

CMOS Very Small 1 bit Control SPDT Switch for 0.01~10.6GHz

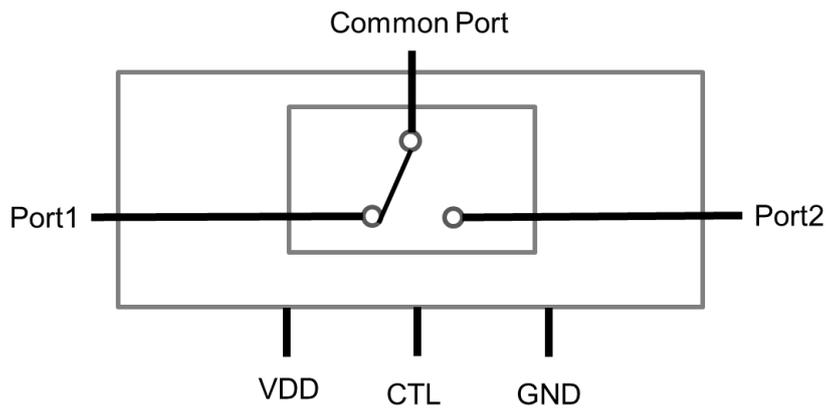
■ Applications

UWB/WiFi for Consumer Application

■ Features

- Low Insertion Loss1.4dB @ 10.6GHz
- Supply Voltage.....1.6 to 3.6V
- Small Package6 pin QFN Package
(0.7mm×1.1mm×0.60mm max)
- MSL1
- ESD.....HBM JEDEC JS-001-2017 Class 1C
- RoHS Compliant

■ Functional Block Diagram



■ Pin Description

Pin #	Symbol	Description
1	Port2	Single Ended RF port
2	GND	Ground
3	Port1	Single Ended RF port
4	VDD	Voltage Supply
5	Common Port	Single Ended RF port
6	CTL	SW Logic Control Input

■ SW Control Logic

Mode	Port1	Port2
CTL (L)	ON	OFF
CTL (H)	OFF	ON

■ Absolute Maximum Ratings

Symbol	Parameter	Conditions	Rating	Unit
Vdd	Supply Voltage	Ta = 25°C	4.0	V
CTL	Control Voltage	Ta = 25°C	4.0	V
Pin	RF Input Power	Ta = 25°C, Vdd=1.8V, CW, 50ohm, CTL(H) =1.8V,CTL(L) =0V Correspond RF path is ON	30	dBm
Top	Operating Temperature	-	-40 to 90	°C
Tstg	Storage Temperature	-	-55 to 150	°C

Remark: Exceeding any of the rating limits may cause fatal damage to the device and result in permanent failure.

■ Recommended Operating Conditions

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Top	Operating Temperature		-40		90	
Vdd	Supply Voltage	Ta = -40~90°C	1.6	1.8	3.6	V
CTL(H)	Control Voltage (High)	Ta = -40~90°C	1.2	1.8	3.6	V
CTL(L)	Control Voltage (Low)	Ta = -40~90°C	0	0	0.5	V

■ DC Electrical Specifications

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Idd	Supply Current	Ta = 25°C, Vdd = 1.8V CTL(H) =1.8V,CTL(L) =0V	-	8	20	uA
Ictl	Control Current	Ta = 25°C, Vdd = 1.8V CTL(H) =1.8V,CTL(L) =0V	-	0.01	5	uA

■ RF Electrical Specifications (Ta=25°C, VDD=1.8V, VCTL(H)=1.8V, VCTL(L)=0V, Pin=0dBm)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
IL	Insertion Loss: Common port to RF Port1 Common port to RF Port2	10-1000MHz	-	0.40	0.65	dB
		1000-2500MHz	-	0.45	0.75	dB
		2500-5925MHz		0.70	0.95	dB
		5925-7125MHz	-	0.80	1.10	dB
		7125-8250MHz	-	0.95	1.35	dB
		8250-9000MHz	-	1.05	1.45	dB
		9000-10600MHz	-	1.40	1.80	dB
ISO	Isolation: Common port to RF Port1 Common port to RF Port2	10-1000MHz	50.5	56	-	dB
		1000-2500MHz	46.5	52	-	dB
		2500-5925MHz	34.5	40	-	dB
		5925-7125MHz	28.5	35	-	dB
		7125-8250MHz	22.5	31	-	dB
		8250-9000MHz	21.5	28	-	dB
		9000-10600MHz	18.5	24	-	dB
Tsw	Switching Time	Vctl 50% ~ RF 90% or Vctl 50% ~ RF 10%	-	70	280	ns
2f0	Harmonics	2.45GHz Pin=23dBm	82	93		dBc
3f0			80	89		dBc
2f0		5.5GHz Pin=23dBm	53	65		dBc
3f0			61	75		dBc

