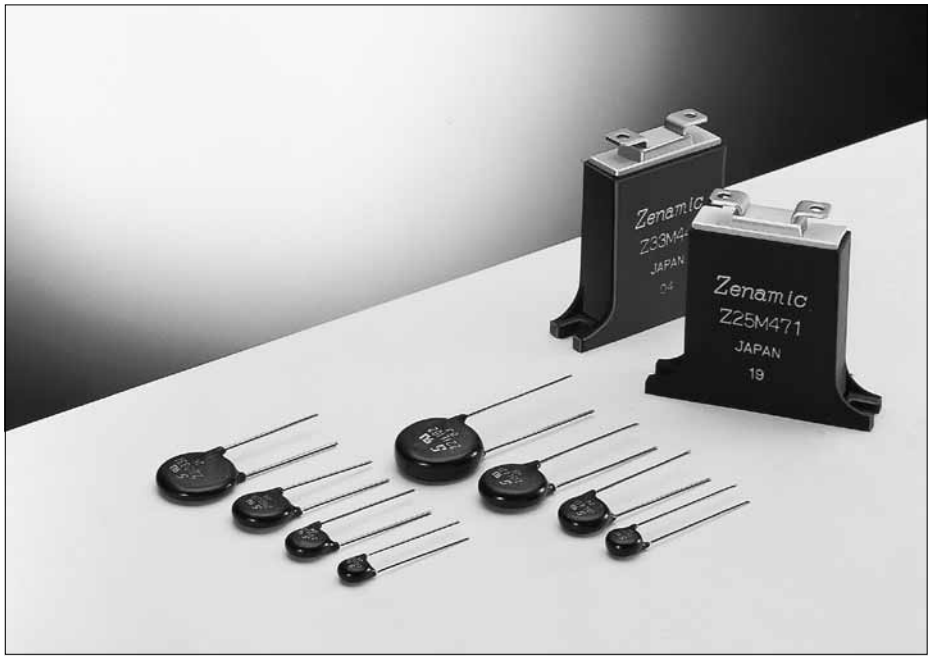
METAL OXIDE VARISTOR

ZENAMIC



ZENAMIC is the product name of a metal oxide varistor.
ZENAMIC Transient/Surge Absorber, Series D is newly released through our continued research in ceramic material composition of ZnO varistor and manufacturing process, featuring large surge current handling capability and energy handling capability for absorbing transient overvoltage in compact size.

Features

- Improved in "Surge Current Handling Capability (at 8/20μs, 2 times)" by about 2 times over the current.
- Very large "Energy Handling Capability" absorbing transient overvoltages in compact sizes.
- Lower Clamping Voltage for better surge protection.
- Fast response to high speed transient/surge voltage.
- Wide products range for transient/surge protection on AC 100V to AC 480V nominal system with the maximum peak current ratings of 600A to 7000A (at 8/20 μs, 2 times).

V-I characteristics

ZENAMIC has the forward-reverse symmetrical electrical characteristics as shown in the figure 1. The voltage-current curves show the varistor characteristics in the range 1μA to 10^4A, and show the resistance characteristics for the range under 1 μA and over 10^4A in the figure 2.
The voltage across terminals when test current(It: 1 mA)is applied to ZENAMIC is the standard varistor voltage(Vz), and the voltage across terminals when a standard surge(Ip) is applied represents the maximum suppression voltage(Vc).

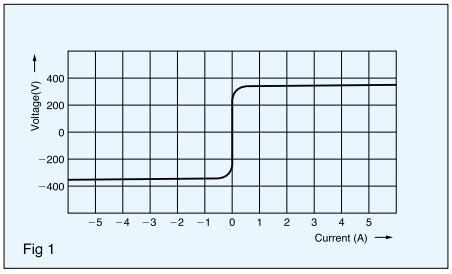


Fig 1

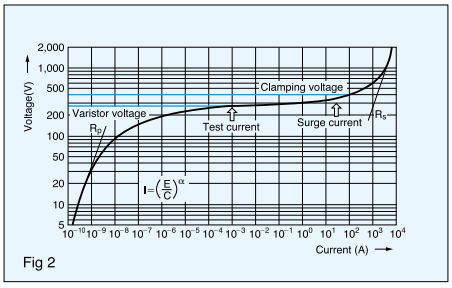


Fig 2

Temperature characteristics

In the small current range, ZENAMIC features outstanding temperature characteristics. A shunt resistance Rp of metal oxide varistor has the temperature characteristics which is determined by the following equation.

