



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 mm²
- 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

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	2 / 15

Contents

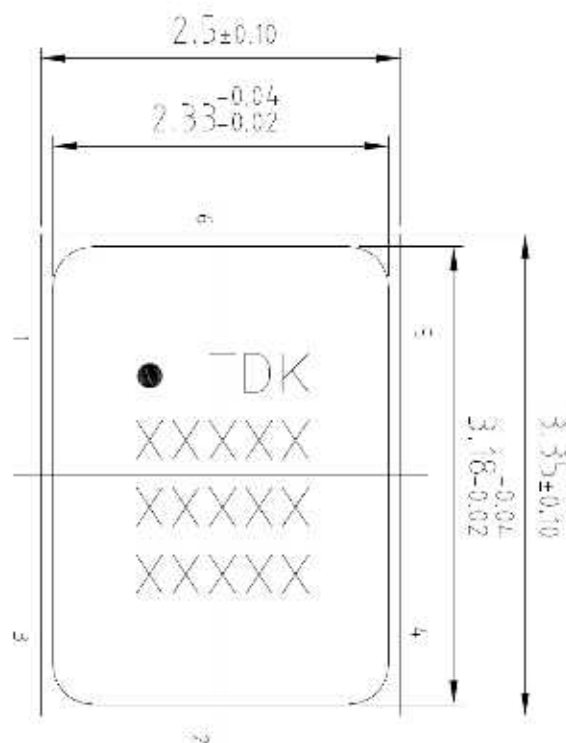
1	General description.....	4
2	Marking.....	4
3	Mechanical specification.....	5
4	Electrical specification.....	6
4.1	ELECTRICAL CHARACTERISTICS	6
5	Absolute maximum ratings	7
6	Application example	7
7	Typical Performance Characteristics	8
8	Packing material.....	9
8.1	TAPE.....	9
8.2	REEL	10
8.3	BAG AND BOX.....	11
8.4	IDENTIFICATION LABEL (BPL) EXAMPLE.....	12
9	Assembly recommendations.....	12
9.1	RECOMMENDED LANDING AREA.....	12
9.2	RECOMMENDED SOLDER PASTE STENCIL LAYOUT	12
9.3	REFLOW PROFILE	13
9.4	CAUTIONS AND WARNINGS.....	13
10	Appendix.....	14
10.1	ORDERING CODES	14
10.2	ROHS COMPATIBILITY.....	14
11	Legal Disclaimer	15

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	3 / 15

1 General description

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

2 Marking



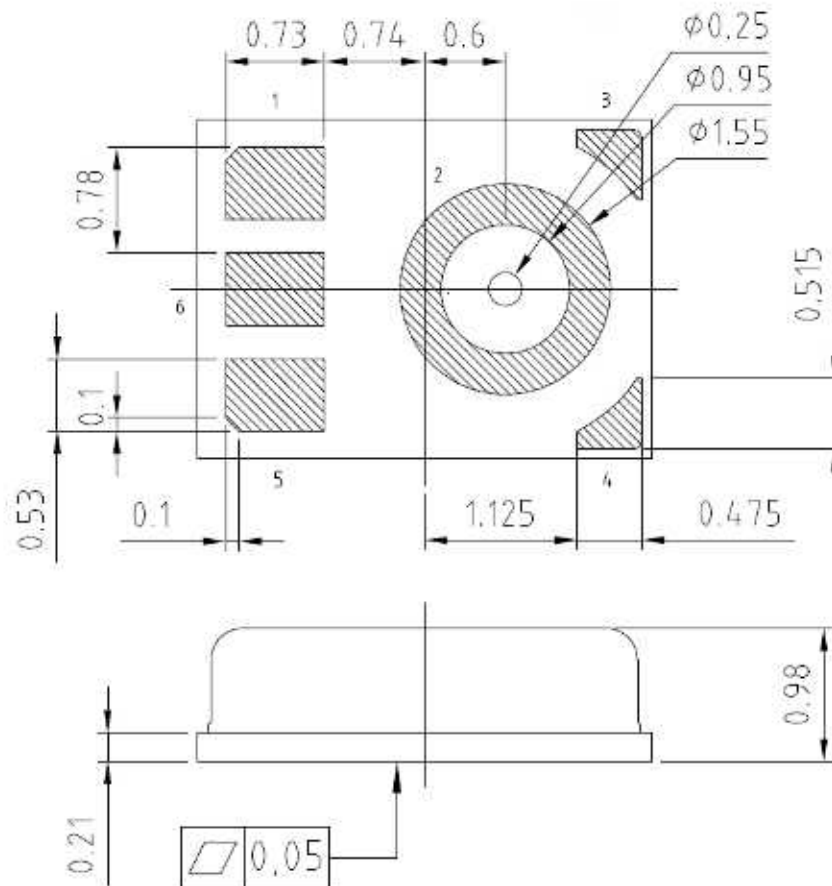
Character Area:

