



OPEN-BRIK™

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
Powerex Europe, S.A., 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 72.75.15

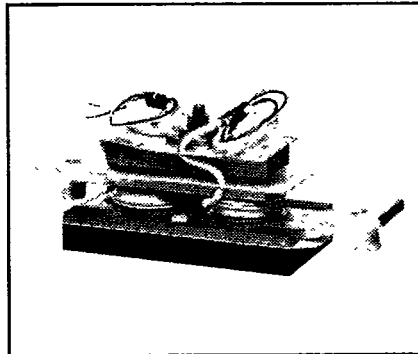
Phase Control Modules

110-205 Amperes/
800-3000 Volts

Configuration Reference

The OPEN-BRIK™ part number system takes the form *P3 Z7B CT7 XT W16* where:

- *P3* is the configuration number. The configurations are shown pictorially on the outline drawings.
- *Z7B* is the package type per the outline drawings Z7B and Z8B on this data sheet.
- *CT7* denotes the element code. The Element Code Reference at the end of this data sheet provides information on the standard element codes, including the corresponding disc device using the element. Refer to the appropriate disc package data sheets in the Powerex Semiconductor Data Book for additional device specifications.
- *XT* denotes special features:
 - XT — standard module
 - AA-ZZ — denotes unique customer specification
- *W16* denotes voltage code per the table below. Note that not all voltage ratings are available for every element. Refer to the Element Code Reference for available voltage ratings.



OPEN-BRIK™ Phase Control Modules
110-205 Amperes/800-3000 Volts

Description

Powerex OPEN-BRIK™ Modules are designed for medium and high current power control applications. OPEN-BRIK™ Modules feature an electrically isolated baseplate that simplifies system packaging, installation and cooling. OPEN-BRIK™ Modules utilize hermetic disc semiconductors mounted in inverse parallel (AC switch) or doubler configurations. OPEN-BRIK™ Modules are especially advantageous in low duty cycle pulse applications since the large area elements (33 or 38 mm) provide high pulse currents relative to the modules' continuous rating. An optional ported base plate is available for water cooled application. Versions utilizing inverter thyristors, fast recovery diodes, transistors, and GTOs and various circuit configurations, e.g. Common Anode, Common Cathode, and Parallel Elements, are available.

Features:

- Electrically Isolated Baseplate
- Hermetic Devices
- Rugged Buss Bar Terminations
- Anodized Aluminum Baseplate

Applications:

- AC Motor Starters
- DC Motor Controls
- Resistance Welding Controls
- UPS Inverters

Ordering Information

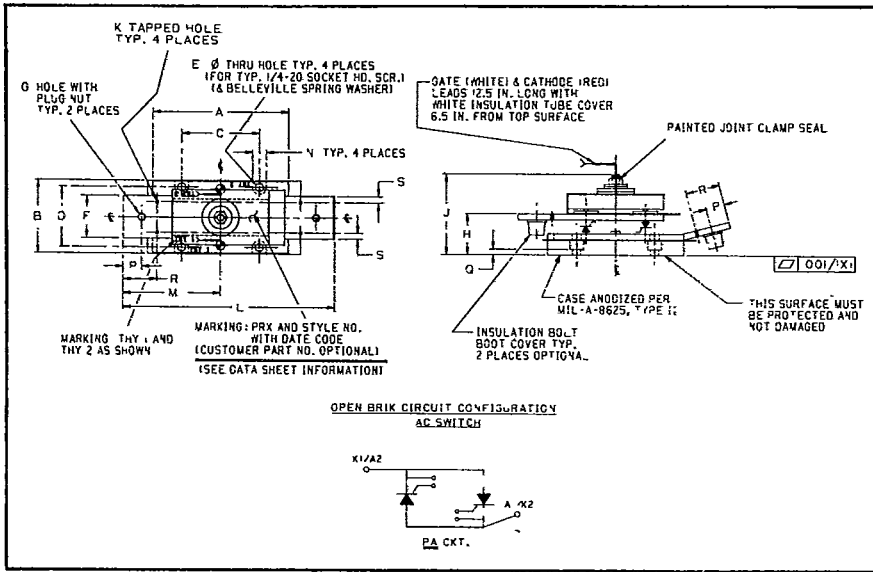
Example: Select the complete thirteen digit module part number you desire from the Configuration Reference Description — i.e. P3Z7BCT7XTW16 is a 1600 Volt, 160 Ampere Average, Dual SCR OPEN-BRIK™ module.

