

CXM3645ER

Description

The CXM3645ER is a high power and ultra-high linearity DPDT switch for wireless communication systems. The CXM3645ER can be used for SVLTE and carrier aggregation requiring very high linearity. This IC has a 1.8 V CMOS compatible decoder. The Sony GaAs junction gate pHEMT (JPHEMT) MMIC process is used for low insertion loss and high linearity. (Application: LTE/CDMA/GSM/UMTS Handsets and mini base-stations)

Features

- ◆ Very Low Insertion loss: 0.23dB (Typ.) (Cellular Band)
0.35 dB (Typ.) (IMT2000)
- ◆ Ultra-high linearity: IIP3 = 82dBm (Min.) for SVLTE
2f0 = -78dBm(Max) at Band13, Pin=25dBm
3f0 = -95dBm (Typ.) at Band17, Pin=25dBm
- ◆ Low voltage operation: $V_{DD} = 2.5\text{ V}$
- ◆ No DC blocking capacitors required on RF ports
- ◆ 2 Control input
- ◆ Small package size: VQFN-18 pin (2.4 mm × 2.0 mm)
- ◆ Lead-Free and RoHS compliant

Structure

GaAs JPHEMT MMIC switch, CMOS decoder

Moisture Sensitivity

Moisture Sensitivity Level for this part is MSL= 2

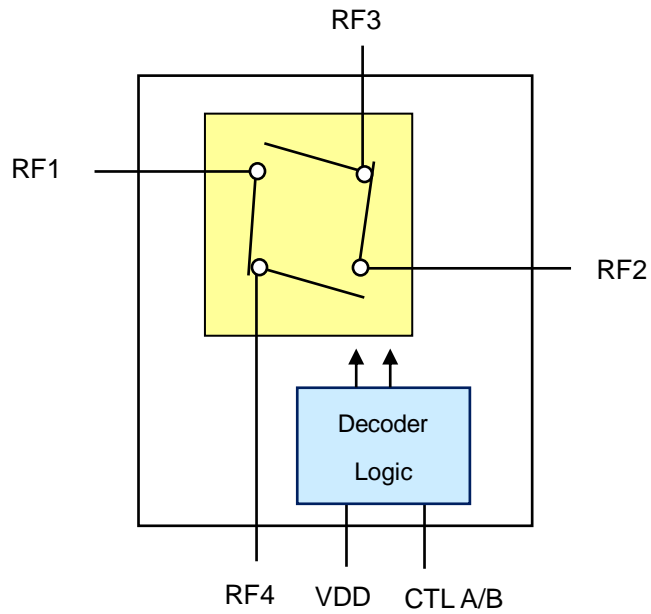
Absolute Maximum Ratings

◆ Bias voltage	V_{DD}	4	V	($T_a = 25\text{ }^\circ\text{C}$)
◆ Control voltage	V_{ctl}	4	V	($T_a = 25\text{ }^\circ\text{C}$)
◆ Maximum input power		36	dBm	(Duty cycle = 12.5 to 50 %, $T_a = 25\text{ }^\circ\text{C}$)
◆ Operating temperature	T_{opr}	-35 to +90	$^\circ\text{C}$	
◆ Storage temperature	T_{stg}	-65 to +150	$^\circ\text{C}$	

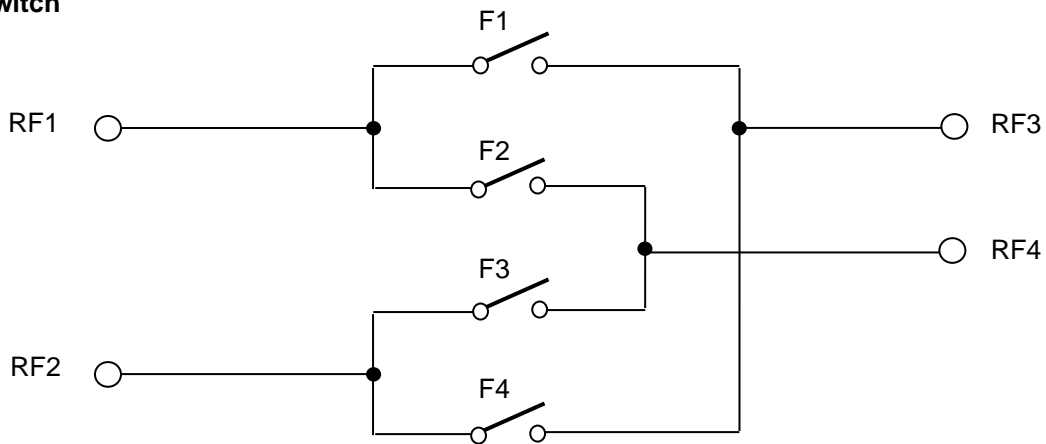
This IC is ESD sensitive device. Special handling precautions are required.