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

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	4 / 15

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 _{DD}	power
6	OUTN	balanced output -

Item	Nominal	Tolerance
Length	3.35	±0.1
Width	2.5	±0.1
Height	0.98	±0.1

Note: All dimensions in mm unless otherwise stated

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	5 / 15

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 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 ²⁾
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 ²⁾
		–	128	–	dB SPL	LM, 10% THD, 1kHz ²⁾
Power supply rejection ratio	PSRR ¹⁾	80	90	–	dB	HM; 1 kHz sine wave; 200 mV _{pp}
		65	75	–	dB	LM; 1 kHz sine wave; 200 mV _{pp}
Current consumption	I _{cc}	–	–	250	μA	HM
		–	–	85	μA	LM
Output impedance		–	250	–	Ω	HM, OUTP/OUTN to GND, 1kHz
		–	300	–	Ω	LM, OUTP/OUTN to GND, 1kHz

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

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	6 / 15

5 Absolute maximum ratings

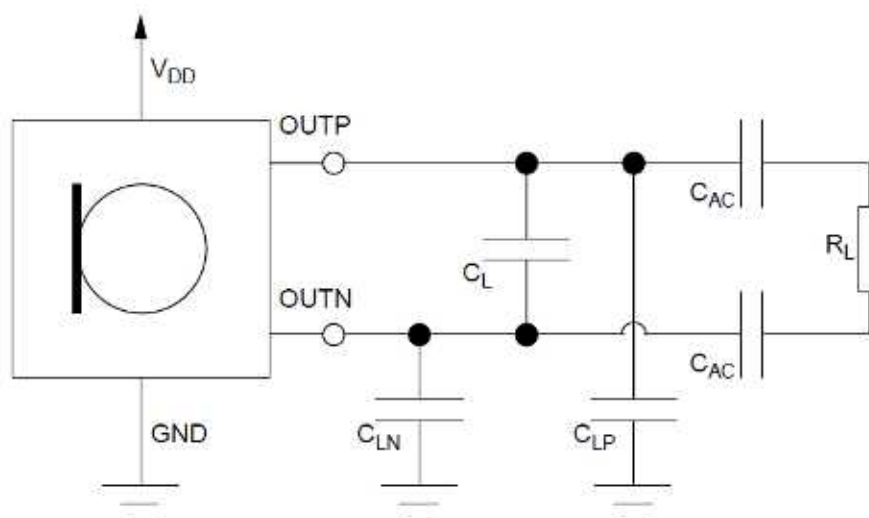
		Min.	Max.	Unit	Note or condition
Operable temperature range	T	-40	+105	°C	
Storage temperature range	T _{STG}	-40	+125	°C	
	T _{STGT}	0	+60	°C	stored in tape
Operable Power supply voltage	V _{DD}	1.52	3.60	V	
ESD capability MM	V _{ESD MM}	—	200 ¹⁾	V	Any pin
ESD capability HBM	V _{ESD HBM}	—	2000 ²⁾	V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

¹⁾ According to JESD22-A115A.

²⁾ 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

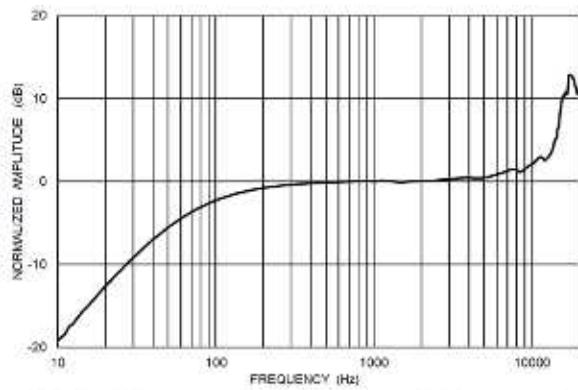


C_{LN}, C_{LP}, C_L: Optional EMI capacitors; maximum value 150pF.

