



PHI-CON

1 W SMD DC-DC Converter P1HS_C-Series

- Dual output
- Efficiency up to 85 %
- Up to 1500 V_{DC} isolation
- MTBF > 3.5 Mio. h at 25 °C
- -40...105 °C operating temperature range
- Continuous short circuit protection



Model guide

Type	Input voltage		Output voltage [V _{DC}]	Input current		Output current		Efficiency [%] typ.	Capacitive load [μF] max.
	nominal [V _{DC}]	range [V _{DC}]		no load [mA] typ.	full load [mA] max.	[mA] min.	[mA] max.		
P1HS0505CD	5	4.5..5.5	±5	5	257	±10	±100	82	2 x 1200
P1HS0509CD	5	4.5..5.5	±9	12	254	±6	±56	83	2 x 470
P1HS0512CD	5	4.5..5.5	±12	12	254	±5	±42	83	2 x 220
P1HS0515CD	5	4.5..5.5	±15	18	254	±4	±34	83	2 x 220
P1HS0524CD	5	4.5..5.5	±24	18	254	±3	±21	85	2 x 100
P1HS1205CD	12	10.8..13.2	±5	8	107	±10	±100	82	2 x 1200
P1HS1209CD	12	10.8..13.2	±9	8	106	±6	±56	83	2 x 470
P1HS1212CD	12	10.8..13.2	±12	8	106	±5	±42	83	2 x 220
P1HS1215CD	12	10.8..13.2	±15	8	106	±4	±34	83	2 x 220
P1HS1224CD	12	10.8..13.2	±24	8	103	±3	±21	85	2 x 100
P1HS1515CD	15	13.5..16.5	±15	8	85	±4	±34	83	2 x 220
P1HS2405CD	24	21.6..26.4	±5	8	55	±10	±100	82	2 x 1200
P1HS2409CD	24	21.6..26.4	±9	8	55	±6	±56	83	2 x 470
P1HS2412CD	24	21.6..26.4	±12	8	55	±5	±42	83	2 x 220
P1HS2415CD	24	21.6..26.4	±15	8	55	±4	±34	83	2 x 220
P1HS2424CD	24	21.6..26.4	±24	8	53	±3	±21	85	2 x 100

Specifications

Input	
Filter	Capacitors
Reflected ripple current	15 mAp-p, typ. (see Figure 1)
Surge voltage	P1HS05xxCD -0.7 ... 9 V _{DC} , duration ≤ 1 s
	P1HS12xxCD -0.7 ... 18 V _{DC} , duration ≤ 1 s
	P1HS15xxCD -0.7 ... 21 V _{DC} , duration ≤ 1 s
	P1HS24xxCD -0.7 ... 30 V _{DC} , duration ≤ 1 s
Input / output:	
DC-Isolation voltage tested for 60 s @ leakage current < 1 mA	1.5 kV _{DC}
Isolation Resistance @ 500 V _{DC}	≥ 10 ⁹ Ω
Capacitance @ 100 kHz, 0.1 V	20 pF, typ.
Output	
Line deviation @ 1 % V _{in} change	≤ ± 1.2 %
Output voltage deviation @ 10 % ... 100 % load change	
P1HSxx05CD	5 %, typ. ≤15 %
P1HSxx09CD	3 %, typ. ≤10 %
P1HSxx12CD	3 %, typ. ≤10 %
P1HSxx15CD	3 %, typ. ≤10 %
P1HSxx24CD	2 %, typ. ≤10 %
Output ripple and noise, BW 20 MHz	P1HSxx24CD: ≤ 100 mVp-p All others: ≤ 75 mVp-p (see Figure 2)
Temperature coefficient	0.02 % / °C, max., at full load
Short circuit protection	Continuous, hiccup auto restart

