



# DATASHEET

Datasheet T4078 0A V5  
DATE: 30-Jul-19

TDK'S PRODUCT NAME

MMICT4078-0A-908

TDK Corporation  
Sales

Electronic Components Sales &  
Marketing Group

Engineering

TDK ELECTRONICS AG  
TEG MEMS

Sales Manager	Sales

Engineering Manager	Superior	Engineering Person in Charge
A. Leidl	H. Hayashi	M. Winter



## Features:

- Surface Mounted Technology (SMT)
- Reflow soldering up to 260 °C
- RoHS compatible, Ni/Au-plated terminals suited for lead free soldering
- Size of 3.35 × 2.5 mm<sup>2</sup>
- Approximate weight of 19 mg
- Sound hole on bottom side
- Balanced operation
- High performance mode (HM) and low power mode (LM)
- Very high signal to noise ratio of 66 dB(A)
- Wide dynamic range
- Positive polarity

## Applications:

- Microphone designed for mobile phones, headsets, PDAs, notebooks and cameras

Rev.	Date	Revised by	Revision
1	17-Apr-18	A. Schober	Initial issue
2	2-May-18	A. Schober	Mechanical specification updated
3	26-Sep-18	A. Schober	TDK product name and ordering code changed, electrical and mechanical specification updated, recommended solder stencil layout updated
4	5-Feb-19	A. Schober	Product marking updated
5	30-Jul-19	A. Schober	Chapter 5 updated, Chapter 7 added

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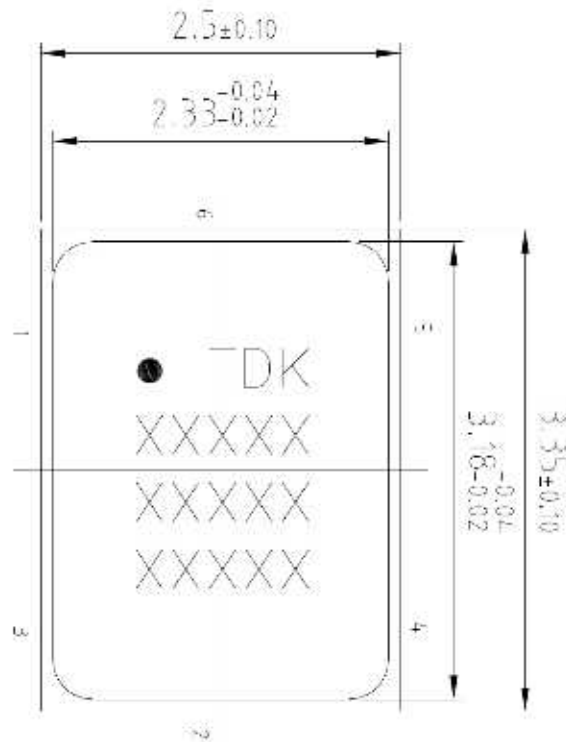
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## 1 General description

The T4078 is an analog, omnidirectional MEMS microphone with internal pre-amplifier. It has positive polarity and balanced output.