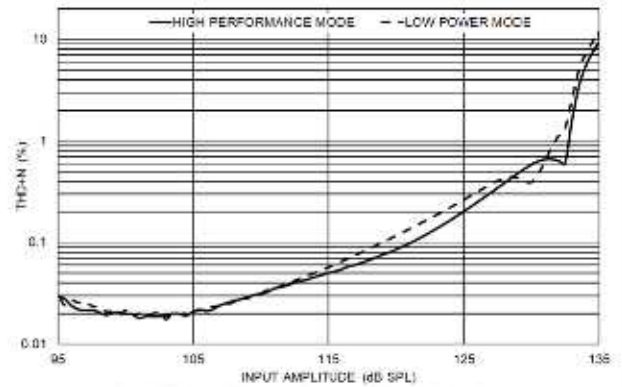
R_L: Output load impedance; minimum value 25 kΩ

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	7 / 15

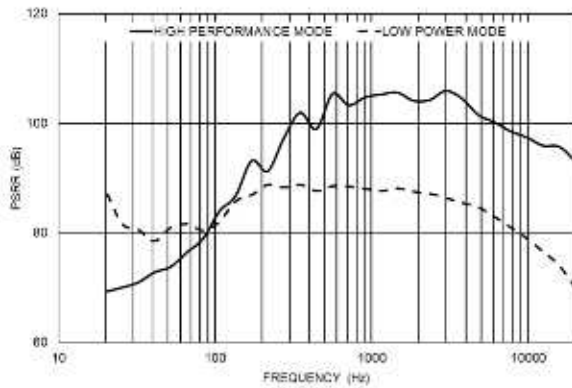
7 Typical Performance Characteristics



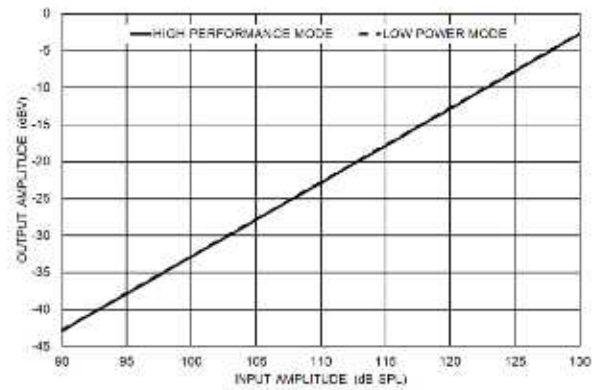
Typical Frequency Response (Measured)