$$Rp = Ae^{Eg/2kT} \quad (2)$$

T:Absolute temperature
k:Boltzmann constant
A, Eg:constants

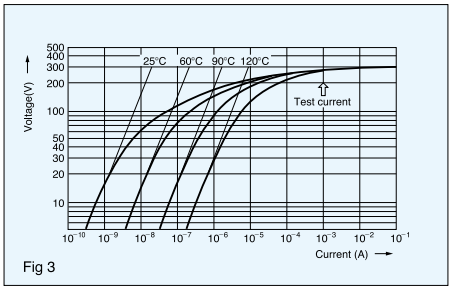


Fig 3

As shown in the figure 3, the temperature dependence characteristics are shown clearly in the low current area.

Surge waveform

A surge waveform varies according to the sources. An EXP waveform is used for surge testing of ZENAMIC, while a AC half-wave is used for the energy absorption test. The EXP waveform reaches its peak voltage (current) at [ta] as shown in the figure 5, and then decreases as time passes and reaches half of the peak voltage (current) at [tb]. This type of the EXP waveform is shown as a [ta/tb] voltage (current) waveform. For surge testing of ZENAMIC, the 8/20μ sec current waveform is used.

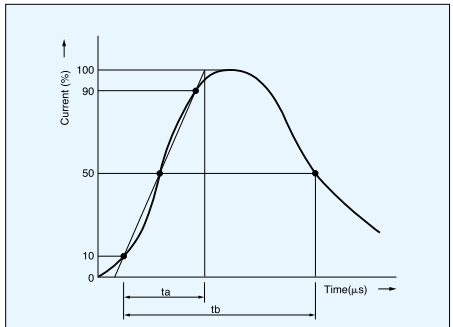
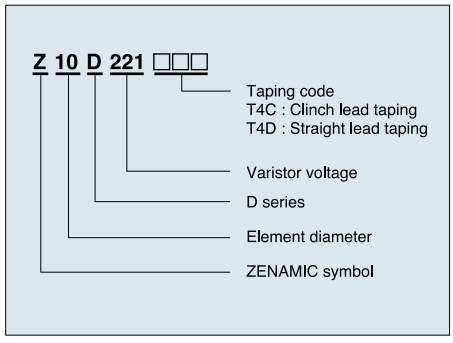


Fig 5

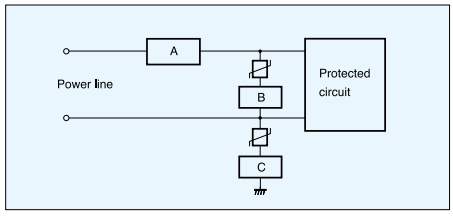
Part Number.



Application notes(General)

1.A surge excess of the specified Maximum Peak Current may cause short circuit or mechanical damage. The following measures are recommended.

- In case that ZENAMIC is used in line to ground, the ground fault circuit interrupter shall be applied in location A or thermally coupled fuse shall be applied in location C.
- ZENAMIC shall not be used near heat generating device and free from direct sunlight.
- ZENAMIC shall not be used near the flammable materials.



1) Location of the over current protector(circuit breaker or current fuse)shall be in the power line to the circuit(Location A)or in series with ZENAMIC (Location B).
2) It recommended that a fuse listed in the table be put in location A or B.
3) In case that ZENAMIC is used in line to ground, the ground fault circuit interrupter should be applied in location A or thermally coupled fuse should be applied in location C.

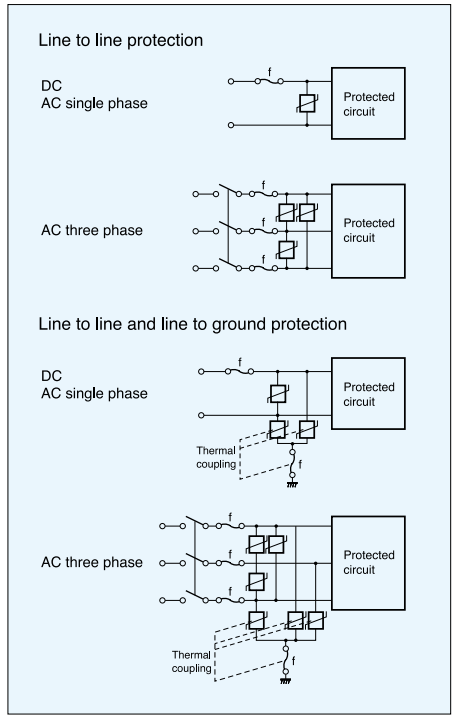
Part Number	Z7D□□□	Z10D□□□
Rating of fuse	5A max.	7A max.