## 2 Marking



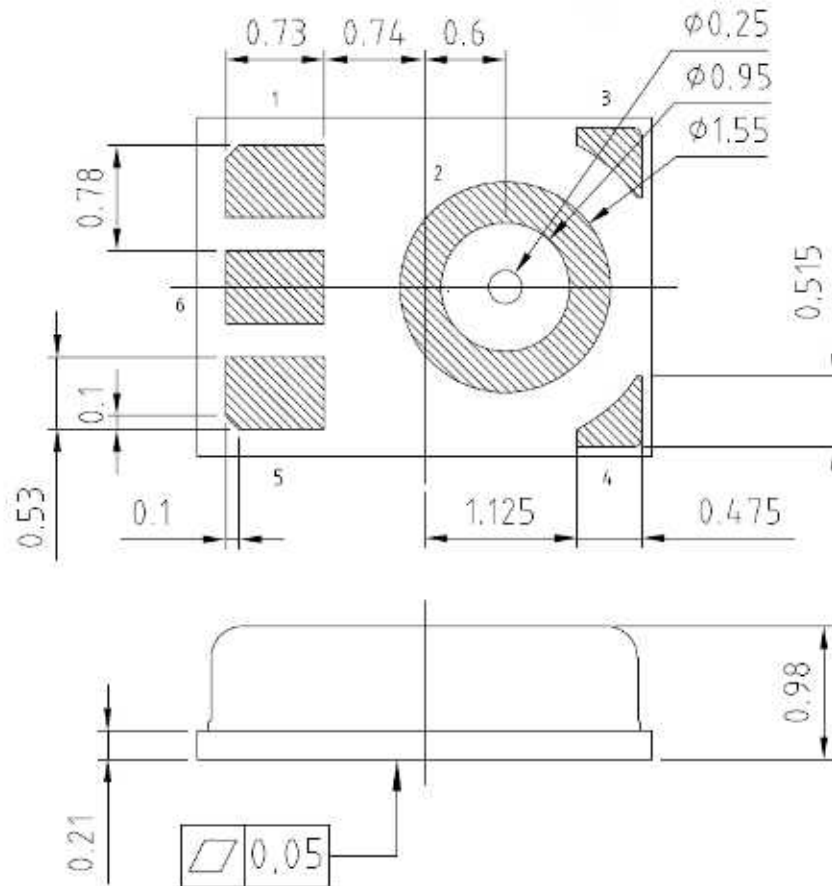
Character Area:

<b>1<sup>st</sup> row:</b>	Pin 1 mark	Blank	T	D	K
	Type and Revision (see below table)				
<b>Example:</b>	E	4	0	7	8
<b>3<sup>rd</sup> row:</b>	Blank	Production ID (4 digit)			
<b>Example:</b>		4	2	2	6
<b>4<sup>th</sup> row:</b>	Production ID (5 digit)				
<b>Example:</b>	A	0	G	5	9

Production status	Product marking	Example
Engineering Sample	"E" + Type	E4078
MP release	Type	4078
Product change (PCN)	Type + PCN revision	40781

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### 3 Mechanical specification



Pin	Name	Function
1	OUTP	balanced output +
2	GND	ground
3,4	KOA	keep out area, no structure on PCB recommended
5	V <sub>DD</sub>	power
6	OUTN	balanced output -

Item	Nominal	Tolerance
Length	3.35	$\pm 0.1$
Width	2.5	$\pm 0.1$
Height	0.98	$\pm 0.1$

Note: All dimensions in mm unless otherwise stated

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## 4 Electrical specification

### 4.1 Electrical characteristics

Ambient temperature of test conditions:

$T_A = 25\text{ }^\circ\text{C}$

Output load:

$Z_L = 200\text{ k}\Omega$

Supply voltage:

$V_{DD} = 2.7\text{V}$  if not otherwise noted

All voltages refer to ground.

		Min.	Typ.	Max.	Unit	Note or condition
Supply voltage	Vdd	2.3	2.7	3.0	V	High performance mode (HM)
		1.52	1.8	1.89	V	Low power mode (LM)
Sensitivity 1 kHz	$S_{1\text{ kHz}}$	-39	-38	-37	dBV/Pa	HM, 94 dB SPL
		-39	-38	-37	dBV/Pa	LM, 94 dB SPL
Sensitivity settling time		-	-	30	ms	Within +/- 0.5 dB of final sensitivity after power-on <sup>2)</sup>
Signal to noise ratio	SNR	-	66	-	dB(A)	HM, A-weighted
		-	64.5	-	dB(A)	LM, A-weighted
Total harmonic distortion	THD	-	-	0.2	%	HM, 94 dB SPL, 1 kHz
		-	-	0.2	%	LM, 94 dB SPL, 1 kHz
		-	0.5	0.85	%	HM, 121 dB SPL, 1 kHz
		-	0.5	1	%	LM, 121 dB SPL, 1 kHz
		-	1	4	%	HM, 130 dB SPL, 1 kHz
Acoustic Overload Point	AOP	-	135	-	dB SPL	HM, 10% THD, 1kHz <sup>2)</sup>
		-	128	-	dB SPL	LM, 10% THD, 1kHz <sup>2)</sup>
Power supply rejection ratio	PSRR <sup>1)</sup>	80	90	-	dB	HM; 1 kHz sine wave; 200 mV <sub>pp</sub>
		65	75	-	dB	LM; 1 kHz sine wave; 200 mV <sub>pp</sub>
Current consumption	I <sub>cc</sub>	-	-	250	$\mu\text{A}$	HM
		-	-	85	$\mu\text{A}$	LM
Output impedance		-	250	-	$\Omega$	HM, OUTP/OUTN to GND, 1kHz
		-	300	-	$\Omega$	LM, OUTP/OUTN to GND, 1kHz