THD + N vs. Input Amplitude



Power-Supply Rejection Ratio vs. Frequency

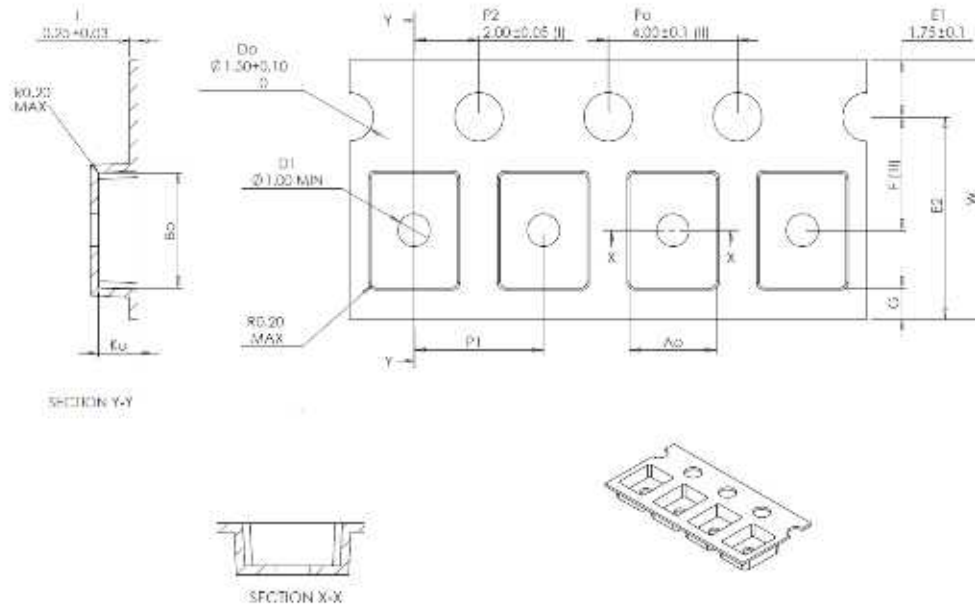


Linearity

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	8 / 15

8 Packing material

8.1 Tape



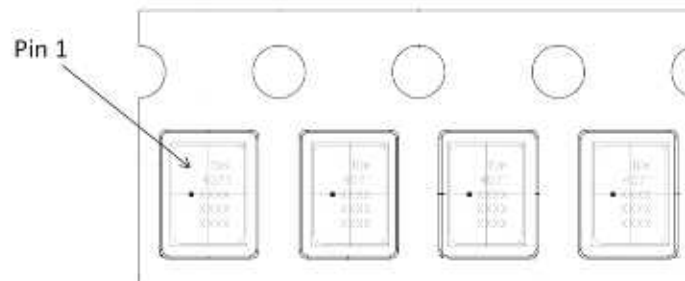
A ₀	2.70±0.05 mm
B ₀	3.55±0.05 mm
E ₂	min 6.25 mm
F	3.50±0.05 mm
G	min 0.75 mm

K ₀	1.20±0.1 mm
P ₁	4.00±0.1 mm
W	ø8.00 ^{+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 ± 0.20 .
- (III) Measured from centerline of sprocket hole to centerline of pocket.

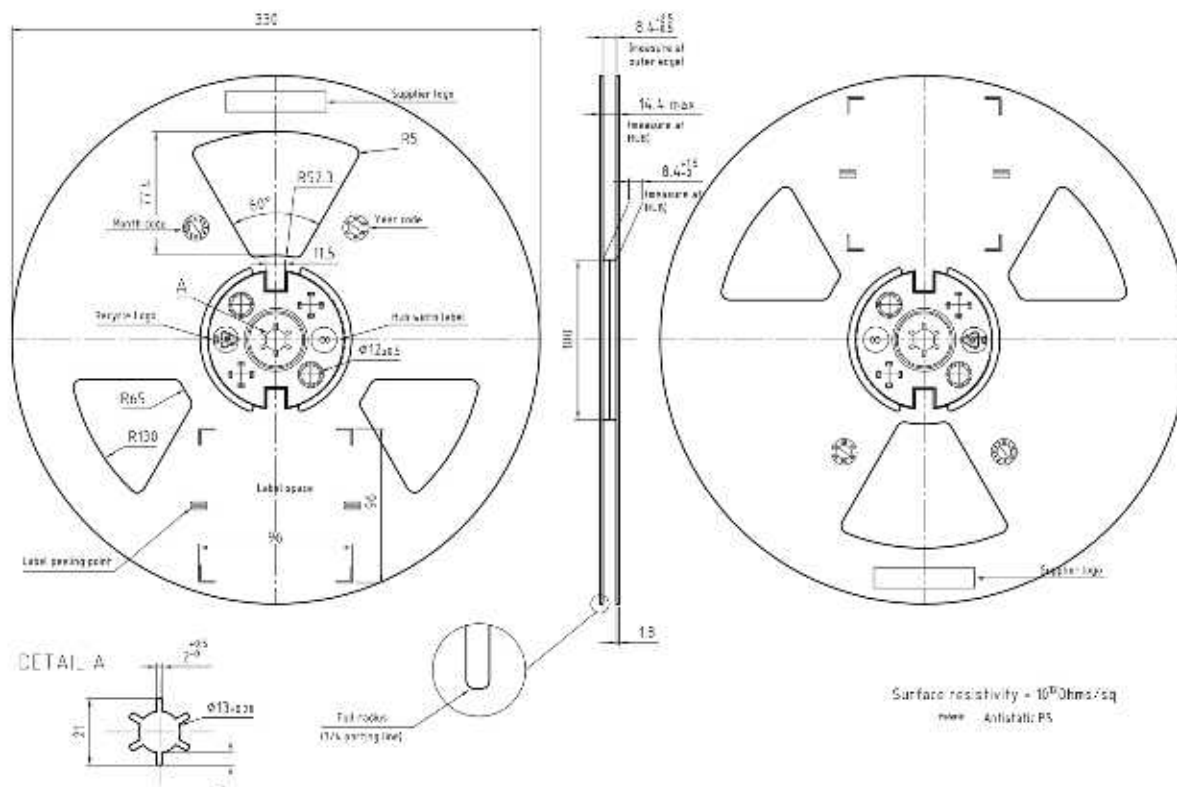
Orientation of devices in tape:



NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	9 / 15

8.2 Reel

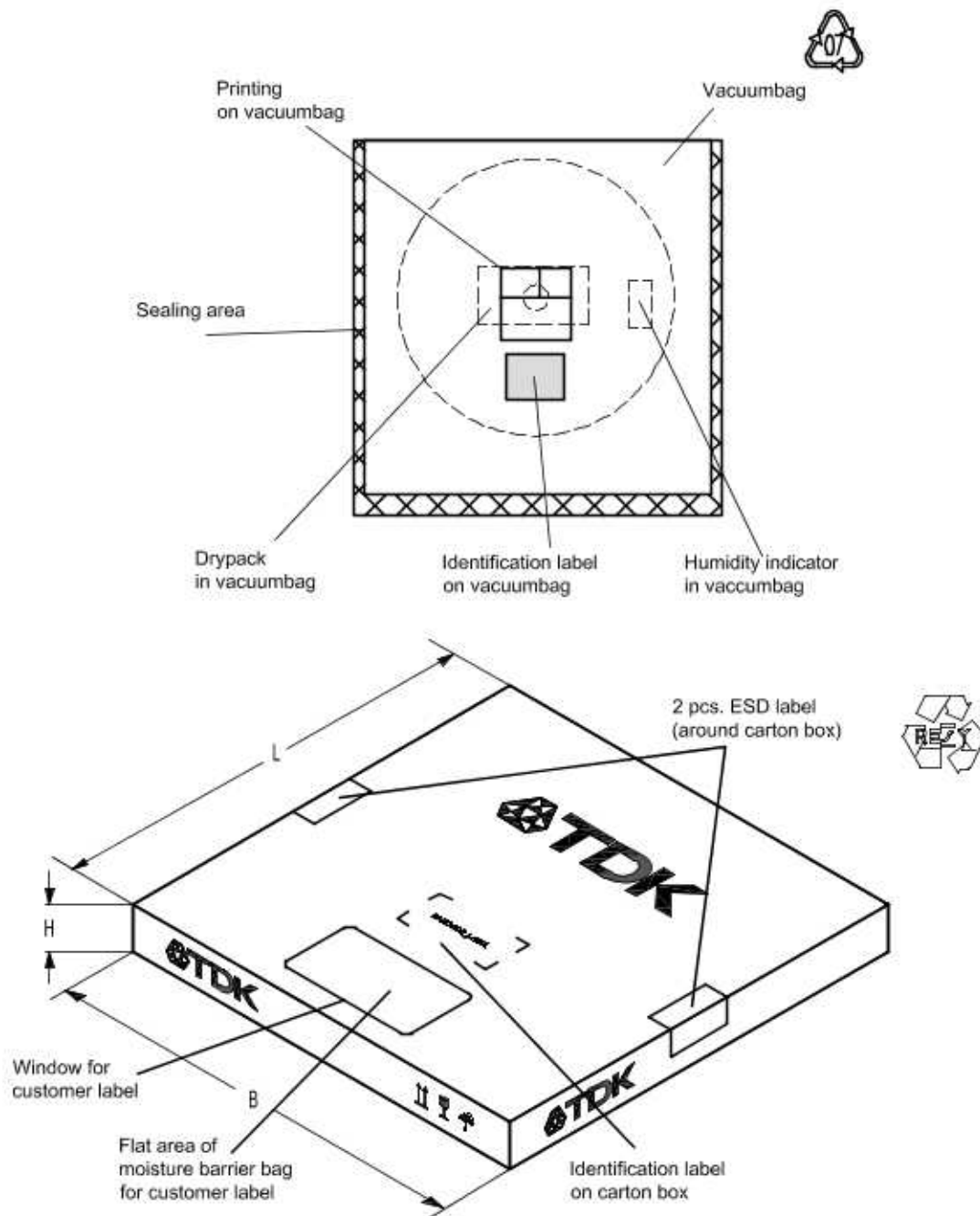
8.2.1 330mm Reel



Note: All dimensions in mm unless otherwise stated

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	10 / 15

8.3 Bag and Box



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

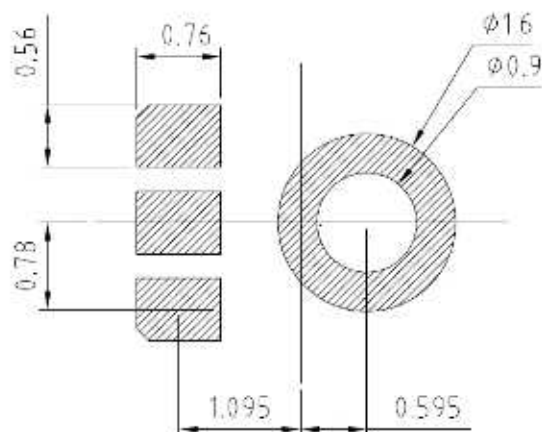
NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	11 / 15