Block Diagram

DPDT Antenna Switch



MMIC Switch



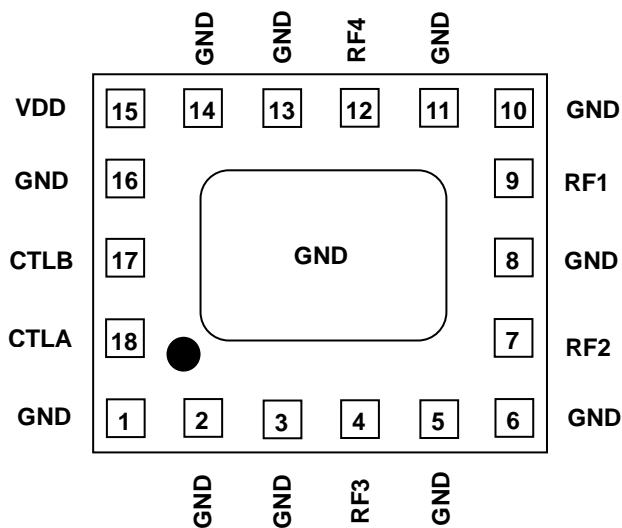
Truth Table

CTL A	CTL B	Active path	F1	F2	F3	F4
L	L	RF1-RF4 RF2-RF3	OFF	ON	OFF	ON
L	H	RF1-RF3 RF2-RF4	ON	OFF	ON	OFF
H	L	RF1-RF4 RF2,RF3 Off	OFF	ON	OFF	OFF
H	H	RF1-RF3 RF2,RF4 Off	ON	OFF	OFF	OFF

Pin Configuration

VQFN-18P PKG (2.4mm x 2.0mm)

(Top View)



DC Bias Condition

Parameter	Min.	Typ.	Max.	Unit
V _{DD}	2.5	2.7	3.3	V
V _{ctl} (H)	1.35	1.8	3.3	
V _{ctl} (L)	0	—	0.45	

Target Electrical Characteristics

(Ta = 25 °C, V_{DD} = 2.5 V, V_{ctl} = 0/1.8 V)

Item	Symbol	Path	Condition	Min.	Typ.	Max.	Unit
Insertion loss	IL	RF1-RF4 RF2-RF3	*1, *2, *3, *7, *9	—	0.23	0.33	dB
			*4, *5, *8, *10	—	0.35	0.45	
			*6	—	0.47	0.62	
		RF1-RF3 RF2-RF4	*1, *2, *3, *7, *9	—	0.23	0.33	
			*4, *5, *8, *10	—	0.35	0.45	
			*6	—	0.47	0.62	
		RF1-RF4 (RF2,RF3 Off)	*1, *2, *3, *7, *9	—	0.23	0.33	dB
			*4, *5, *8, *10	—	0.35	0.45	
			*6	—	0.47	0.62	
		RF1-RF3 (RF2,RF4 Off)	*1, *2, *3, *7, *9	—	0.23	0.33	
			*4, *5, *8, *10	—	0.35	0.45	
			*6	—	0.47	0.62	
Isolation	ISO	RF1-RF4 RF2-RF3	*1, *2, *3, *7, *9	20	23	—	dB
			*4, *5, *8, *10	14	16.5	—	
			*6	12	14.5	—	
		RF1-RF3 RF2-RF4	*1, *2, *3, *7, *9	20	25	—	
			*4, *5, *8, *10	14	18.5	—	
			*6	12	16.5	—	
		RF2-RF3 (RF1-RF4 Active)	*1, *2, *3, *7, *9	16	19	—	dB
			*4, *5, *8, *10	10	12.5	—	
			*6	8	10.5	—	
		RF2-RF4 (RF1-RF3 Active)	*1, *2, *3, *7, *9	16	19	—	
			*4, *5, *8, *10	10	12.5	—	
			*6	8	10.5	—	
VSWR	VSWR	All ports in active paths	700 to 2700 MHz	—	—	1.5	—
Harmonics	2fo	RF1-RF4, RF3 RF2-RF3, RF4	*7	—	-60	-45	dBm
	3fo			—	-61	-45	
	2fo		*8	—	-58	-50	
	3fo			—	-68	-55	
	2fo		*3, *4, *6	—	—	-60	
	3fo			—	—	-65	
	2fo		*2	—	-81	-78	
	3fo		*1	—	-95	-85	