General	
Safety Standard	EN-, IEC-, UL 62368-1
Switching frequency	265 kHz, typ.
Environmental	
CE	EN 55032, CISPR 32 Class B (see Figure 4)
RE	EN 55032, CISPR 32 Class B (see Figure 4)
ESD	EN -, IEC 61000-4-2 Air ± 8 kV perf. criteria B Contact ± 4 kV perf. criteria B
Operating ambient temperature	-40..105 °C, see derating diagram
Storage temperature	-55..125 °C
Case temperature rise at full load	25 °C, typ.
Humidity	≤ 95 %, non condensing
Cooling	Free air convection, 30...65 LFM
Moisture sensitivity level	MSL 1
IPC/JEDEC J-STD-020D.1	
Physical	
Package material	Black plastic, UL94 V-0 rated
Dimensions	11.4 x 15.24 x 7.25 mm
Weight	1.4 g
Reliability, MTBF (MIL-HDBK-217 @ 25 °C)	3.5 Mio. h
Absolute maximum ratings	
Reflow soldering temperature (IPC / JEDEC J-STD-020D.1)	≤ 245 °C, Peak ≤ 10 s 217 °C, duration ≤ 60 s See reflow soldering Profile

Note:

1. Unless otherwise noted, all specifications are measured at Ta 25 °C, humidity < 75 %, nominal input voltage and rated output load.
2. Operation under minimum load will not damage the converter. However, they may not meet all specifications.
3. Maximum capacitive load is specified at nominal input voltage and full load.
4. It is not recommended to increase the output power capability by connecting two or more converters in parallel.
5. To ensure this module operate efficiently and reliably, the minimum output load could not be less than 10 % of the full load. If the actual output load current is very small, please connect a resistor or Z-diode parallel to the output to increase the load.

Part designation structure													
Output power		Series designation	Mounting technology		Input voltage		Output voltage		Revision	Output configuration		Packing	
P1	1 W	H	S	SMT	05	5 V	05	5 V	C	D	Dual	blanc	Tube
					12	12 V	09	9 V				TR	Reel
					15	15 V	12	12 V					
					24	24 V	15	15 V					
							24	24 V					

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Figure 1 Test circuit for reflected ripple input current

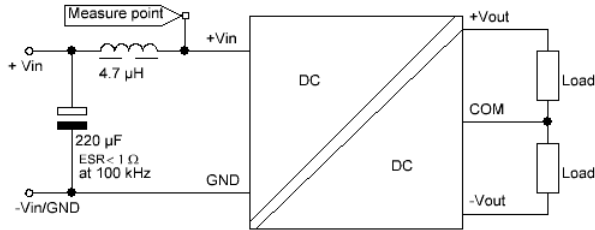


Figure 2 Test circuit for ripple & noise output voltage

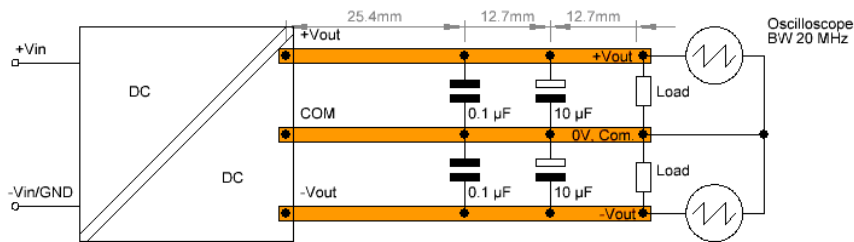


Figure 3 Typical application circuit

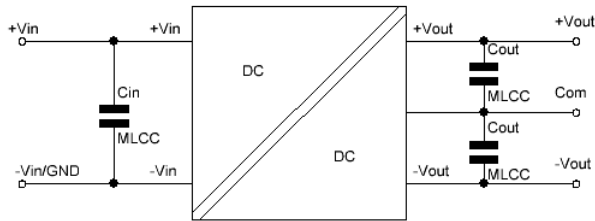


Table A for Figure 3

Type Vin type	Cin		Type Vout type	Cout (2 pcs)	
	[µF]	[V]		[µF]	[V]
P1HS05xxCD	4.7	25	P1HSxx05CD	4.7	16
P1HS12xxCD	2.2	25	P1HSxx09CD	1	16
P1HS15xxCD	2.2	25	P1HSxx12CD	1	25
P1HS24xxCD	1	50	P1HSxx15CD	0.47	25
			P1HSxx24CD	0.47	50