(Ta=-40~90°C, VDD=1.8V, VCTL(H)=1.8V, VCTL(L)=0V, Pin=0dBm)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
IL	Insertion Loss: Common port to RF Port1 Common port to RF Port2	10-1000MHz	-	0.40	0.75	dB
		1000-2500MHz	-	0.45	0.85	dB
		2500-5925MHz		0.70	1.05	dB
		5925-7125MHz	-	0.80	1.2	dB
		7125-8250MHz	-	0.95	1.45	dB
		8250-9000MHz	-	1.05	1.55	dB
		9000-10600MHz	-	1.40	1.90	dB
ISO	Isolation: Common port to RF Port1 Common port to RF Port2	10-1000MHz	47.5	56	-	dB
		1000-2500MHz	44.5	52	-	dB
		2500-5925MHz	33.5	40	-	dB
		5925-7125MHz	27.5	35	-	dB
		7125-8250MHz	21.5	31	-	dB
		8250-9000MHz	20.5	28	-	dB
		9000-10600MHz	17.5	24	-	dB
Tsw	Switching Time	Vctl 50% ~ RF 90% or Vctl 50% ~ RF 10%	-	70	300	ns
2f0	Harmonics	2.45GHz Pin=23dBm	77	93		dBc
3f0			78	89		dBc
2f0		5.5GHz Pin=23dBm	51	65		dBc
3f0			59	75		dBc

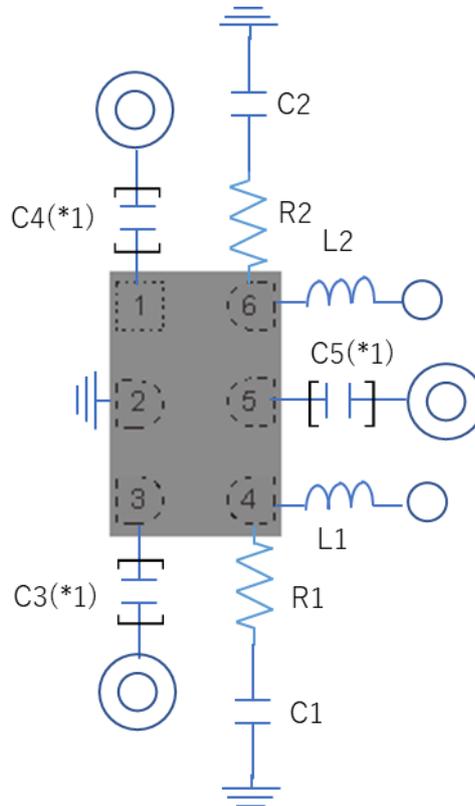
■ Reference : RF Performance RL/ IIP3 /P0.5dB/ HD for WiFi expansion
(Ta=25°C, Vdd=1.8 V, CTL=0 / 1.8 V)

Symbol	Parameter	Conditions	Typ.	Unit
RL	Return Loss: Common Port	10-1000MHz	-25	dB
		1000-2500MHz	-24	dB
		2500-5925MHz	-18	dB
		5925-7125MHz	-16	dB
		7125-8250MHz	-14	dB
		8250-9000MHz	-13	dB
		9000-10600MHz	-10	dB
IIP3	3 rd order input intercept point	2.45GHz Pin=17dBm 20MHz offset	63	dBm
		5.80GHz Pin=17dBm 20MHz offset	53	dBm
P0.5dB	Input Power for 0.5dB compression	2.45GHz	30	dBm
		5.5GHz	29	dBm
		6.175GHz	29	dBm
2f0	Harmonics	6.175GHz Pin=23dBm	61	dBc
3f0			73	dBc

■ Evaluation Board (EVB)

Electrical Performance of XMSSJK8GPA-246 is characterized under the condition where the device is mounted on the EVB.