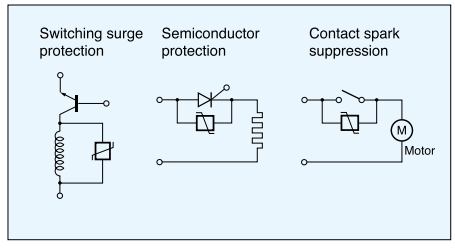
Part Number	Z15D□□□	Z21D□□□
Rating of fuse	10A max.	15A max.

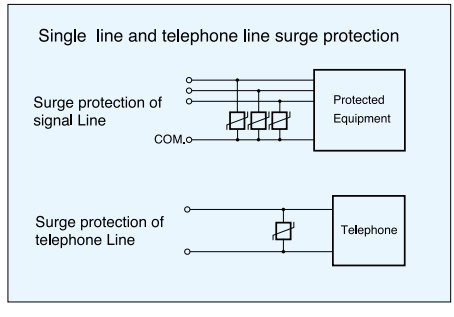
Refer to the related Safety Standards.

Applications

Power lines and surge absorption units with error display (SA series).







Z7D Series

Specifications

Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage (max.)	Rated Power	Maximum Energy		Maximum Peak Current (8/20μs)	Capacitance (TYP) 1kHz
						(10/1000μs)	(2ms)	2 times	
	V_{1mA}(V)	AC_{rms} (V)	DC(V)	V(V)	(W)	(J)	(J)	(A)	(pF)
Z7D180	18(16-20)	11	14	36 at 2.5A	0.02	1.1	0.9	250	3800
Z7D220	22(20-24)	14	18	43		1.3	1.1		3600
Z7D270	27(24-30)	17	22	53		1.6	1.3		3400
Z7D330	33(30-36)	20	26	65		2.0	1.6		2900
Z7D390	39(35-43)	25	31	77		2.4	1.9		1600
Z7D470	47(42-52)	30	38	93		2.8	2.3		1550
Z7D560	56(50-62)	35	45	110		3.4	2.7		1500
Z7D680	68(61-75)	40	56	135		4.1	3.3		1200
*1 Z7D820	82(74-90)	50	65	135 at 10A	0.25	7	5	1250	810
*1 Z7D101	100(90-110)	60	85	165		8.5	6		700
*1 Z7D121	120(108-132)	75	100	200		10	7		590
*1 Z7D151	150(135-165)	95	125	250		13	9		500
*1 Z7D201	200(185-225)	130	170	340		17.5	12.5		200
*1 Z7D221	220(198-242)	140	180	360		19	13.5		190
*1 Z7D241	240(216-264)	150	200	395		21	15		170
*1 Z7D271	270(247-303)	175	225	455		24	17		150
*1 Z7D331	330(297-363)	210	270	545		28	20		130
*1 Z7D361	360(324-396)	230	300	595		32	23		130
*1 Z7D391	390(351-429)	250	320	650		35	25		130
*1 Z7D431	430(387-473)	275	350	710		40	27.5		120
*1 Z7D471	470(423-517)	300	385	775		42	30		100 *2
*1 Z7D511	510(459-561)	320	410	845		45	32		90 *2

1. Operating temperature range:−40 to 85°C
2. Storage temperature range:−40 to 125°C
*1 UL 1449 approved model
*2 Measured at 1MHz

