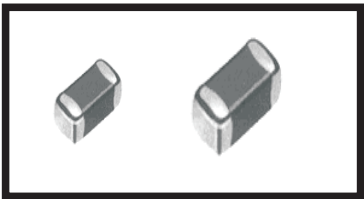


車規疊層片式壓敏電阻器

Automotive Grade Multilayer chip Varistor



- 特性FEATURES
- 多層獨石結構適合高密度安裝

Multilayer monolithic construction suitable for high density mounting

● 良好的殘壓比和電壓浪涌抑制能力強

Excellent clamping ratio and strong capability of voltage surge suppression

● 可靠性以AEC-Q200 Rev-D為依據

Qualification based on AEC-Q200 Rev-D
- 推薦應用Recommended Applications
- 汽車多媒體和無線連接系統、車身與舒適系統

Automotive multimedia,wireless connection system and body comfort system.

● 產品規格型號的表示方法 PART NUMBER IDENTIFICATION

APV

321611

E

240

P

K

T

①

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④

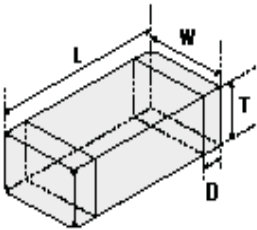
⑤

⑥

⑦

①		②		③		④		⑤		⑥		⑦	
產品代號 Product Code		規格尺寸(L × W × T) (mm) Dimensions		產品系列 Product Series		直流工作電壓 Working DC Voltage		端頭 Termination		誤差 Tolerance		包裝方式 Packaging Style	
APV	車規疊層片式 壓敏電阻器 Automotive Grade Multilayer chip Varistor	160808	1.6 × 0.8 × 0.8	E	高耐能型 High energy absorb type	240	24V	P	電鍍 Plated	K	±10%	T	編帶包裝 Tape & Reel
		201209	2.0 × 1.2 × 0.9							L	±15%		
		321611	3.2 × 1.6 × 1.1	S	高速型High speed type					M	±20%		
		322513	3.2 × 2.5 × 1.3										
		453215	4.5 × 3.2 × 1.5	G	通用型 General type								

● 外形尺寸 SHAPE AND DIMENSIONS



單位(Unit): mm/inch

Part Number	L	W	T	D
160808 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.8±0.2 (0.031±0.008)	0.3±0.2 (0.01±0.008)
201209 (0805)	2.0±0.2 (0.079±0.008)	1.2±0.2 (0.047±0.008)	0.9±0.2 (0.047±0.008)	0.5±0.3 (0.020±0.012)
321611 (1206)	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	1.1±0.2 (0.043±0.008)	0.5±0.3 (0.020±0.012)
322513 (1210)	3.2±0.2 (0.126±0.008)	2.5±0.2 (0.098±0.008)	1.3±0.2 (0.051±0.008)	0.5±0.3 (0.020±0.012)
453215 (1812)	4.5±0.2 (0.180±0.008)	3.2±0.2 (0.126±0.008)	1.5±0.2 (0.060±0.008)	0.5±0.3 (0.020±0.012)

● 通用系列 General Series

為各種IC提供浪涌電壓保護

I Protection from transient voltage noise in all kinds of IC

為電源I/O接口提供ESD、EFT及浪涌保護

I Protection from ESD, EFT and surge in power I/O port

1608 (0603) TYPE

1608 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	VB	Δ VB	Volts	Joules	Amps	pF
APV160808G140PKT	14	10	20	$\pm 10\%$	35	0.1	30	190
APV160808G160PKT	16	11.3	22	$\pm 10\%$	39	0.1	30	180
APV160808G180PKT	18	12.7	25	$\pm 10\%$	44	0.1	30	170
APV160808G220PKT	22	15.6	30	$\pm 10\%$	53	0.1	30	150
APV160808G240PKT	24	17	33	$\pm 10\%$	58	0.1	30	140
APV160808G260PKT	26	18.4	36	$\pm 10\%$	63	0.1	30	120
APV160808G300PKT	30	21.2	42	$\pm 10\%$	74	0.1	30	100