Item	Symbol	Path	Condition	Min.	Typ.	Max.	Unit
Inter modulation distortion in Rx Band	IMD2	RF1-RF4, RF3 RF2-RF3, RF4	*11, *12, *13, *16, *17, *20, *21, *24, *25	—	—	-110	dBm
	IMD3		*11, *14, *15, *18, *19, *22, *23, *26, *27	—	—	-110	
			*11, *28	—	—	-104	
			*11, *29	—	—	-110	
			*11, *30	—	—	-104	
Switching speed	Ts		50 % Ctl to 90 % RF	—	6.5	9.5	μs
Wakeup time	Twu		V _{DD} = 2.5 V to 90 % RF, Pin = 0 dBm	—		20	μs
Control current	Ictl		Vctl = 1.8 V	—	1	5	μA
Supply current	Idd		V _{DD} = 2.7 V	—	0.15	0.35	mA

Electrical characteristics are measured with all RF ports terminated in 50 Ω.

- *1 Pin = 25 dBm, 704 to 716 MHz (Band 17)
- *2 Pin = 25 dBm, 777 to 787 MHz (Band 13)
- *3 Pin = 26 dBm, 824 to 960 MHz (Band 5, Band 8)
- *4 Pin = 26 dBm, 1710 to 1990 MHz (Band 1 Tx, Band 2 Tx, Band 3 Tx, Band 4 Tx)
- *5 Pin = 10 dBm, 2110 to 2170 MHz (Band 1 Rx, Band 4 Rx)
- *6 Pin = 26 dBm, 2500 to 2690 MHz (Band 7)
- *7 Pin = 35 dBm, 824 to 915 MHz (GSM850/900 Tx)
- *8 Pin = 32 dBm, 1710 to 1910 MHz (GSM1800/1900 Tx)
- *9 Pin = 10 dBm, 869 to 960 MHz (GSM850/900 Rx)
- *10 Pin = 10 dBm, 1805 to 1990 MHz (GSM1800/1900 Rx)
- *11 Measured with the recommended circuit.

IMD Condition (1)

Band	fRx on RF [MHz]	fTx +20 dBm on RF3/RF4 [MHz]	fBlocker -15 dBm on RF1/RF2 [MHz]		IMD condition
Band 1	2140	1950	IMD2 (fRx - fTx)	190	*12
			IMD2 (fRx + fTx)	4090	*13
			IMD3 (2fTx - fRx)	1760	*14
			IMD3 (2fTx + fRx)	6040	*15
Band 2	1960	1880	IMD2 (fRx - fTx)	80	*16
			IMD2 (fRx + fTx)	3840	*17
			IMD3 (2fTx - fRx)	1800	*18
			IMD3 (2fTx + fRx)	5720	*19
Band 5	880	835	IMD2 (fRx - fTx)	45	*20
			IMD2 (fRx + fTx)	1715	*21
			IMD3 (2fTx - fRx)	790	*22
			IMD3 (2fTx + fRx)	2550	*23
Band 7	2655	2535	IMD2 (fRx - fTx)	120	*24
			IMD2 (fRx + fTx)	5190	*25
			IMD3 (2fTx - fRx)	2415	*26
			IMD3 (2fTx + fRx)	7725	*27