Figure 4 Test circuit to meet EMC EN 55032 Class B

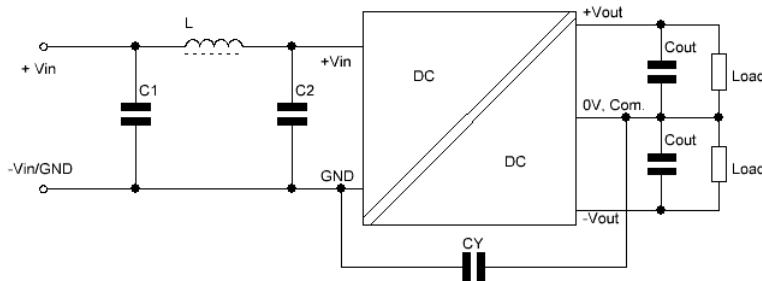


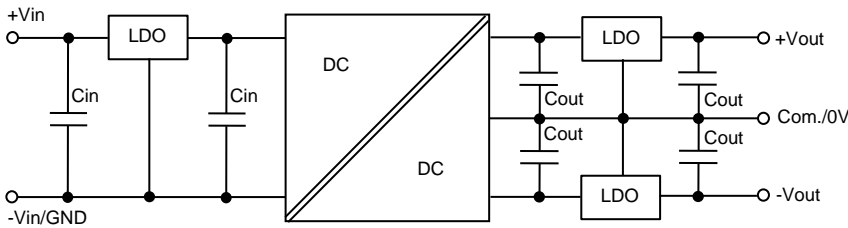
Table to Figure 4

C1, C2		L	CY		Cout
[µF]	[V]		[µH]	[pF]	
4.7	25	6.8	270	2	See table A

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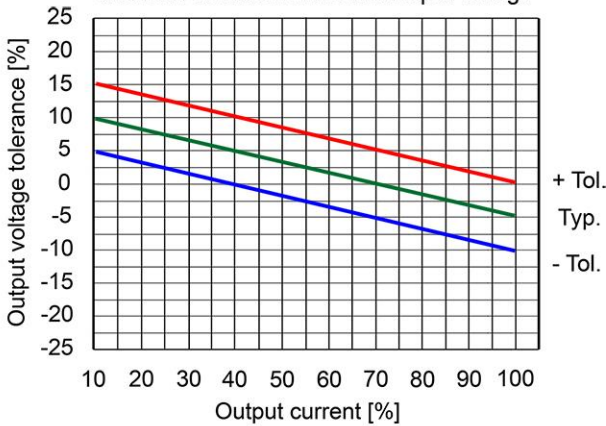


Application circuit for input protection and output regulation

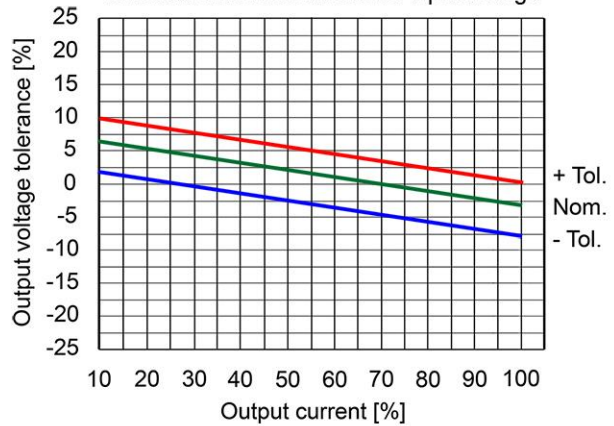


The simplest method for output voltage regulation, over voltage protection, over current protection and filtering are over temperature protected linear voltage regulator.

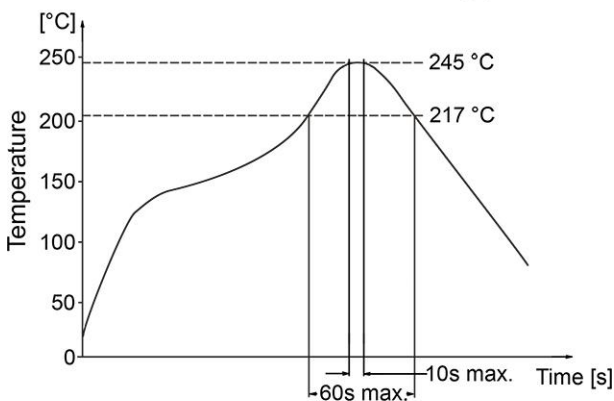
P1HSxx05CD Output voltage tolerance and load deviation at nominal input voltage