Elements Voltage Rating	Voltage Code
800	W08
1000	W10
1200	W12
1400	W14
1600	W16
1800	W18
2000	W20
2200	W22
2400	W24
2600	W26
2800	W28
3000	W30



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OPEN-BRIK™ Modules
 800-3000 Volts
 Outline Drawing

Electrical Terminal (G) and Mounting Bolt (E) Torque Limit is 11 ft/lbs.

Apply a thin coating of thermal joint compound to heat sink prior to module mounting.

If incoming test is done for isolation voltage, the voltage should be applied in a slow manner rather than abruptly imposed on the device. The voltage should be applied between the top terminals, which must be shorted together, and the metal case.

The metal case is anodized and provides added voltage isolation capability if not damaged: factory hi-pot test is achieved without the benefit of the anodized coating.

7 Size AC Switch (Z7B)

Dim.	Inches	Metric
A	5.50	139.70
B	3.00	76.20
C	3.15	80.01
D	2.47	62.73
E	.328 φ	8.33 φ
F	1.75	44.45
G	5/16-18 UNC-2B	5/16-18 UNC-2B
H	1.70	43.18
J	3.25	82.55
K	6-32 UNC-2B	6-32 UNC-2B
L	8.57	217.67
M	3.94	100.07
N	.56	14.22
P	.75	19.05
Q	.25	6.35
R	1.37	14.22
S	.25	6.35

Approximate Weight Pounds
 3.20

Hi-Pot Voltage
 2,500 VAC

8 Size AC Switch (Z8B)

Dim.	Inches	Metric
A	5.50	139.70
B	3.70	93.98
C	3.15	80.01
D	3.15	80.01
E	.328 φ	8.33 φ
F	1.75	44.45
G	5/16-18 UNC-2B	5/16-18 UNC-2B
H	2.17	55.12
J	3.82	97.03
K	6-32 UNC-2B	6-32 UNC-2B
L	8.57	217.67
M	3.94	100.07
N	.56	14.22
P	.75	19.05
Q	.25	6.35
R	1.37	34.79
S	.25	6.35

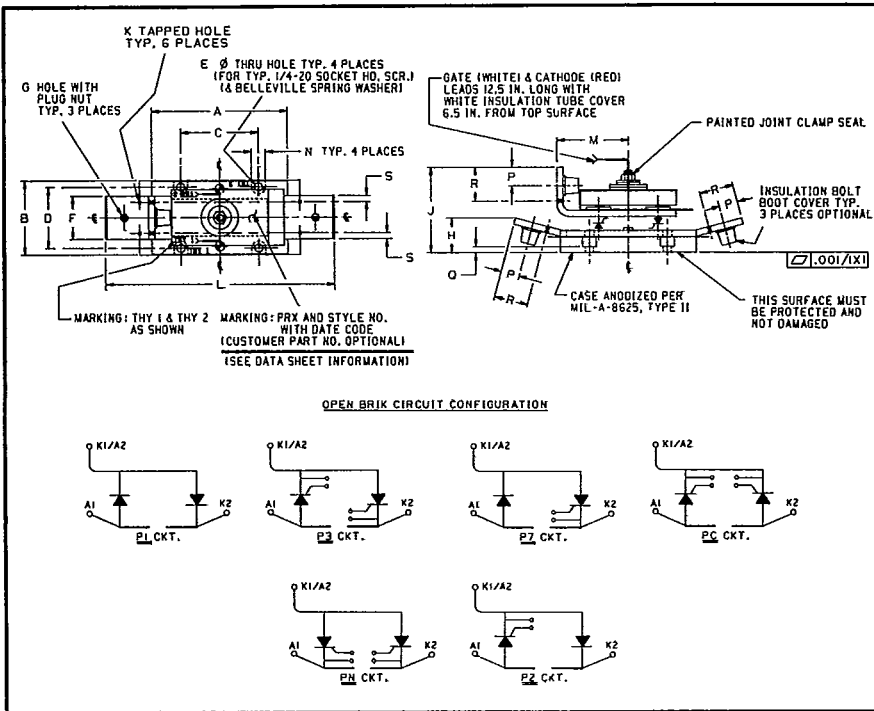
Approximate Weight Pounds
 4.35

Hi-Pot Voltage
 2,500 VAC



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OPEN-BRIK™ Modules
 800-3000 Volts
 Outline Drawing

Electrical Terminal (G) and Mounting Bolt (E) Torque Limit is 11 ft/lbs.