<sup>1)</sup>  $\text{PSRR} = 20 \cdot \log \frac{V_{\text{Disturb}}}{V_{\text{OUT}}}$ , <sup>2)</sup> verified by design

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## 5 Absolute maximum ratings

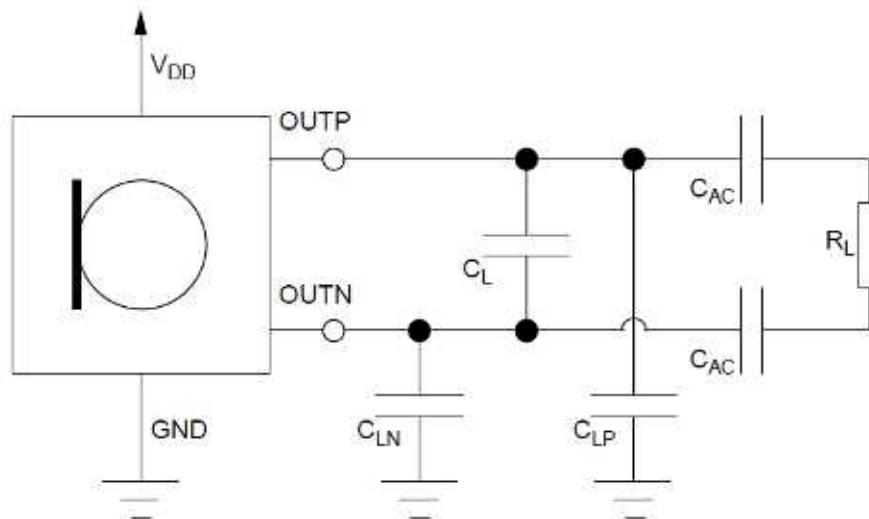
		Min.	Max.	Unit	Note or condition
Operable temperature range	T	-40	+105	°C	
Storage temperature range	T <sub>STG</sub>	-40	+125	°C	
	T <sub>STGT</sub>	0	+60	°C	stored in tape
Operable Power supply voltage	V <sub>DD</sub>	1.52	3.60	V	
ESD capability MM	V <sub>ESD MM</sub>	–	200 <sup>1)</sup>	V	Any pin
ESD capability HBM	V <sub>ESD HBM</sub>	–	2000 <sup>2)</sup>	V	Any pin
Mechanical Shock		–	10,000	g	

<sup>1)</sup> According to JESD22-A115A.

<sup>2)</sup> According to JESD22-A114E.

Stress above those listed as Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to the absolute maximum ratings conditions for extended periods may affect device reliability.

## 6 Application example

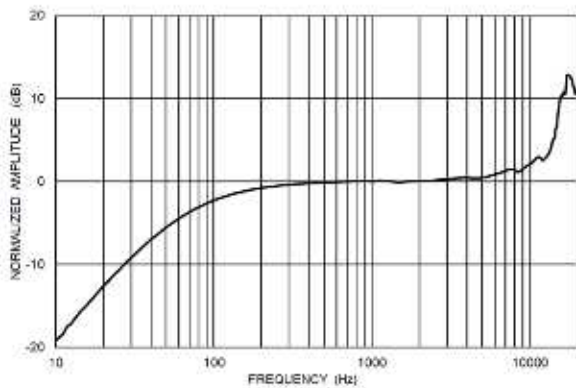


C<sub>LN</sub>, C<sub>LP</sub>, C<sub>L</sub>: Optional EMI capacitors; maximum value 150pF.