Z10D Series

Specifications

Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage (max.)	Rated Power	Maximum Energy		Maximum Peak Current (8/20μs)	Capacitance (TYP) 1kHz
						(10/1000μs)	(2ms)	2 times	
	V_{1mA}(V)	AC_{rms}(V)	DC(V)	V(V)	(W)	(J)	(J)	(A)	(pF)
Z10D180	18(16-20)	11	14	36 at 5A	0.05	2.6	2.2	500	16000
Z10D220	22(20-24)	14	18	43		3.2	2.6		11000
Z10D270	27(24-30)	17	22	53		3.9	3.2		8000
Z10D330	33(30-36)	20	26	65		4.8	4.0		6300
Z10D390	39(35-43)	25	31	77		5.6	4.7		5200
Z10D470	47(42-52)	30	38	93		6.8	5.6		4600
Z10D560	56(50-62)	35	45	110		8.1	6.7		3750
Z10D680	68(61-75)	40	56	135		9.8	8.2		2800
* Z10D820	82(74-90)	50	65	135 at 25A	0.4	14	10	2500	2000
* Z10D101	100(90-110)	60	85	165		17	12		1700
* Z10D121	120(108-132)	75	100	200		20	14.5		1400
* Z10D151	150(135-165)	95	125	250		25	18		1100
* Z10D201	200(185-225)	130	170	340		35	25		430
* Z10D221	220(198-242)	140	180	360		39	27.5		410
* Z10D241	240(216-264)	150	200	395		42	30		380
* Z10D271	270(247-303)	175	225	455		49	35		350
* Z10D331	330(297-363)	210	270	545		58	42		300
* Z10D361	360(324-396)	230	300	595		65	45		300
* Z10D391	390(351-429)	250	320	650		70	50		300
* Z10D431	430(387-473)	275	350	710		80	55		270
* Z10D471	470(423-517)	300	385	775		85	60		230
* Z10D511	510(459-561)	320	410	845		92	67		210
* Z10D561	560(504-616)	350	450	930		92	67		200
* Z10D681	680(612-748)	420	560	1120		92	67		170
* Z10D751	750(675-825)	460	615	1240		100	70		160
* Z10D821	820(738-902)	510	670	1355		110	80		140
* Z10D911	910(819-1001)	550	745	1500		130	90		120
* Z10D102	1000(900-1100)	625	825	1650		140	100		110

1. Operating temperature range:−40 to 85°C
2. Storage temperature range:−40 to 125°C

* UL 1449 approved model

Z15D Series

Specifications

Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage (max.)	Rated Power	Maximum Energy		Maximum Peak Current (8/20μs)	Capacitance (TYP) 1kHz
						(10/1000μs)	(2ms)	2 times	
	V_{1mA}(V)	AC_{rms}(V)	DC(V)	V(V)	(W)	(J)	(J)	(A)	(pF)
Z15D180	18(16-20)	11	14	36 at 10A	0.1	5.2	4.3	1000	25000
Z15D220	22(20-24)	14	18	43		6.3	5.3		20000
Z15D270	27(24-30)	17	22	53		7.8	6.5		16000
Z15D330	33(30-36)	20	26	65		9.5	7.9		12200
Z15D390	39(35-43)	25	31	77		11	9.4		7000
Z15D470	47(42-52)	30	38	93		14	11		6750
Z15D560	56(50-62)	35	45	110		16	13		6500
Z15D680	68(61-75)	40	56	135		20	16		5500
* Z15D820	82(74-90)	50	65	135 at 50A	0.6	28	20	4500	3700
* Z15D101	100(90-110)	60	85	165		35	25		3200
* Z15D121	120(108-132)	75	100	200		42	30		2700
* Z15D151	150(135-165)	95	125	250		53	37.5		2200
* Z15D201	200(185-225)	130	170	340		70	50		770
* Z15D221	220(198-242)	140	180	360		78	55		740
* Z15D241	240(216-264)	150	200	395		84	60		700
* Z15D271	270(247-303)	175	225	455		99	70		640
* Z15D331	330(297-363)	210	270	545		115	80		580
* Z15D361	360(324-396)	230	300	595		130	90		540
* Z15D391	390(351-429)	250	320	650		140	100		500
* Z15D431	430(387-473)	275	350	710		155	110		450
* Z15D471	470(423-517)	300	385	775		175	125		400
* Z15D511	510(459-561)	320	410	845		190	136		350
* Z15D561	560(504-616)	350	450	930		190	136		340
* Z15D681	680(612-748)	420	560	1120		190	136		320
* Z15D751	750(675-825)	460	615	1240		210	150		310
* Z15D821	820(738-902)	510	670	1355		235	165		280
* Z15D911	910(819-1001)	550	745	1500		255	180		250
* Z15D102	1000(900-1100)	625	825	1650		280	200		230