IMD Condition (2)

Band	fRx on RF [MHz]	fTx PTx = +23 dBm on RF3/RF4 [MHz]	fBlocker PBlocker = +14 dBm on RF1/RF2 [MHz]		IMD condition
Band 13	747	786	IMD3 (2fTx - fRx)	825	*28
BC0	872	782	IMD3 (fTx + fRx)/2	827	*29
	872	827	IMD3 (2fTx - fRx)	782	*30

Triple Beat Ratio

(V_{DD} = 2.5 V, Ta = 25 °C)

Item	Symbol	Path	Condition					Min.	Typ.	Max.	Unit
			Input power at RF3/RF4 [dBm]	Tx1 at RF3/RF4 [MHz]	Tx2 at RF3/RF4 [MHz]	Jammer at RF1/RF2 -30 dBm [MHz]	Triple beat product at RF [MHz]				
Triple beat ratio	TBR	RF1-RF4, RF3, RF2-RF3, RF4	21.5	835.5	836.5	881.5	881.5 ± 1	88	—	—	dBc
			21.5	1880	1881	1960	1960 ± 1	88	—	—	
			13.5	1732	1733	2132	2132 ± 1	88	—	—	

* Electrical characteristics are measured with all RF ports terminated in 50 Ω. Measured with the recommended circuit.

IIP2

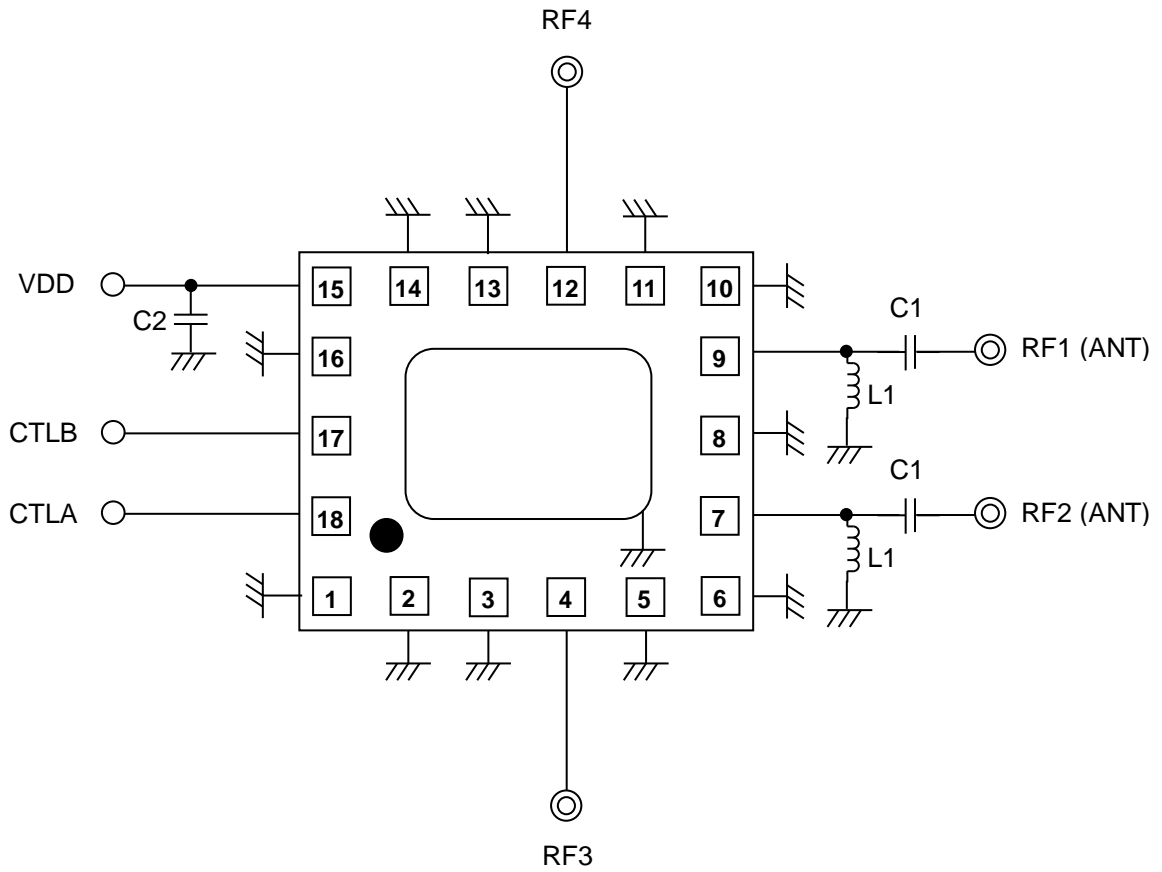
(V_{DD} = 2.5 V, Ta = 25 °C)