2012 (0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	VB	Δ VB	Volts	Joules	Amps	pF
APV201209G160PKT	16	11.3	22	$\pm 10\%$	39	0.1	35	190
APV201209G180PKT	18	12.7	25	$\pm 10\%$	44	0.1	35	180
APV201209G220PKT	22	15.6	30	$\pm 10\%$	53	0.1	35	175
APV201209G240PKT	24	17	33	$\pm 10\%$	58	0.1	35	170
APV201209G260PKT	26	18.4	36	$\pm 10\%$	63	0.1	35	165
APV201209G300PKT	30	21.2	42	$\pm 10\%$	74	0.1	35	150
APV201209G330PKT	33	23.3	45	$\pm 10\%$	79	0.1	35	120
APV201209G380PKT	38	27	51	$\pm 10\%$	90	0.1	35	110
APV201209G420PKT	42	30	56	$\pm 10\%$	99	0.1	35	100
APV201209G480PKT	48	34	62	$\pm 10\%$	110	0.1	35	80

3216(1206) TYPE

3216 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	VB	Δ VB	Volts	Joules	Amps	pF
APV321611G160PKT	16	11.3	22	$\pm 10\%$	39	0.1	35	300
APV321611G180PKT	18	12.7	25	$\pm 10\%$	44	0.1	35	270
APV321611G220PKT	22	15.6	30	$\pm 10\%$	53	0.1	35	250
APV321611G240PKT	24	17	33	$\pm 10\%$	58	0.1	35	230
APV321611G260PKT	26	18.4	36	$\pm 10\%$	63	0.1	35	220
APV321611G300PKT	30	21.2	42	$\pm 10\%$	74	0.1	35	200
APV321611G330PKT	33	23.3	45	$\pm 10\%$	79	0.1	35	180
APV321611G380PKT	38	27	51	$\pm 10\%$	90	0.1	35	160
APV321611G420PKT	42	30	56	$\pm 10\%$	99	0.1	35	150
APV321611G480PKT	48	34	62	$\pm 10\%$	110	0.1	35	120

車規疊層片式壓敏電阻器

Automotive Grade Multilayer chip Varistors

● 高耐能系列 HIGH ENERGY ABSORB SERIES

抑制各種感性負載切換或各種瞬間噪聲在電路板中產生的EFT和浪涌電壓。

Suppression of Inductive Switching or Other Transient Events Such as EFT and Surge Voltage at the Circuit Board Level.

2012 (0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	VB	ΔV_B	Volts	Joules	Amps	pF
APV201209E160PKT	16	11.3	22	$\pm 10\%$	39	0.3	120	380
APV201209E180PKT	18	12.7	25	$\pm 10\%$	44	0.3	100	360
APV201209E220PKT	22	15.6	30	$\pm 10\%$	53	0.3	100	320
APV201209E240PKT	24	17	33	$\pm 10\%$	58	0.3	100	300
APV201209E260PKT	26	18.4	36	$\pm 10\%$	63	0.3	100	280
APV201209E300PKT	30	21.2	42	$\pm 10\%$	74	0.3	100	260
APV201209E330PKT	33	23.3	45	$\pm 10\%$	79	0.3	100	230

3216(1206) TYPE

3216 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	VB	ΔV_B	Volts	Joules	Amps	pF
APV321611E160PKT	16	11.3	22	$\pm 10\%$	39	0.4	150	750
APV321611E180PKT	18	12.7	25	$\pm 10\%$	44	0.4	150	700
APV321611E220PKT	22	15.6	30	$\pm 10\%$	53	0.4	150	600
APV321611E240PKT	24	17	33	$\pm 10\%$	58	0.4	150	550
APV321611E260PKT	26	18.4	36	$\pm 10\%$	63	0.4	120	500
APV321611E300PKT	30	21.2	42	$\pm 10\%$	74	0.4	120	450
APV321611E330PKT	33	23.3	45	$\pm 10\%$	79	0.4	120	400
APV321611E380PKT	38	27	51	$\pm 10\%$	90	0.4	120	310
APV321611E420PKT	42	30	56	$\pm 10\%$	99	0.4	120	260
APV321611E480PKT	48	34	62	$\pm 10\%$	110	0.4	120	240