1. Operating temperature range:−40 to 85°C
2. Storage temperature range:−40 to 125°C

* UL 1449 approved model

Z21D Series

Specifications

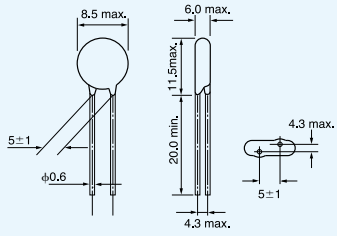
Part No.	Varistor Voltage	Maximum Allowable Voltage		Clamping Voltage (max.)	Rated Power	Maximum Energy		Maximum Peak Current (8/20μs)	Capacitance (TYP) 1kHz
						(10/1000μs)	(2ms)	2 times	
	V_{1mA}(V)	AC_{rms}(V)	DC(V)	V(V)	(W)	(J)	(J)	(A)	(pF)
Z21D180	18(16-20)	11	14	36 at 20A	0.2	13	12	2000	40000
Z21D220	22(20-24)	14	18	43		16	14		30000
Z21D270	27(24-30)	17	22	53		19	17		24500
Z21D330	33(30-36)	20	26	65		24	21		20000
Z21D390	39(35-43)	25	31	77		28	25		13800
Z21D470	47(42-52)	30	38	93		34	30		13500
Z21D560	56(50-62)	35	45	110		41	36		12200
Z21D680	68(61-75)	40	56	135		49	44		11500
* Z21D820	82(74-90)	50	65	135 at 100A	1.0	56	40	6500	7500
* Z21D101	100(90-110)	60	85	165		70	50		6500
* Z21D121	120(108-132)	75	100	200		85	60		5500
* Z21D151	150(135-165)	95	125	250		106	75		4500
* Z21D201	200(185-225)	130	170	340		140	100		1700
* Z21D221	220(198-242)	140	180	360		155	110		1600
* Z21D241	240(216-264)	150	200	395		168	120		1500
* Z21D271	270(247-303)	175	225	455		190	135		1300
* Z21D331	330(297-363)	210	270	545		228	160		1100
* Z21D361	360(324-396)	230	300	595		255	180		1100
* Z21D391	390(351-429)	250	320	650		275	195		1100
* Z21D431	430(387-473)	275	350	710		303	215		1000
* Z21D471	470(423-517)	300	385	775		350	250		900
* Z21D511	510(459-561)	320	410	845		382	273		800
* Z21D561	560(504-616)	350	450	930		382	273		750
* Z21D681	680(612-748)	420	560	1120		382	273		650
* Z21D751	750(675-825)	460	615	1240		420	300		600
* Z21D821	820(738-902)	510	670	1355		460	325		530
* Z21D911	910(819-1001)	550	745	1500		510	360		500
* Z21D102	1000(900-1100)	625	825	1650		565	400		450

1. Operating temperature range:−40 to 85°C
2. Storage temperature range:−40 to 125°C

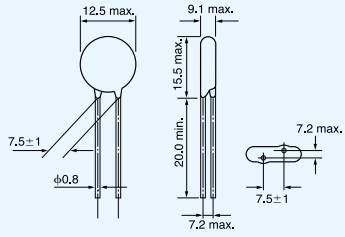
* UL 1449 approved model

Dimensions

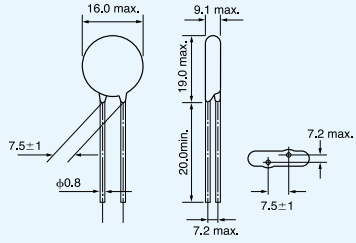
Z7D



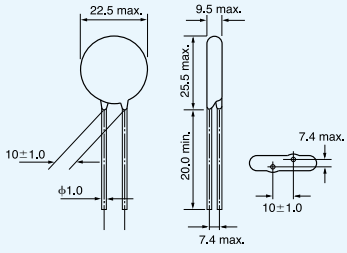
Z10D



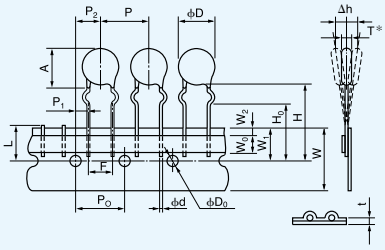
Z15D



Z21D



Crimped Leads and Taped
Z7D□□□ T4C

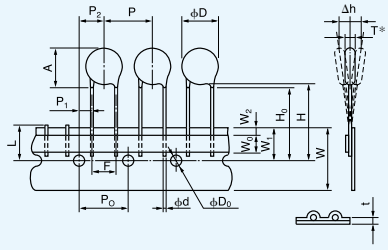


*Dimension"T":Conforms to each individual specification
*Packing quantily:1000pcs/BOX