Item	Symbol	Path	Condition			Min.	Typ.	Max.	Unit
			Tx at RF3/RF4 24 dBm [MHz]	Jammer at RF1/RF2 -20 dBm [MHz]	IM2 product at RF [MHz]				
Input IP2	IIP2	RF1-RF4, RF3, RF2-RF3, RF4	836.61	1718.22	881.61	113.5	—	—	dBm
			836.61	45	881.61	95.5	—	—	
			1885	3850	1965	95.5	—	—	
			1885	80	1965	95.5	—	—	
			1732.5	3865	2132.5	95.5	—	—	
			1732.5	400	2132.5	95.5	—	—	

* Electrical characteristics are measured with all RF ports terminated in 50 Ω. Measured with the recommended circuit.

Recommended Circuit

(Top View)



- *1 No DC blocking capacitors are required on all RF ports. (Except sourcing DC bias)
- *2 The DC levels of all RF ports are GND.
- *3 L1 (27nH) and C1(12pF) are recommended on Ant port for ESD protection.
- *4 C2(100pF) is recommended on VDD pin for Decoupling Capacitor.




Recommended Land Pattern

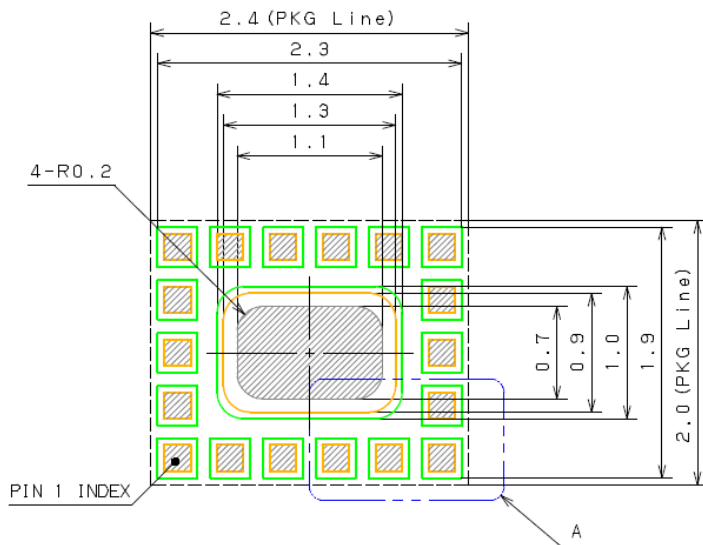
VQFN-18P-03 Macro drawing (Reference)

- PKG : 2.4mm×2.0mm *Metal mask thickness : 100μm
- Pin pitch : 0.4mm

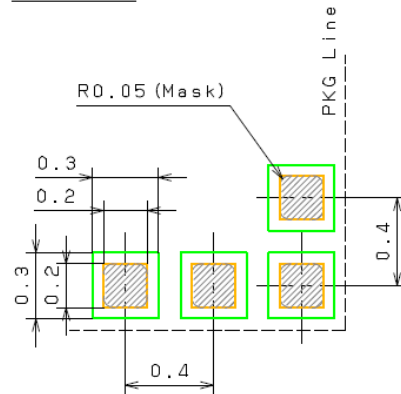
Confidential

9/Aug./'12

-  : Land
-  : Mask (Open area)
-  : Resist (Open area)