Apply a thin coating of thermal joint compound to heat sink prior to module mounting.

If incoming test is done for isolation voltage, the voltage should be applied in a slow manner rather than abruptly imposed on the device. The voltage should be applied between the top terminals, which must be shorted together, and the metal case.

The metal case is anodized and provides added voltage isolation capability if not damaged: factory hi-pot test is achieved without the benefit of the anodized coating.

7 Size (Z7B)

Dim.	Inches	Metric
A	5.50	139.70
B	3.00	76.20
C	3.15	80.01
D	2.47	62.73
E	.328 φ	8.33 φ
F	1.75	44.45
G	5/16-18 UNC-2B	5/16-18 UNC-2B
H	1.40	35.56
J	3.46	87.88
K	6-32 UNC-2B	6-32 UNC-2B
L	9.26	235.20
M	2.88	73.15
N	.56	14.22
P	.75	19.05
Q	.25	6.35
R	1.37	34.79
S	.25	6.35

Approximate Weight Pounds
 3.30

Hi-Pot Voltage
 2,500 VAC

8 Size (Z8B)

Dim.	Inches	Metric
A	5.50	139.70
B	3.70	93.98
C	3.15	80.01
D	3.15	80.01
E	.328 φ	8.33 φ
F	1.75	44.45
G	5/16-18 UNC-2B	5/16-18 UNC-2B
H	1.40	35.56
J	3.90	99.06
K	6-32 UNC-2B	6-32 UNC-2B
L	9.26	235.20
M	2.88	73.15
N	.56	14.22
P	.75	19.05
Q	.25	6.35
R	1.37	34.79
S	.25	6.35

Approximate Weight Pounds
 4.45

Hi-Pot Voltage
 2,500 VAC



T-25-23

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OPEN-BRIK™
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Maximum Ratings and Electrical Characteristics

Part Number	Voltage Gate Current, Speed of Element†												Isolation Voltage††		Strike Distance	
	Voltage				Gate			Current				Speed		V _{RMS} (V)	I _{RMS} (mA)	Bus To Case (Inches)
	V _{DRM} /V _{RRM} Ⓞ E1 E2 (V) (V)		V _{RSM} E1 E2 (V) (V)		dv/dtⓄ (V/μs)	V _{GT} (V)	I _{GT} (mA)	di/dtⓄ (A/μs)	I _{DRM} /I _{RRM} Ⓞ E1 E2 (mA) (mA)		I _{TSM} /I _{FSM} Ⓞ E1 E2 (kA) (kA)		SCR t _q (μsec)			

Full Control SCR, Inverse Parallel

PAZ7BBT7XTW__	2200	2200	2300	2300	300	3	150	600	30	30	9	9	150	—	2500	.66	.5
PAZ7BCT7XTW__	1600	1600	1700	1700	300	3	150	600	30	30	10	10	150	—	2500	.66	.5
PAZ8BAT8XTW__	3000	3000	3100	3100	300	3	200	600	75	75	7.8	7.8	350	—	3000	.8	.5
PAZ8BBT8XTW__	2200	2200	2300	2300	300	3	200	600	50	50	12	12	250	—	2500	.66	.5
PAZ8BCT8XTW__	1400	1400	1500	1500	300	3	150	600	35	35	15	15	150	—	2500	.66	.5

Diode/Diode

PIZ7BBR7XTW__	2200	2200	2300	2300	—	—	—	—	50	50	9	9	—	10	2500	.66	.5
PIZ7BCR7XTW__	1200	1200	1300	1300	—	—	—	—	50	50	14	14	—	8	2500	.66	.5

Half Control SCR/Diode Ⓞ

P2Z7BBB7XTW__	2200	2200	2300	2300	300	3	150	600	30	30	9	9	150	10	2500	.66	.5
P2Z7BCB7XTW__	1600	1600	1700	1700	300	3	150	600	30	30	10	9	150	10	2500	.66	.5
P2Z8BAA8XTW__	3000	3000	3100	3100	300	3	200	600	75	50	7.8	7	350	14	3000	.8	.5
P2Z8BBB8XTW__	2200	2200	2300	2300	300	3	200	600	50	50	12	9	250	10	2500	.66	.5
P2Z8BCC8XTW__	1400	1200	1500	1300	300	3	150	600	35	35	15	14	150	8	2500	.66	.5