3225(1210) TYPE

3225 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	VB	ΔV_B	Volts	Joules	Amps	pF
APV322513E180PKT	18	12.7	25	$\pm 10\%$	44	1.5	300	1200
APV322513E220PKT	22	15.6	30	$\pm 10\%$	53	1.5	300	1100
APV322513E240PKT	24	17	33	$\pm 10\%$	58	1.5	300	1050
APV322513E260PKT	26	18.4	36	$\pm 10\%$	63	1.5	280	1000
APV322513E300PKT	30	21.2	42	$\pm 10\%$	74	1.5	280	800
APV322513E330PKT	33	23.3	45	$\pm 10\%$	79	1.5	280	700
APV322513E380PKT	38	27	51	$\pm 10\%$	90	1.5	280	650
APV322513E420PKT	42	30	56	$\pm 10\%$	99	1.5	280	580
APV322513E480PKT	48	34	62	$\pm 10\%$	110	1.5	280	510

4532(1812) TYPE

4532 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC	VB	Δ VB	Volts	Joules	Amps	pF
	Volts	Volts						
APV453215E180PKT	18	12.7	25	$\pm 10\%$	44	2.5	500	1800
APV453215E220PKT	22	15.6	30	$\pm 10\%$	53	2.5	500	1600
APV453215E240PKT	24	17	33	$\pm 10\%$	58	2.5	500	1500
APV453215E260PKT	26	18.4	36	$\pm 10\%$	63	2.5	500	1300
APV453215E300PKT	30	21.2	42	$\pm 10\%$	74	2.5	500	1200
APV453215E330PKT	33	23.3	45	$\pm 10\%$	79	2.5	500	1100
APV453215E380PKT	38	27	51	$\pm 10\%$	90	2.5	500	1050
APV453215E420PKT	42	30	56	$\pm 10\%$	99	2.5	500	1000
APV453215E480PKT	48	34	62	$\pm 10\%$	110	2.5	500	900

• 可靠性測試 RELIABILITY TESTING

序號 NO.	項目 Item	詳細說明Specified value	試驗方法Test methods
1	工作溫度範圍 Operating temperature range	-55 to +125℃	
2	貯存溫度範圍 Storage temperature range	-10 to +40℃	
3	高溫存儲 High Temperature Exposure (Storage)	無可見損傷; 壓敏電壓: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$.	溫度150℃; 不通電; 持續時間1000h; 周期測試250h, 500h; 試驗結束後 (24±4)h 內進行電性能測量。 Temperature 150℃; Unpowered; Duration 1000h; Examination at 250h ,500h and 1000h; Measurement at (24±4) hours after test conclusion.
4	溫度循環 Temperature Cycling	無可見損傷; 壓敏電壓: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$.	高溫125℃; 低溫-40℃; 高、低溫下暴露時間各30分鐘; 轉換時間≤1min; 循環次數1000次。 試驗結束後24±4小時內進行測試。 High Temperature +125℃; low temperature -40℃; Duration at each temperature 30 min; Transition time ≤1 min; Severity 1000 cycles; Measurement at 24±4 hours after test Conclusion.
5	偏高濕度(高溫高濕) Biased Humidity	無可見損傷; 壓敏電壓: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$.	溫度: 85℃ 濕度: 85% 施加直流工作電壓 持續時間: 1000 h 周期測量: 250h, 500h; 試驗結束後24±4小時內進行測試。 Temperature: 85℃; Relative humidity: 85%; Bias at Working Voltage Vdc; Duration:1000 h; Examination at 250h ,500h and 1000h; Measurement at 24±4 hours after test conclusion.
6	工作壽命 Operational Life	無可見損傷; 壓敏電壓: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V_{1mA}/V_{1mA} \leq \pm 10\%$.	測試溫度: 125℃; 施加直流工作電壓; 持續時間: 1000小時; 周期測量: 250h, 500h; 試驗結束後24±4小時內進行測試。 Test temp: 125℃; Bias at Working Voltage Vdc; Duration:1000 h; Examination at 250h ,500h and 1000h; Measurement at 24±4 hours after test conclusion.
7	機械衝擊 Mechanical Shock	無可見損傷; 壓敏電壓: $\Delta V_{1mA}/V_{1mA} \leq \pm 5\%$. No Visible damage; varistor voltage: $\Delta V_{1mA}/V_{1mA} \leq \pm 5\%$.	正半弦波; 峰值加速度1500g; 脈衝持續時間0.5ms; 三軸六向各 3 次, 共 18 次。 Half sine wave; Peak value 1500g; Normal duration 0.5 ms; Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen (18 shocks).