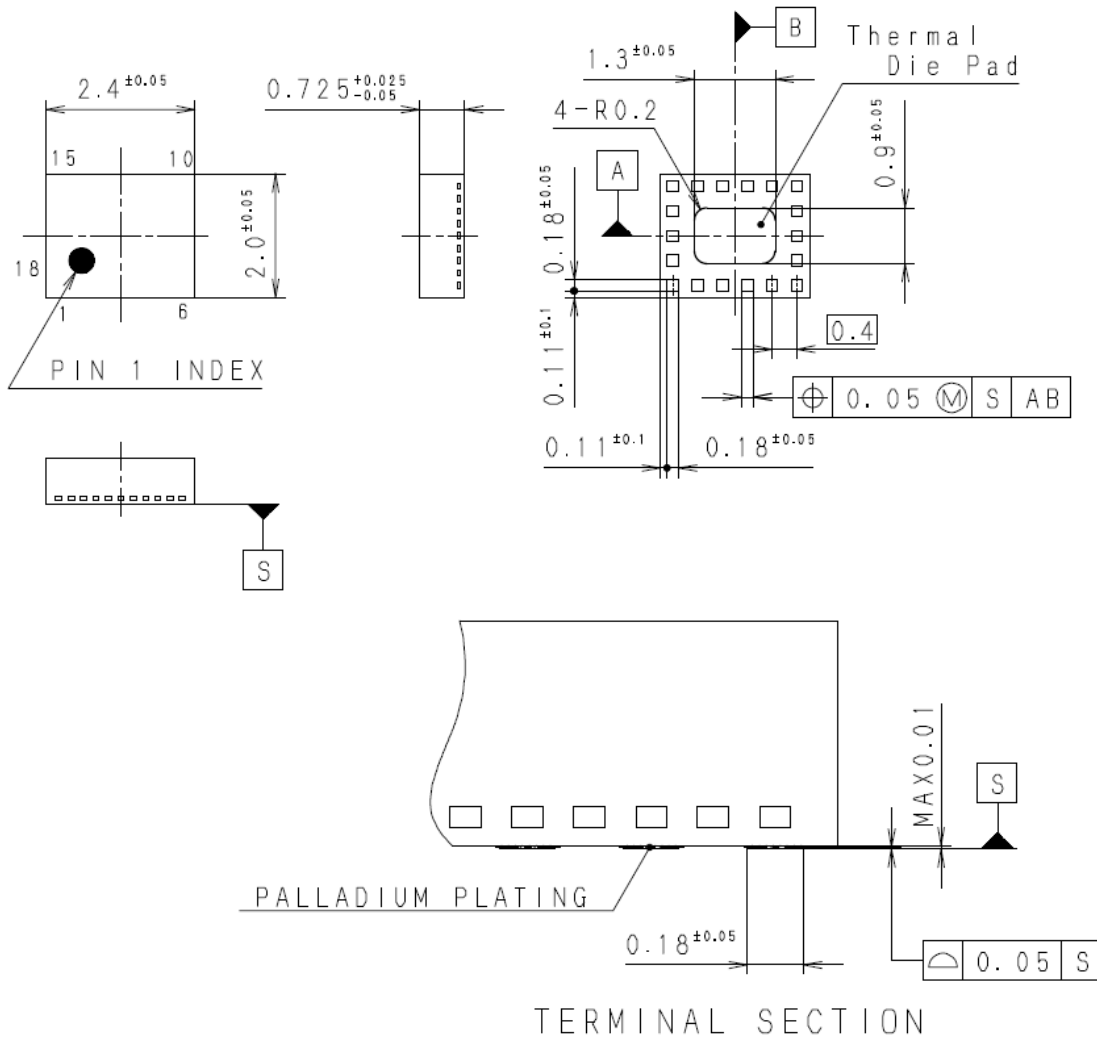
Detail A



Package Outline

(Unit: mm)

18PIN VQFN (PLASTIC)



TERMINAL SECTION

PACKAGE STRUCTURE

SONY CODE	VQFN-18P-03
JEITA CODE	_____
JEDEC CODE	_____

PACKAGE MATERIAL	EPOXY RESIN
TERMINAL TREATMENT	PALLADIUM PLATING
TERMINAL MATERIAL	COPPER ALLOY
PACKAGE MASS	0.0090 g

PART No.	AP-4000-18015S1	Rev. 0
ISSUED	12.12.12	REVISED
PRODUCTION LINE	COMPILING DIV. SONY SEMICONDUCTOR	
REMARKS	PKG CODE:ER-018-AS FOR SPECIFIC CUSTOMER	