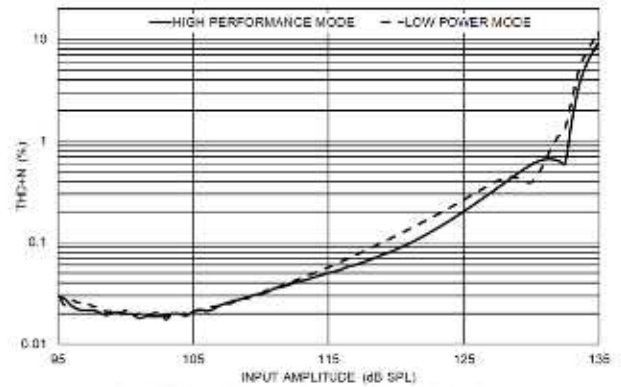
R<sub>L</sub>: Output load impedance; minimum value 25 kΩ

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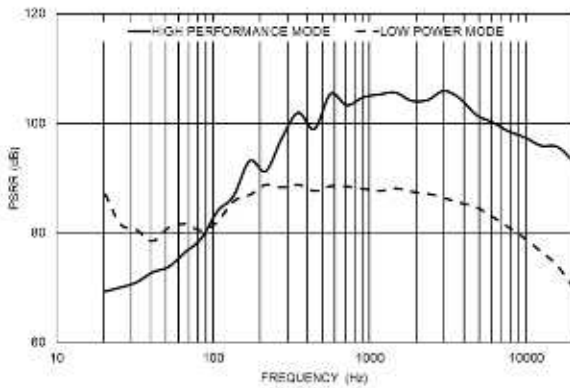
## 7 Typical Performance Characteristics



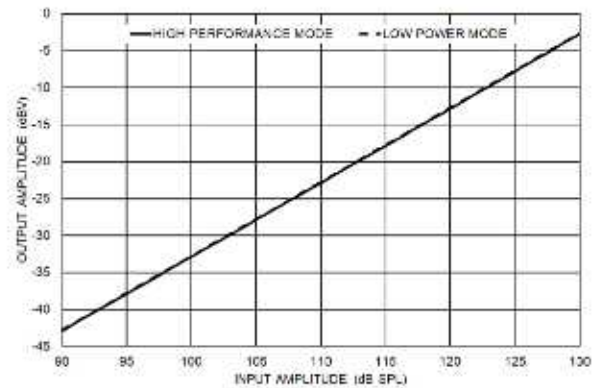
Typical Frequency Response (Measured)



THD + N vs. Input Amplitude



Power-Supply Rejection Ratio vs. Frequency



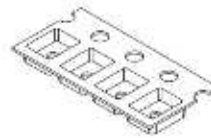
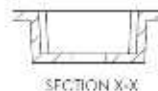
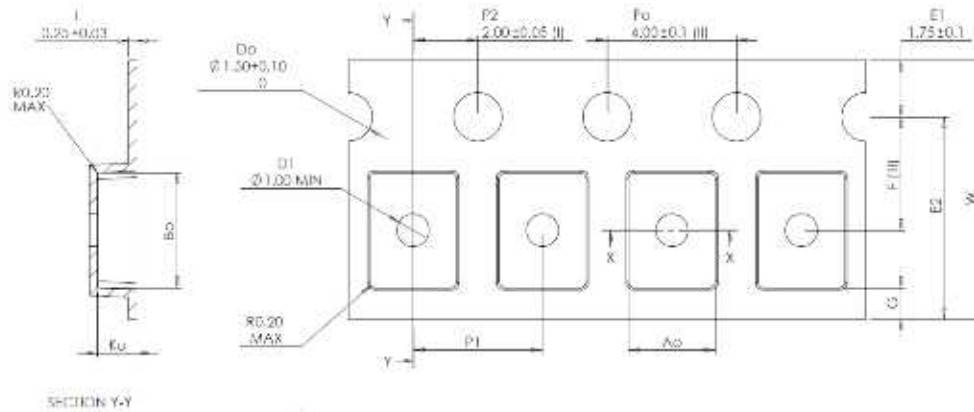
Linearity