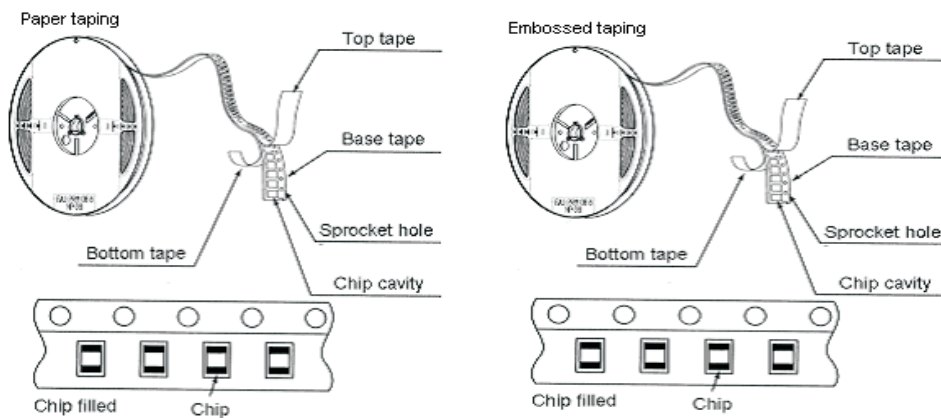
序號 NO.	項目 Item	詳細說明Specified value	試驗方法Test methods
8	振動 Vibration	無可見損傷; 壓敏電壓: $\Delta V1mA/V1mA \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V1mA/V1mA \leq \pm 10\%$.	頻率10Hz~2000Hz; 加速度5克; 一個循環20分鐘; X、Y、Z三個方向每個方向12個循環,共36個循環; The entire frequency range of 10 to 2000 Hz and return to 10 Hz shall be traversed in 20 minutes. This cycle shall be preformed 12 time in each of three mutually perpendicular directions (total of 36 times), so that the motion shall be applied for a total period of approximately 12 hours. Peak value 5g.
9	耐焊接熱 Resistance to Soldering Heat	無可見損傷; 壓敏電壓: $\Delta V1mA/V1mA \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V1mA/V1mA \leq \pm 10\%$.	焊槽法; 溫度(260±5)℃; 浸漬時間 (10±1) s. Solder bath; Temperature (260±5)℃; Immersion timer (10±1) seconds.
10	靜電放電 ESD	無可見損傷; 壓敏電壓: $\Delta V1mA/V1mA \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V1mA/V1mA \leq \pm 10\%$.	接觸放電; 放電電壓: 8000V; 每個樣品每個電極承受兩次放電,正、負極性各1次 Direct contact discharge; Indicated voltage: 8000V; Two discharges shall be applied to each PUT within a sample group and at each stress voltage level, one with a positive polarity and one with a negative polarity.
11	可焊性 Solderability	無可見損傷; 電極面95%以上覆蓋新的焊料。 95% or more of electrode area shall be coated by new solder.	焊槽法; 溫度(245±5)℃; 浸漬時間 (3±0.3) s. Solder bath; Temperature (245±5)℃; Immersion timer (3±0.3) seconds.
12	彎曲 Board flex	無可見損傷; 壓敏電壓: $\Delta V1mA/V1mA \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V1mA/V1mA \leq \pm 10\%$.	試樣安裝在厚1.6mm環氧玻璃布板上,以1mm/s的速度向下彎曲2mm; 維持時間60s±5s。 The testing samples shall be mounted on a 100mm×40mm FR4 PCB board, which is 1.6mm±0.2mm thick; Bending shall be applied to the 2.0mm with 1.0mm/sec; Duration: 60±5s.
13	端子強度 Terminal Strength (SMD)	無可見損傷; 壓敏電壓: $\Delta V1mA/V1mA \leq \pm 10\%$. No Visible damage; varistor voltage: $\Delta V1mA/V1mA \leq \pm 10\%$.	試樣安裝在環氧玻璃布板上,施加17.7N的力到試樣的側面,保持60s±1s。 The testing samples shall be mounted on the testing boards, apply a 17.7N(1.8kg) force to the side of a device being tested. Duration: 60s±1s. 