All others output voltage tolerance and load deviation at nominal input voltage

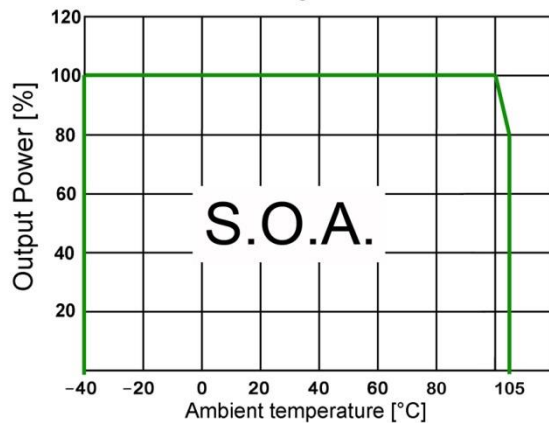


Recommended reflow soldering profile

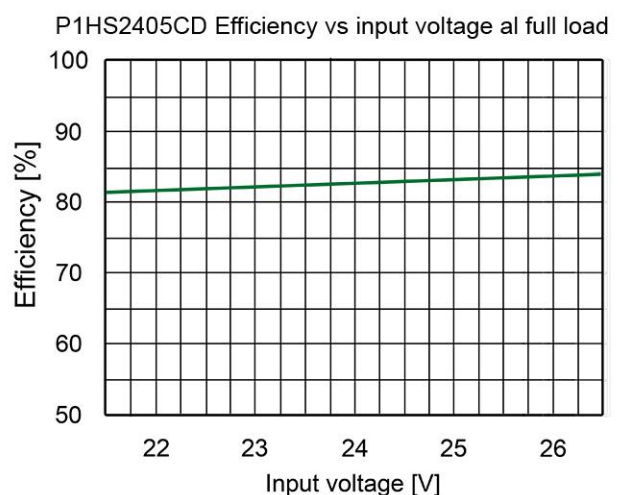
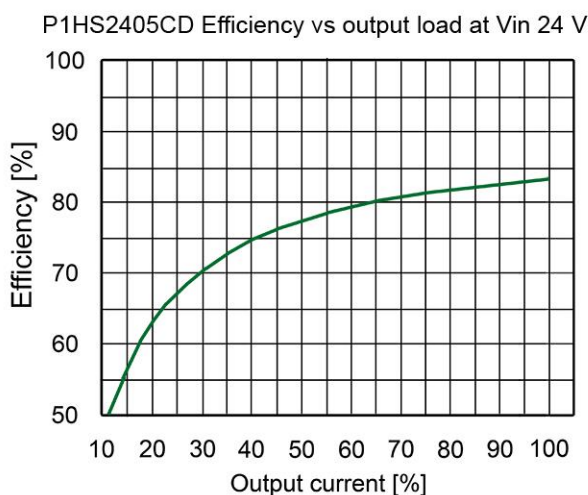
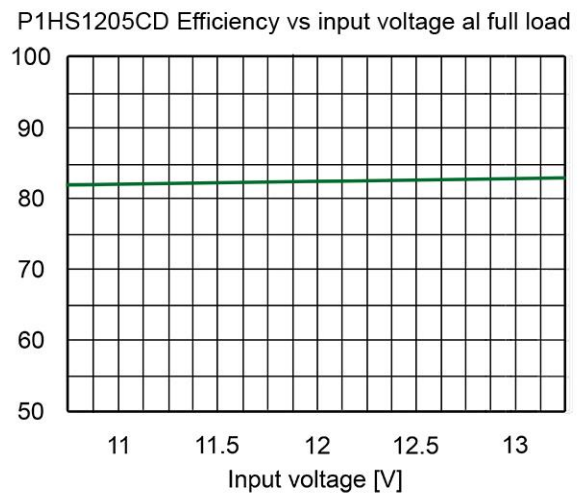
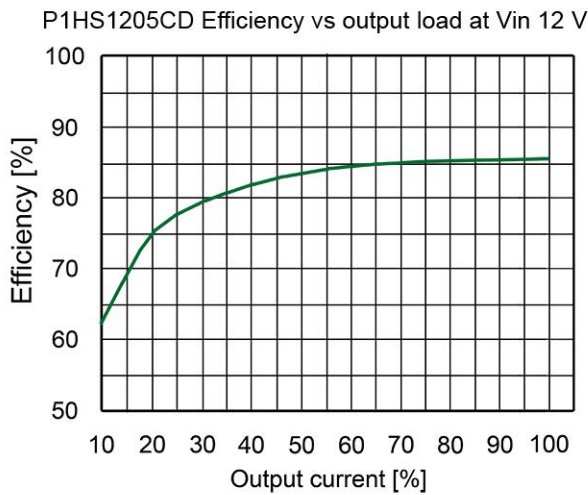
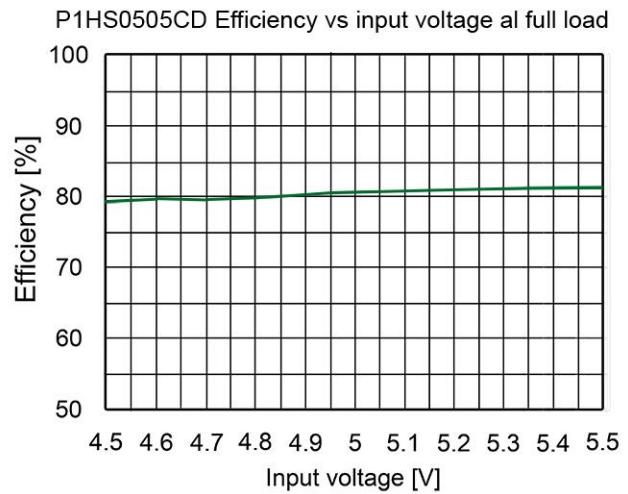
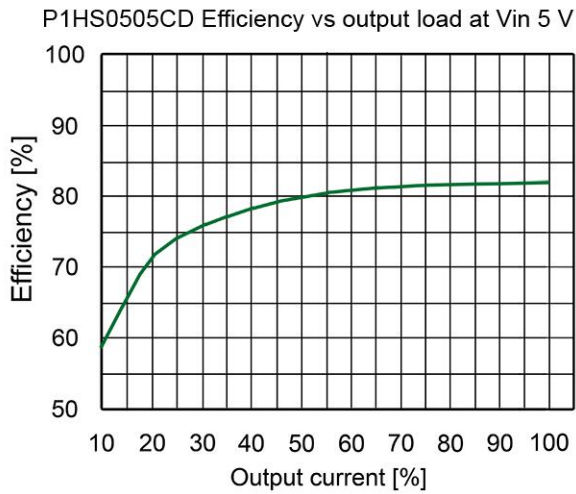