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## 8 Packing material

### 8.1 Tape



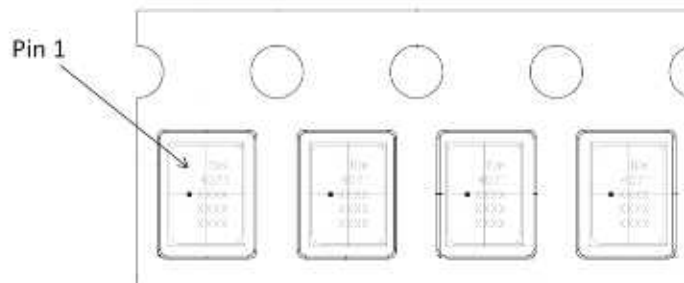
A <sub>0</sub>	2.70 $\pm$ 0.05 mm
B <sub>0</sub>	3.55 $\pm$ 0.05 mm
E <sub>2</sub>	min 6.25 mm
F	3.50 $\pm$ 0.05 mm
G	min 0.75 mm

K <sub>0</sub>	1.20 $\pm$ 0.1 mm
P <sub>1</sub>	4.00 $\pm$ 0.1 mm
W	$\varnothing$ 8.00 $^{+0.30}_{-0.10}$ mm


#### Notes:

- (I) Measured from centerline of sprocket hole to centerline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is  $\pm 0.20$ .
- (III) Measured from centerline of sprocket hole to centerline of pocket.

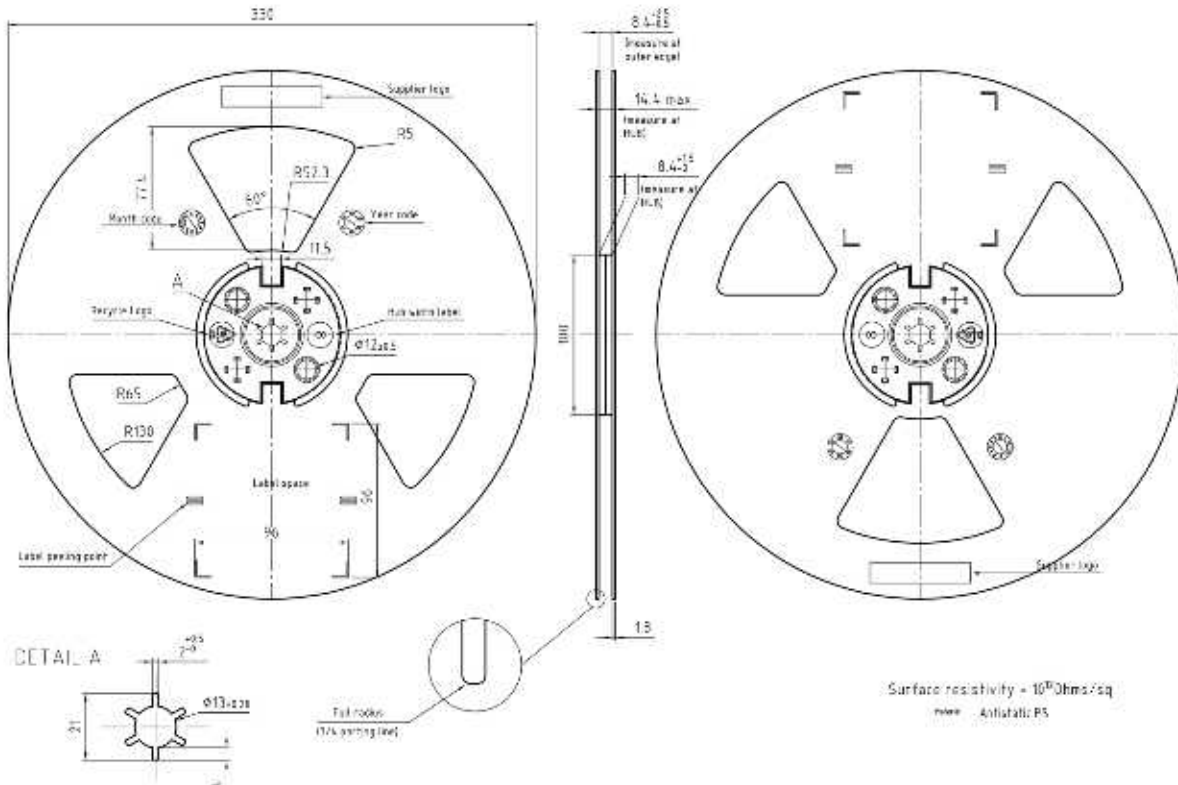
#### Orientation of devices in tape:



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## 8.2 Reel

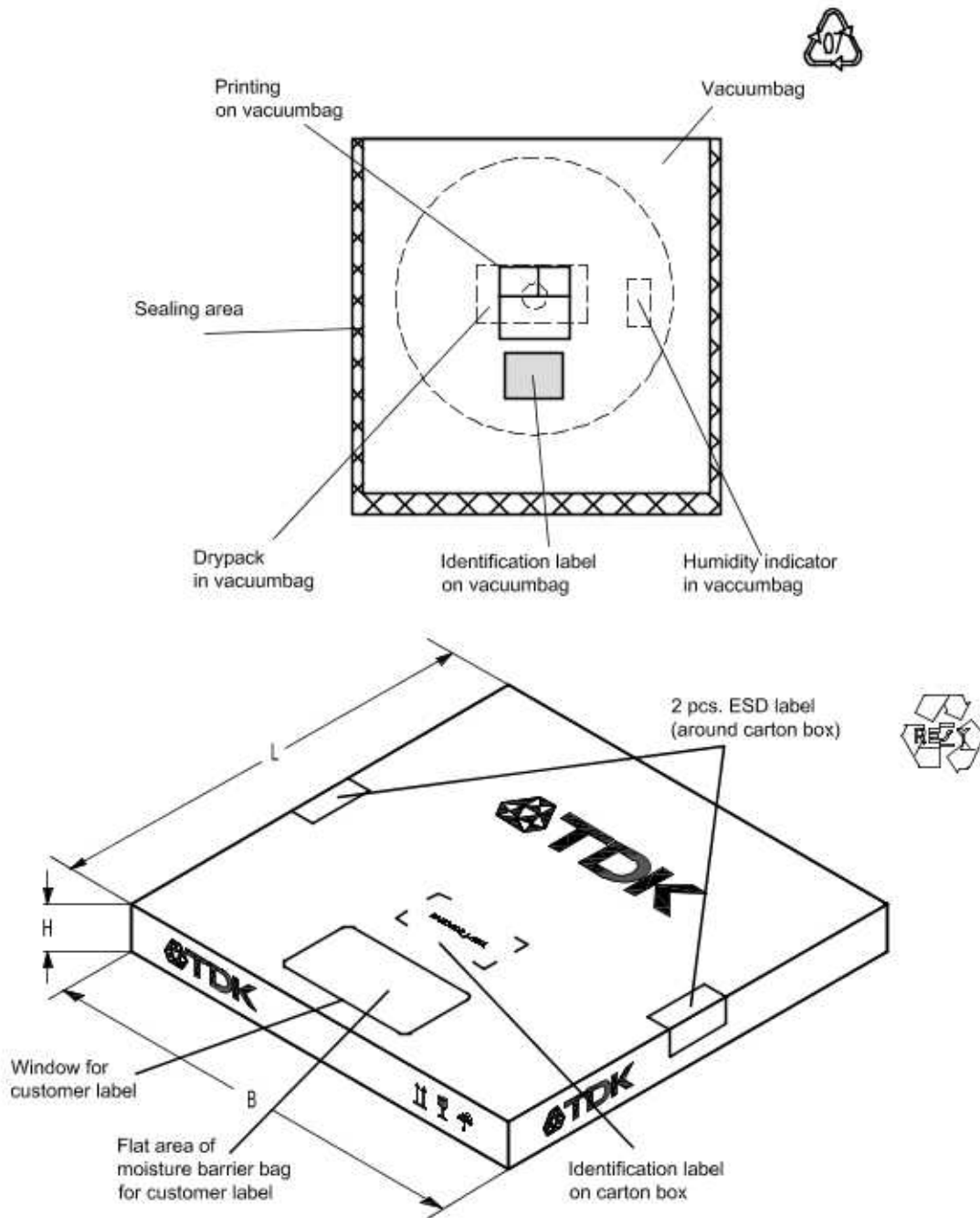
### 8.2.1 330mm Reel



Note: All dimensions in mm unless otherwise stated

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### 8.3 Bag and Box



Reel Size	Width B	Length L	Height H
330 mm	338 mm	335 mm	36 mm

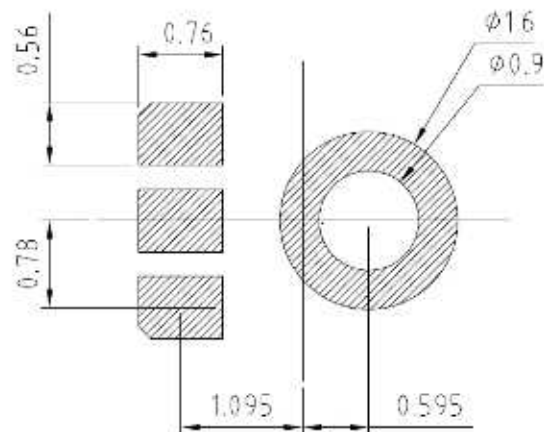
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## 8.4 Identification Label (BPL) Example