Full Control SCR/SCR

P3Z7BBT7XTW__	2200	2200	2300	2300	300	3	150	600	30	30	9	9	150	—	2500	.66	.5
P3Z7BCT7XTW__	1600	1600	1700	1700	300	3	150	600	30	30	10	10	150	—	2500	.66	.5
P3Z8BAT8XTW__	3000	3000	3100	3100	300	3	200	600	75	75	7.8	7.8	350	—	3000	.8	.5
P3Z8BBT8XTW__	2200	2200	2300	2300	300	3	200	600	50	50	12	12	250	—	2500	.66	.5
P3Z8BCT8XTW__	1400	1400	1500	1500	300	3	150	600	35	35	15	15	150	—	2500	.66	.5

†Element location indicated by E1 or E2.

††Hi-Pot. 60 Hz, 1 minute test



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 110-205 Amperes/800-3000 Volts

Part Number	Current and Thermal Ratings of Module								Circuit Currents				Element Data Model*		
	Current			Thermal					Units Per Sink→ T _A (°C)	1 AC Switch I _{RMS} (A)	3 AC Switch [Ⓞ] I _{RMS} (A)	2 1φ Bridge I _{DC} (A)	3 3φ Bridge [Ⓞ] I _{DC} (A)	E1	E2
	I _{T(RV)} [Ⓞ] (A)	@ T _C (°C)	Maximum Power Dissipation (W)	T _J (°C)	Sensor @ T _J (Ω)	R _{θJC} per Module (°C/W)	R _{θCS} per Module [Ⓞ] (°C/W)	R _{θCA} (°C/W)							

Full Control SCR, Inverse Parallel

PAZ7BBT7XTW__	135	85	375	130	530	.12	.01	.08	40	385	240	—	—	BT7	BT7
PAZ7BCT7XTW__	160	85	375	130	530	.12	.01	.08	40	415	255	—	—	CT7	CT7
PAZ8BAT8XTW__	110	85	335	125	640	.12	.01	.08	40	300	175	—	—	AT8	AT8
PAZ8BBT8XTW__	170	85	375	130	530	.12	.01	.08	40	435	270	—	—	BT8	BT8
PAZ8BCT8XTW__	190	85	375	130	530	.12	.01	.08	40	485	295	—	—	CT8	CT8

Diode/Diode

PIZ7BBR7XTW__	190	105	375	150	315	.12	.01	.08	40	—	—	280	380	BR7	BR7
PIZ7BCR7XTW__	205	105	375	150	315	.12	.01	.08	40	—	—	310	410	CR7	CR7

Half Control SCR/Diode[Ⓞ]

P2Z7BBB7XTW__	140	85	375	130	530	.12	.01	.08	40	—	—	265	300	BT7	BR7
P2Z7BCB7XTW__	165	85	375	130	530	.12	.01	.08	40	—	—	285	310	CT7	BR7
P2Z8BAA8XTW__	115	85	335	125	640	.12	.01	.08	40	—	—	205	250	AT8	AR7
P2Z8BBB8XTW__	175	85	375	130	530	.12	.01	.08	40	—	—	305	325	BT8	BR7
P2Z8BCC8XTW__	195	85	375	130	530	.12	.01	.08	40	—	—	335	355	CT8	CR7

Full Control SCR/SCR

P3Z7BBT7XTW__	135	85	375	130	530	.12	.01	.08	40	—	—	260	295	BT7	BT8
P3Z7BCT7XTW__	160	85	375	130	530	.12	.01	.08	40	—	—	280	305	CT7	CT7
P3Z8BAT8XTW__	110	85	335	125	640	.12	.01	.08	40	—	—	200	245	AT8	AT8
P3Z8BBT8XTW__	170	85	375	130	530	.12	.01	.08	40	—	—	300	320	BT8	BT8
P3Z8BCT8XTW__	190	85	375	130	530	.12	.01	.08	40	—	—	330	350	CT8	CT8

- Ⓛ Applies for zero or negative gate bias.
- Ⓜ Higher dv/dt ratings available, consult factory.
- Ⓨ With recommended gate drive.
- Ⓩ Per JEDEC standard RS-397, 5.2.2.6.
- ⓐ Per JEDEC RS-397, 5.2.2.1.
- ⓑ Bottom side cooled.
- ⓓ Consult recommended mounting procedures.
- ⓔ Designs are available for "Current Source Inverter" applications, consult factory.
- ⓕ Reflects substantial derating necessary with single .08°C/W or .10°C/W sink.

