td><td>Resistor shall be placed in a cold chamber at -65^{0}_{-5} °C. RCWV shall be applide for 45 minutes,, and then no load for 15 minutes. Return to room temperature. Resistance change measured 30 minutes after the test.</td></tr>
<tr><td>High Temperature Exposure</td><td>△R: ± (0.5 % + 0.05 Ω) max.</td><td>Resistor shall be placed in a hot chamber at 125±5°C with no load for 100 hours.</td></tr>
<tr><td>Short-Time Overload</td><td>△R: ±(0.25 %+0.05 Ω) max.</td><td>Permanent resistance change after the application of a potential of 2.5 times RCWV, or 150 V whichever less, for 5 seconds.</td></tr>
<tr><td>Load Life in Humidity</td><td>△R: ±(0.5 %+0.05 Ω) max.</td><td>Resistance change after 500 hours (1.5 hours "ON", 0.5 hour "OFF") at $\frac{1}{10}$ DC rated power in a humidity chamber controlled at 65±2 °C and 90 to 95 % relative humidity.</td></tr>
<tr><td>Load Life</td><td>△R: ±(1.0 %+0.05 Ω) max.</td><td>Permanent resistance change after 1000 hours operating at RCWV, with duty cycle of 1.5 hours "ON", 0.5 hour "OFF" at 70 ±2 °C ambient.</td></tr>
<tr><td>Insulation Resistance</td><td>10000 MΩ min.</td><td>Measured at DC 100 V between all pins and package.</td></tr>
</table>

Characteristics	Specifications	Test Methods
Dielectric Withstanding Voltage	No evidence of mechanical damage nor arcing break-down	A potential of DC 100 V±10 V shall be applied between all pins and package for 60 seconds on the increasing speed 500 V par second.
Resistance to Soldering Heat	△R: ±(0.25 %+0.05 Ω) max.	Permanent resistance change when leads immersed to 3.2 to 3.8 mm from the body in 350±10 °C solder for 3.0±0.5 seconds.
Resistance to Solvent*	No deterioration of protective coatings and markings.	Specimens shall be immersed in a bath of trichloroethane completely for 5 minutes with ultrasonic.
Solderability	95 % coverage min.	The area covered with a new, smooth, clean, shiny, and continuous surface free from concentrated pinholes when tested per MIL-STD-202 Method 208. Test temperature of solder: 230±5°C Dwell time in solder: 5.0±0.5 seconds
Vibration High Frequency	With no evidence of mechanical damage.	The specimens shall be subjected to a single harmonic motion having an amplitude of either 1.52 mm double amplitude for 2 hours in each three mutually perpendicular directions for a total of 6 hours. The vibration frequency shall be varied between the limits of 10 to 20000 Hz. The entire frequency range of 10 to 2000 Hz and return to 10 Hz shall be traversed in 20 minutes.
Terminal Strength Direct Load	With no evidence of mechanical damage.	Resistance to 9.8 N (1 kgf) direct load for 30±5 seconds in the direction of the longitudinal axis of the terminal.
Terminal Strength Bending Test	With no evidence of mechanical damage.	Resistance to a bending test with 4.4 N (450 gf) load for duty rotation in alternating directions so that the terminals shall be bent through 90° in the both sides.

* ODCs controlled under Montreal Protocol are subject to termination earlier than the year of 2000.