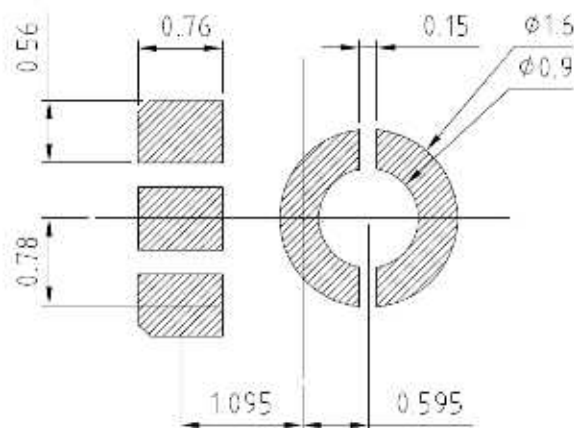


## 9 Assembly recommendations

### 9.1 Recommended landing area



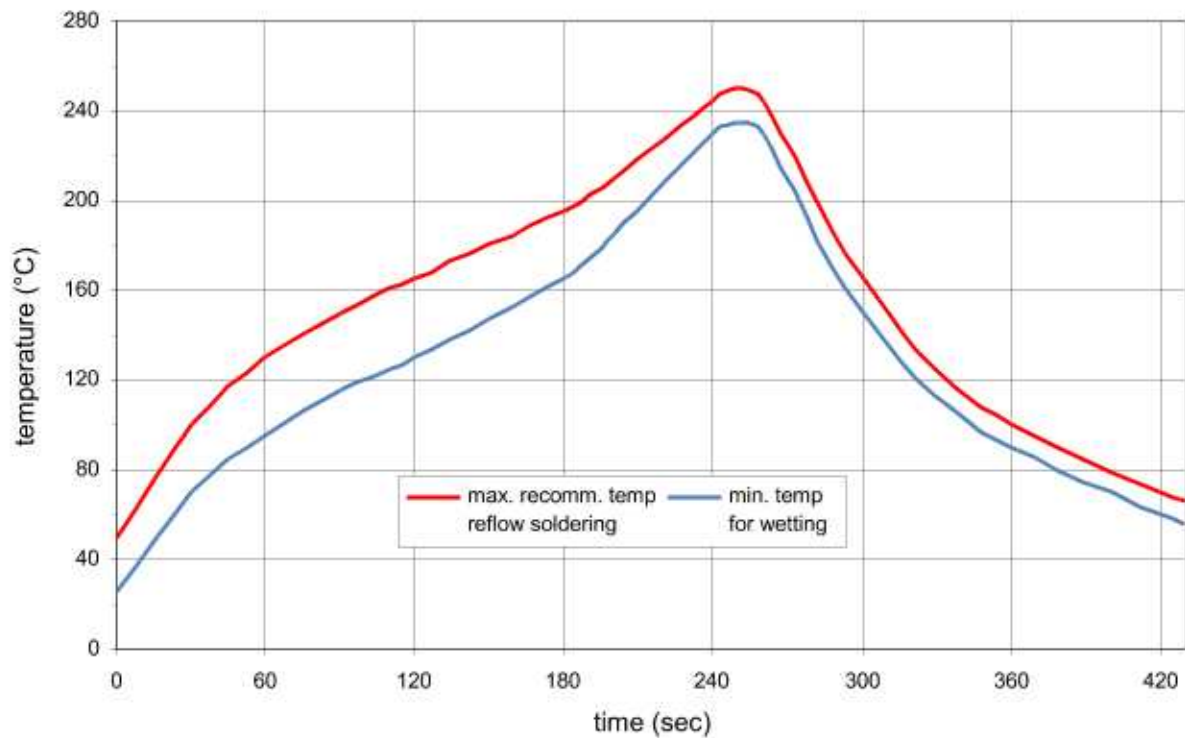
### 9.2 Recommended solder paste stencil layout



Note: All dimensions in mm unless otherwise stated

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### 9.3 Reflow profile



Parameter	Condition
Ramp rate	≤ 3 K/s
Preheat	125°C to 220°C, 150 s to 210 s, 0.4 K/s to 1.0 K/s
T > 220°C	30 s to 70 s
T > 230°C	Min. 10 s
T > 245°C	Max. 20 s
T ≥ 255°C	-
Peak temperature T <sub>peak</sub>	250°C +0/-5°C
Wetting temperature T <sub>min</sub>	230°C +5/-0°C for 10 s ± 1 s
Cooling rate	≤ 3 K/s
Soldering temperature T	Measured at solder pads

### 9.4 Cautions and warnings

- Vacuum on the bottom side of a device with a sound inlet hole has to be avoided
- Compressed air and liquid cleaners should not be used around the area of the sound inlet hole
- The sound inlet hole must not be covered with solder
- The maximum number of reflows should not exceed three

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## 10 Appendix

### 10.1 Ordering codes

Ordering code	Packing units	Reel size
MMICT4078-0A-908	9000 pcs	330 mm

### 10.2 RoHS compatibility

ROHS-compatible means that products are compatible with the requirements according to Art. 4 (substance restrictions) of Directive 2011/65/EU of the European Parliament and of the Council of June 8th, 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("Directive") with due regard to the application of exemptions as per Annex III of the Directive in certain cases.

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## 11 Legal Disclaimer

The products listed on this specification sheet are intended for use in general electronic equipment (AV equipment, telecommunications equipment, home appliances, amusement equipment, computer equipment, personal equipment, office equipment, measurement equipment, industrial robots) under a normal operation and use condition.

The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require a more stringent level of safety or reliability, or whose failure, malfunction or trouble could cause serious damage to society, person or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below or for any other use exceeding the range or conditions set forth in this specification sheet.

Aerospace/Aviation equipment  
 Transportation equipment (cars, electric trains, ships, etc.)  
 Medical equipment  
 Power-generation control equipment  
 Atomic energy-related equipment  
 Seabed equipment  
 Transportation control equipment  
 Public information-processing equipment  
 Military equipment  
 Electric heating apparatus, burning equipment  
 Disaster prevention/crime prevention equipment  
 Safety equipment  
 Other applications that are not considered general-purpose applications

When using this product in general-purpose applications, you are kindly requested to take into consideration securing protection circuit/equipment or providing backup circuits, etc., to ensure higher safety.

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