• 包裝 PACKAGING

• 標準包裝數量STANDAE QUANTITY

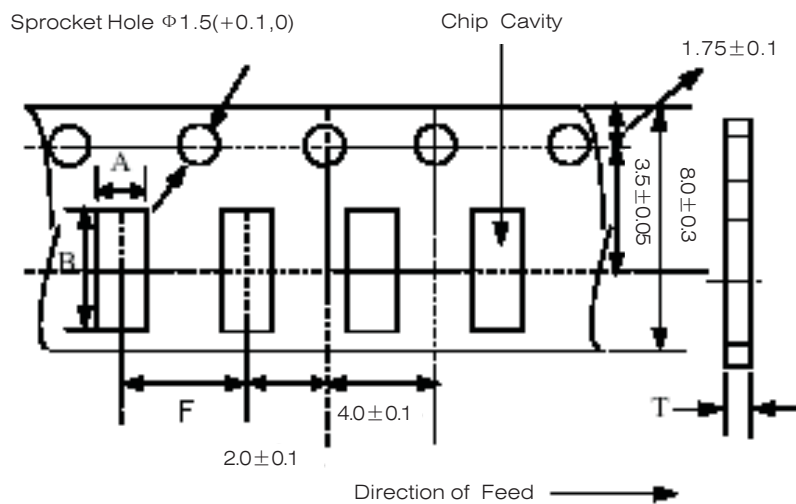
TYPE	160808	201209	321611	322513	453215
Quantity (PCS)	4000	4000	3000	3000	3000

• 編帶圖紙 TAPING DRAWINGS



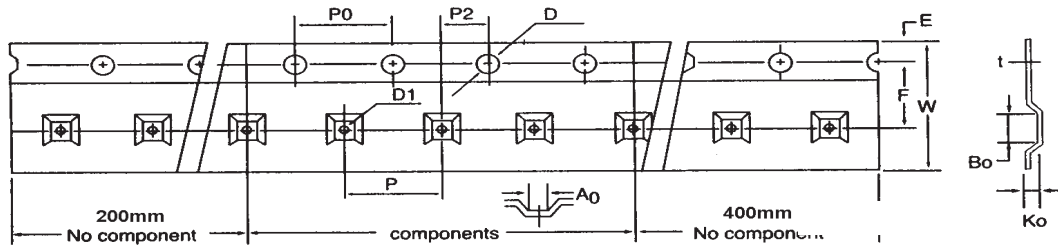
• 編帶尺寸TAPING DIMENSIONS (UNIT: mm)

· 紙載帶 Paper carrier



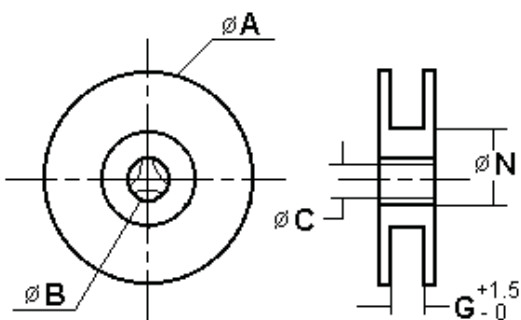
Part NO.	A	B	F	T
160808	1.0±0.2	1.8±0.2	4.0±0.2	1.1max