*Reference element data model on page 458



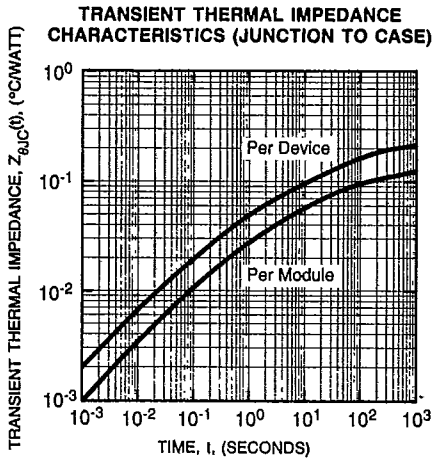
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Element Code Reference

Element Code	Element Type	Comparable Disc Device	Available Voltage Range	Coefficients for V_{TM} , V_F Model [ⓐ] [ⓑ]			
				A	B	C	D
AR7	33mm Diode	R7S0 __ __ 08XX00	2200-3000	.89605	-.08108	.00045	.02836
BR7	33mm Diode	R7S0 __ __ 12XX00	1200-2200	.63200	-.02192	.00013	.02065
CR7	33mm Diode	R7S0 __ __ 16XX00	800-1200	.45030	.02800	.00008	.01128
BT7	33mm SCR	T7S0 __ __ 6504DN	1400-2200	.74419	.00380	.000325	.01882
CT7	33mm SCR	T7S0 __ __ 7504DN	800-1600	.58729	.06654	.000416	.00060
AT8	33mm SCR	T820 __ __ 6003DH	2200-3000	1.02841	.13475	.001179	-.03631
BT8	38mm SCR	T820 __ __ 7503DH	1200-2200	.88287	-.07743	.00010	.03081
CT8	38mm SCR	T820 __ __ 9003DH	800-1400	1.08412	-.13881	-.00013	.03756

[ⓐ] V_{TM} , $V_F = A + B \times \ln(I) + C \times I + D \times \sqrt{I}$ (I = Amps Peak)
[ⓑ] Coefficients are for $T_j = 130^\circ\text{C}$, 50A through 3000A Peak





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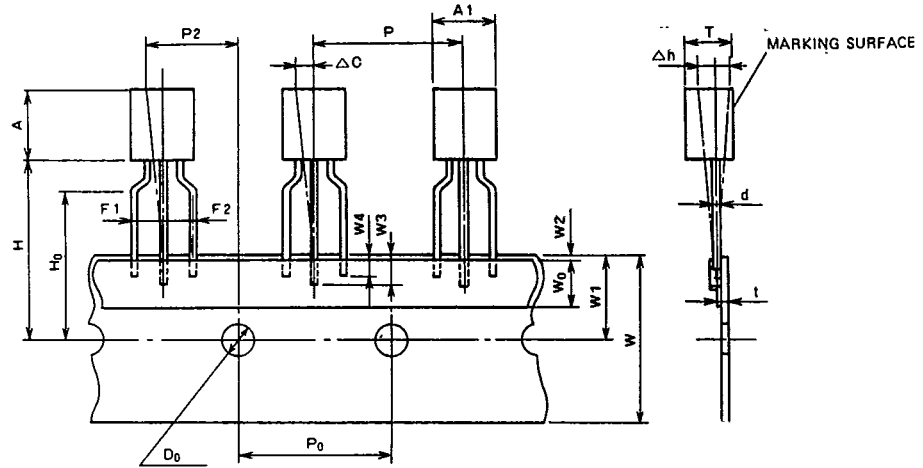
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Taping