8.4 Identification Label (BPL) Example

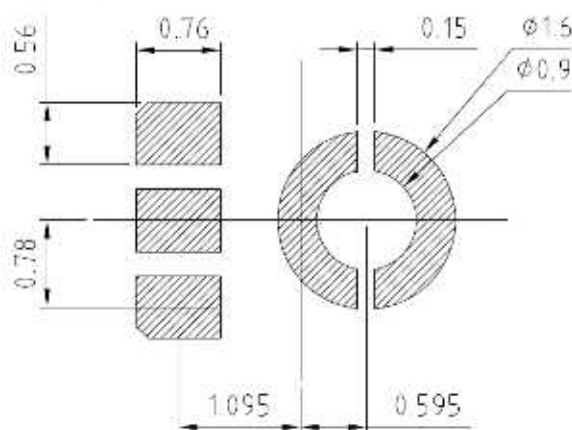


9 Assembly recommendations

9.1 Recommended landing area



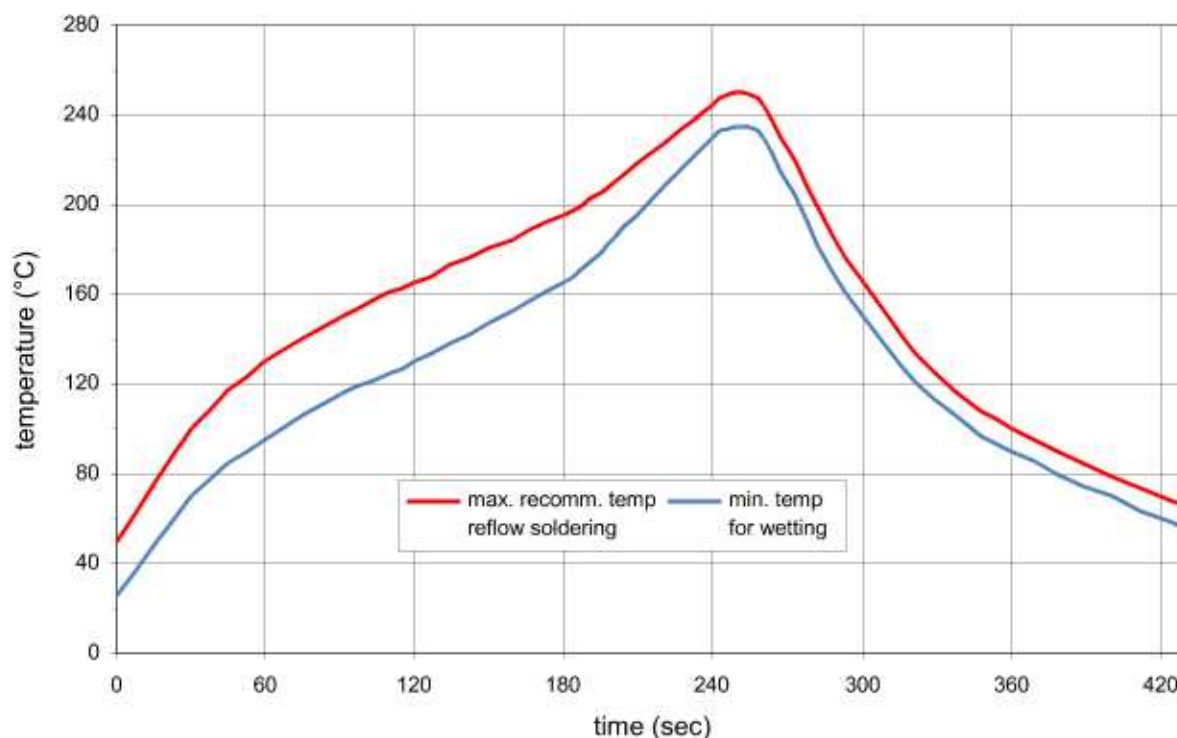
9.2 Recommended solder paste stencil layout



Note: All dimensions in mm unless otherwise stated

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	12 / 15

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_{peak}	250°C +0/-5°C
Wetting temperature T_{min}	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

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	13 / 15

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.

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	14 / 15

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.

NAME	DRAWING No.	DATE	REV.	PAGE
DATASHEET	T4078_0A	30-Jul-19	5	15 / 15