• 塑料膠帶 Embossed Carrier



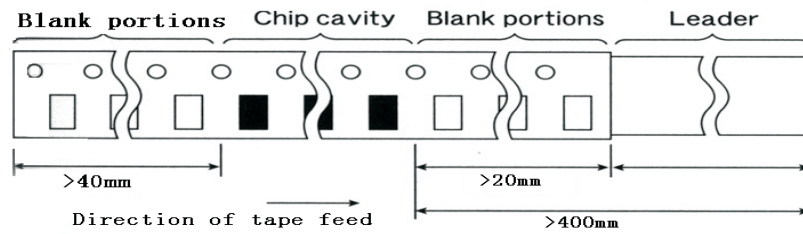
	4532	3225	3216	2012
W	12.0+/-0.2	8.1+/-0.2	8.1+/-0.2	8.1+/-0.2
P	8.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10
E	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10
F	5.50+/-0.10	3.50+/-0.10	3.50+/-0.10	3.50+/-0.10
D	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05
D1	1.50 ^{+0.25} ₋₀	1.50 ^{+0.25} ₋₀	1.50 ^{+0.25} ₋₀	1.50 ^{+0.25} ₋₀
P ₀	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10
P ₀ 10	40.0+/-0.20	40.0+/-0.20	40.0+/-0.20	40.0+/-0.20
P2	2.0+/-0.05	2.0+/-0.05	2.0+/-0.05	2.0+/-0.05
A ₀	3.66+/-0.10	2.80+/-0.10	1.90+/-0.10	1.52+/-0.10
B ₀	4.95+/-0.10	3.50+/-0.10	3.51+/-0.10	2.41+/-0.10
t	0.23+/-0.10	0.23+/-0.10	0.23+/-0.10	0.23+/-0.10
Ko	1.74+/-0.10	1.55+/-0.10	1.27+/-0.10	1.35+/-0.10

• 卷盤尺寸 REEL DIMENSIONS (UNIT: mm)



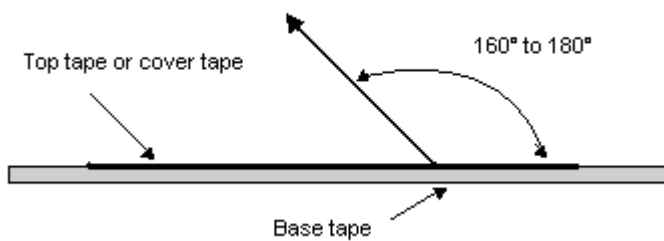
TYPE	REEL	A	B	C	N	G
1608-3225	CF-8	178±2.0	22.0±2.0	12.5±1.5	57±2.0	8
4532	CF-12	330±2.0	22.0±2.0	12.5±1.5	98±2.0	12

- 導帶與空長度 LEADER AND BLANK PORTION



- 剝離力：沿箭頭方向要求 $0.1\sim0.7\text{N}$

PEELING OFF FORCE : 0.05 to 0.7N in the direction show below.



■ 車規系列產品使用注意事項

Cautions for using the automotive products:

- 本產品目錄內容為2018年6月更新的內容，因產品更新或優化，有可能內容有發生更改，所以請務必在使用前先確認產品的最新信息。并對產品信息加以確認后再評估使用。
- 本產品目錄中所記錄的產品推薦用于汽車多媒體和無線連接系統、車身舒適系統，如果没有特別說明不能用于汽車動力系統，安全管理系統等安全性和可靠性要求較高的設備系統。
- 未按我司要求進行產品使用，所造成的設備損壞等損失，我司不承擔任何責任，敬請知悉。
- The catalog is updated on June,2018,Some contents are changed as the products are updated or optimized,so please evaluate and confirm the details before using them.
- The products listed in the catalog are recommended for automotive multimedia,wireless connection system and vehicle body system,without special instructions,the products can't used for automotive power system,safety management system or other equipment systems with high requirements for safety and reliability.
- Please note we shall not take any responsibility for any loss caused by the failure to use the products according to our requiremengts.