Tape and Reel Size

CXM3645ER-T9

8mm WIDTH EMBOSSED TAPING

PACKAGE CODE	EMBOSSED TAPING CODE
VQFN-18P-03	R018QNR2-08-N-1

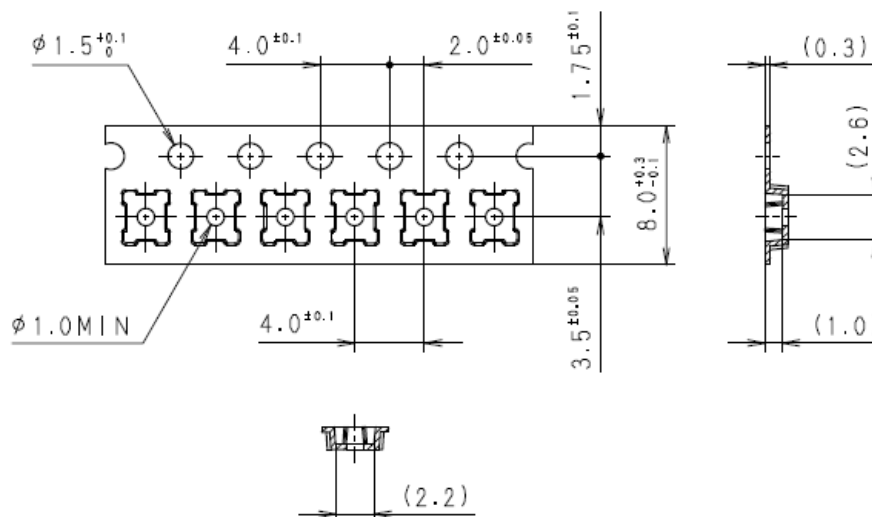
1. SCOPE

THIS SPECIFICATION DESCRIBES THE EMBOSSED TAPING FOR SMD (SURFACE MOUNTED DEVICE) IC'S, FOR SHIPMENT. THIS SPECIFICATION IS BASED ON THE STIPULATIONS OF JAPAN ELECTRONICS AND INFORMATION TECHNOLOGY INDUSTRIES ASSOCIATION (JEITA), JIS C0806-3, AND ELECTRONIC INDUSTRIES ASSOCIATION EIA-481.

2. PRODUCT INDICATION



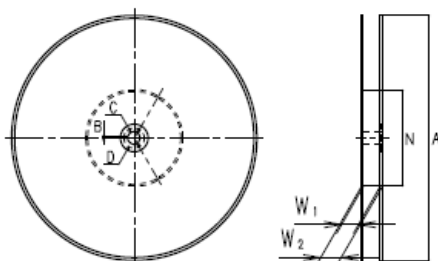
3. TAPING SPECIFICATIONS



NOTE) 1. THE R MEASUREMENT WITHOUT INDICATION IS ASSUMED TO BE 0.3mm MAX. GENERAL TOLERANCE: ± 0.2
 2. THE FEED HOLE CUMULATIVE PITCH ERROR IS ASSUMED AT $\pm 0.2\text{mm}/10\text{PITCH}$. UNIT: mm

4. REEL DIMENSIONS

$\phi 254\text{mm}$ PLASTIC REEL



UNIT: mm

SYMBOL	A	N	C	D
DIMENSION	$\phi 254 \pm 2$	$\phi 100^{+0.5}_0$	$\phi 13 \pm 0.2$	$\phi 21 \pm 0.8$
SYMBOL	B	W ₁	W ₂	
DIMENSION	2 ± 0.5	9.4 ± 1.0	13.4 ± 1.0	

MATERIAL: POLYSTYRENE CONTAINING CARBON (ANTISTATIC)
 *INTRODUCTION OF REUSE REEL
 (REEL THAT IS USED AGAIN AFTER COLLECTION)
 WE USE THE REUSE REEL OF JEITA SPECIFICATION.

Note

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