Symbol	Type Ⅰ
P	12.7±1.0
P_0	12.7±0.3
P_1	3.85±0.70
P_2	6.35±1.30
ϕd	$0.60^{+0.06}_{-0.05}$
F	5.0±0.5
Δh	0±2
W	$18.0^{+1.0}_{-0.5}$
ϕD	Z7D:8.5max

Symbol	Type Ⅰ
W_0	5.0min
W_1	9.0±0.5
W_2	3max
H	Approx. 22
H_0	17.0±0.5
ϕD_0	ϕ4.0±0.2
t	0.6±0.3
L	11max

Straight Leads and Taped
Z7D □□□ T4D



*Dimension"T":Conforms to each individual specification
*Packing quantily:1000pcs/BOX

P	12.7±1.0
P_0	12.7±0.3
P_1	3.85±0.70
P_2	6.35±1.30
ϕd	$0.60^{+0.06}_{-0.05}$
F	5.0±0.5
Δh	0±2
W	$18.0^{+1.0}_{-0.5}$

W_0	5.0min
W_1	9.0±0.5
W_2	3max
H	Approx. 20
H_0	17.0±0.5
ϕD_0	ϕ4.0±0.2
t	0.6±0.3
L	11max
ϕD	Z7D:8.5max

Unit(mm)

Z25M, Z33M Series

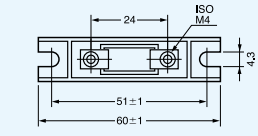
Specifications

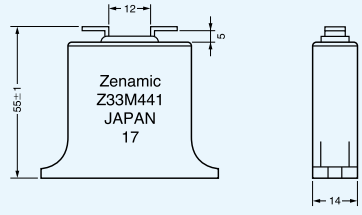
Part No.	Varistor voltage V_{1mA}(V)		Maximum allowable voltage		Clamping voltage	Rated power	Maximum energy (2ms)	Withstanding surge current (8/20μs)	Capacitance (TYP) (1kHz)
	Min	Max	AC	DC					
			V_{rms}	V	V	W	J	2 Times (A)	pF
Z25M221S	220(187	~253)	120	165	380 at 150A	1.0	125	10000	3300
Z25M271S	270(229.5	~310.5)	150	210	465		155		2200
Z25M331S	330(280.5	~379.5)	175	245	570		185		1900
Z25M391S	390(331.5	~448.5)	210	295	675		215		1700
Z25M441S	440(374	~506)	240	335	760		225		1500
Z25M471S	470(399.5	~540.5)	250	350	810		235		1500
Z25M561S	560(476	~644)	300	420	970		260		1400
Z25M681S	680(578	~782)	365	510	1175		280		1250
Z25M821S	820(697	~943)	440	615	1415		330		800
Z25M102S	1000(850	~1,150)	520	730	1725		375		500
Z33M221S	220(187	~253)	120	165	380 at 200A	1.2	200	20000	5500
Z33M271S	270(229.5	~310.5)	150	210	465		255		4200
Z33M331S	330(280.5	~379.5)	175	245	570		310		3700
Z33M391S	390(331.5	~448.5)	210	295	675		360		3200
Z33M441S	440(374	~506)	240	335	760		370		2800
Z33M471S	470(399.5	~540.5)	250	350	810		385		2600
Z33M561S	560(476	~644)	300	420	970		425		2200
Z33M681S	680(578	~782)	365	510	1175		460		1800
Z33M821S	820(697	~943)	440	615	1415		580		1500
Z33M102S	1000(850	~1150)	520	730	1725		620		1000

1. Operating temperature range: −40 to 85°C
2. Storage temperature range: −40 to 125°C

Dimensions

Z25M, Z33M type





Unit(mm)