This curve applies only to hot air reflow soldering.

Derating Curve



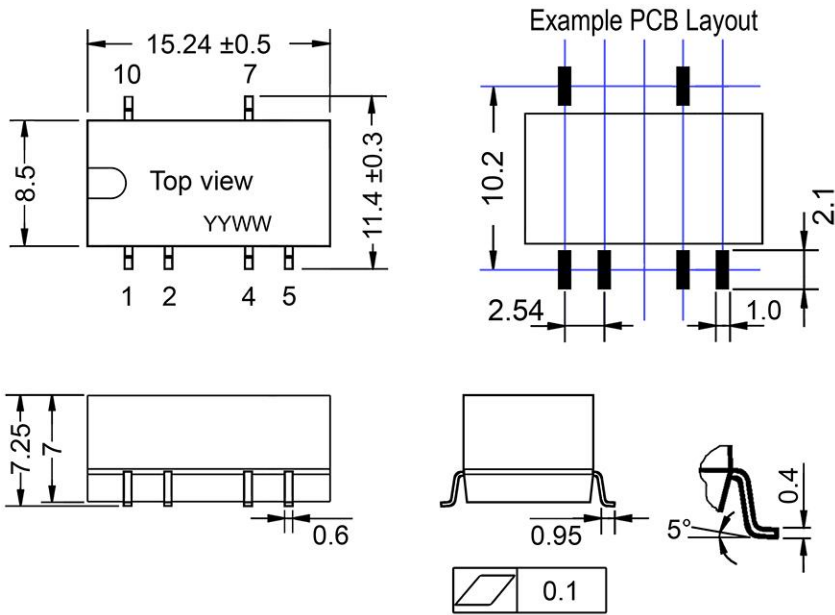
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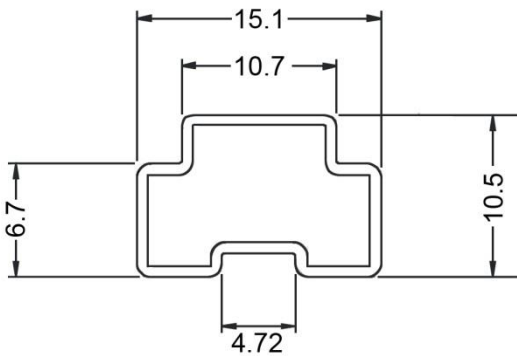
Mechanical dimensions