STANDARD SPECIFICATIONS FOR TAPING OF MOLDED PACKAGE THYRISTORS AND TRIACS

TO-92 Package

Thyristor
CR02AM, CR03AM, CR04AM
Triac
BCR1AM



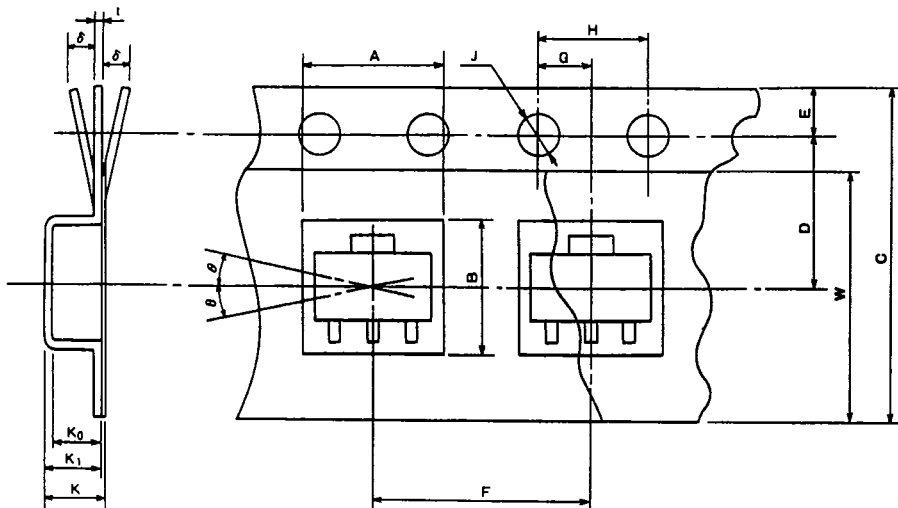
Taping dimensions

Description of symbol	Symbol	Dimensions (Unit:mm)	Remark
Product width	A1	5.0 MAX	
Product height	A	5.0 MAX	
Product thickness	T	3.7 MAX	
Lead wire diameter	d	0.6 MAX	
Sticker lead wire length (1)	W3	2.5 MIN	
Sticker lead wire length (2)	W4	2.0 MIN	
Pitch between products	P	12.7 ± 1.0	
Feed hole pitch	P ₀	12.7 ± 0.3	The cumulative pitch error is ± 1mm per 20 pitches.
Feed hole deviation (1)	P2	6.35 ± 1.3	
Distance between lead wires	F1, F2	2.5 ± 0.4	
Defective product (1)	Δh	0 ± 2.0	
Tape width	W	18.0 ± ^{1.0} / _{0.5}	
Sticker tape width	W ₀	6.0 ± 0.5	
Feed hole deviation (2)	W1	9.0 ± 0.5	
Sticker tape deviation	W2	0.5 MAX	
Position of product bottom surface	H	17.5 MIN	
Lynch height of lead wire	H ₀	16.0 ± 0.5	
Feed hole diameter	D ₀	4.0 ± 0.2	
Tape thickness	t	0.7 ± 0.2	
Defective product (2)	ΔC	0 ± 1.0	



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Powerex Semiconductor Data Book
 Taping



SOT-89 Package

Thyristor
 CR08AS

Taping dimensions

Description of symbol		Symbol	Dimensions/angles Unit:mm	Remark
Parts insertion	Height	A	5.0 ± 0.1	Cross-section of the surface 0.5mm above the inner bottom
	Width	B	4.6 ± 0.1	Cross-section of the surface 0.5mm above the inner bottom
Concave square hole	Depth	K ₀	1.8 ± 0.1	Inner space
	Pitch	F	8.0 ± 0.1	Cumulative error +0.1/-0.3 MAX/10 pitches
Round feed hole	Diameter	J	$\phi 1.5 \pm 0.05$	
	Pitch	H	4.0 ± 0.1	Cumulative error +0.1/-0.3 MAX/10 pitches
	Position	E	1.5 ± 0.1	Distance between the tape edge and the hole center
Distance between center lines	Vertical	G	2.0 ± 0.5	Center line of concave square hole and round feed hole
	Horizontal	D	5.65 ± 0.05	Center line of concave square hole and round feed hole
Cover tape	Width	W	$9.5 + 0.3/-0$	Thickness: 0.1 MAX
Carrier tape	Width	C	12 ± 0.2	Warp ± 0.3 MAX
	Thickness	t	0.3 ± 0.05	
	Package hole depth	K ₁	2.1 ± 0.1	
Device	Package dimensions	—	—	As shown in (e)
	Inclination	θ	30° MAX.	
Total Thickness		K	2.3 ± 0.1	Total thickness including cover and carrier tapes