Lead	Function
1	- Vinput/GND
2	+ Vinput
3	No lead
4	0V / com.
5	- Voutput
6	No lead
7	+ Voutput
8	No lead
9	No lead
10	Not connected

Note:
 Dimensions unit: mm
 Lead tolerances: ± 0.1 mm
 General tolerances: ± 0.25 mm

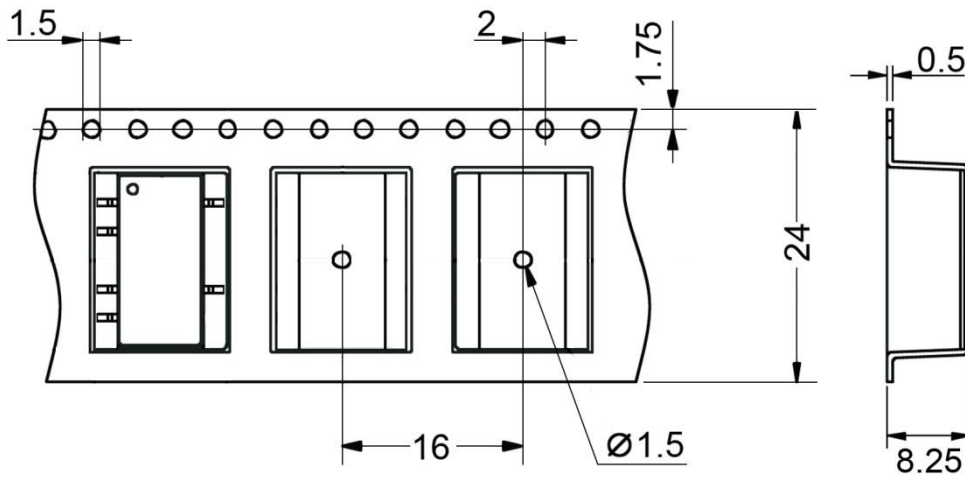
Tube dimensions:



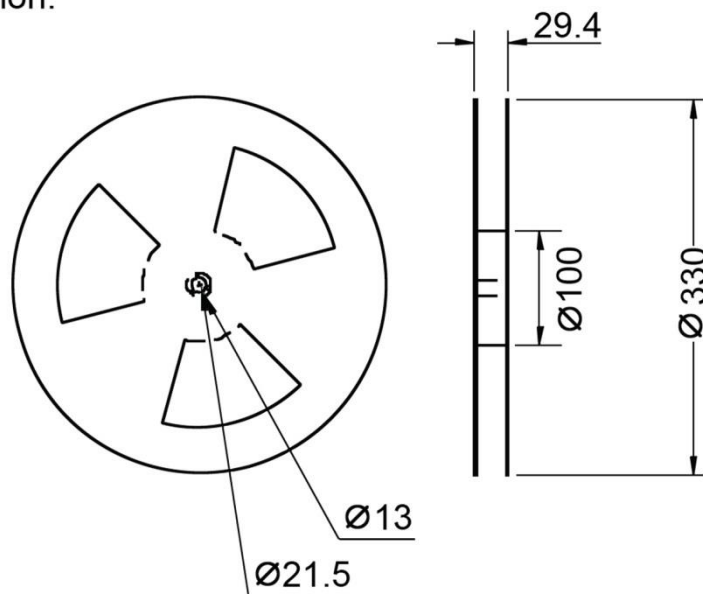
Note:
 Dimensions unit: mm
 Tolerances: ± 0.5 mm
 Quantity per short tube 220 mm: 13 pieces
 Quantity per long tube 530 mm: 33 pieces

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Tape dimension:



Reel dimension:



Quantity per reel: 500 pieces

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