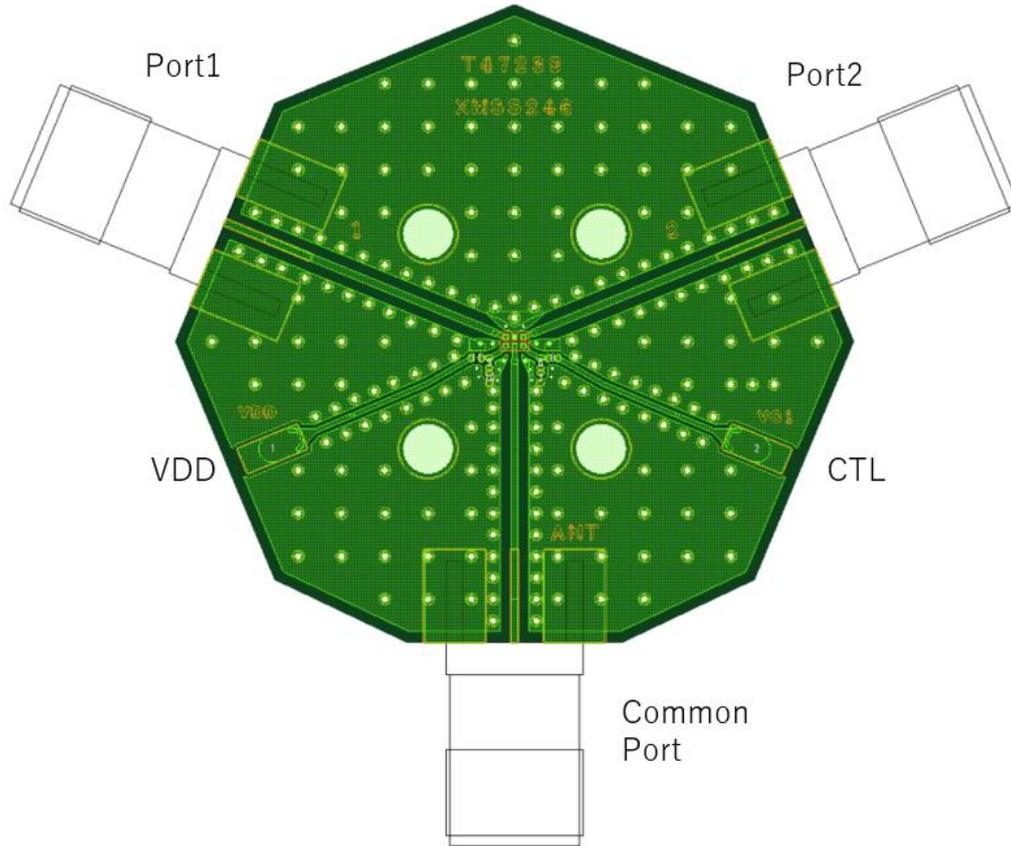
EVB Schematic



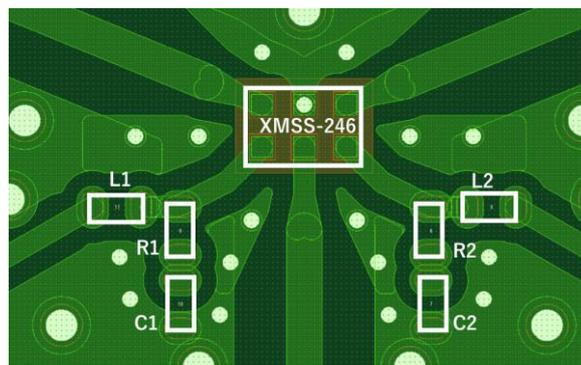
Reference#	Parts Series	Constant	Purpose
C1,C2	GRM033	1pF	RF GND over 8GHz
L1,L2	LQP03HQ	20nH	RF block over 8GHz
R1,R2	ERJ1R	51ohm	termination over 8GHz
[C3,C4,C5] (*1)	[GRM033]	[10pF]	[DC block]

(*1) Remark: DC blocking capacitors on RF ports are necessary when DC voltages are applied from external circuits.

EVB Layout



Overall View



Enlarged around the device

Substrate

Transmission Line: 50Ω

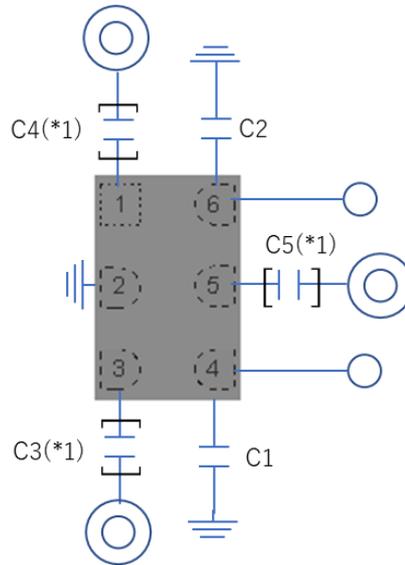
Material: Low Permittivity Glass Fiber Cloth Substrate ($\epsilon_r 3.4$)

Size: 31mm x 30mm

Thickness: 0.2mm+ (Dummy) 0.8mm

■ Reference : RF Performance with minimal external parts for WiFi Application
($T_a=25^{\circ}\text{C}$, $V_{dd}=1.8\text{ V}$, $CTL=0 / 1.8\text{ V}$)

Schematic



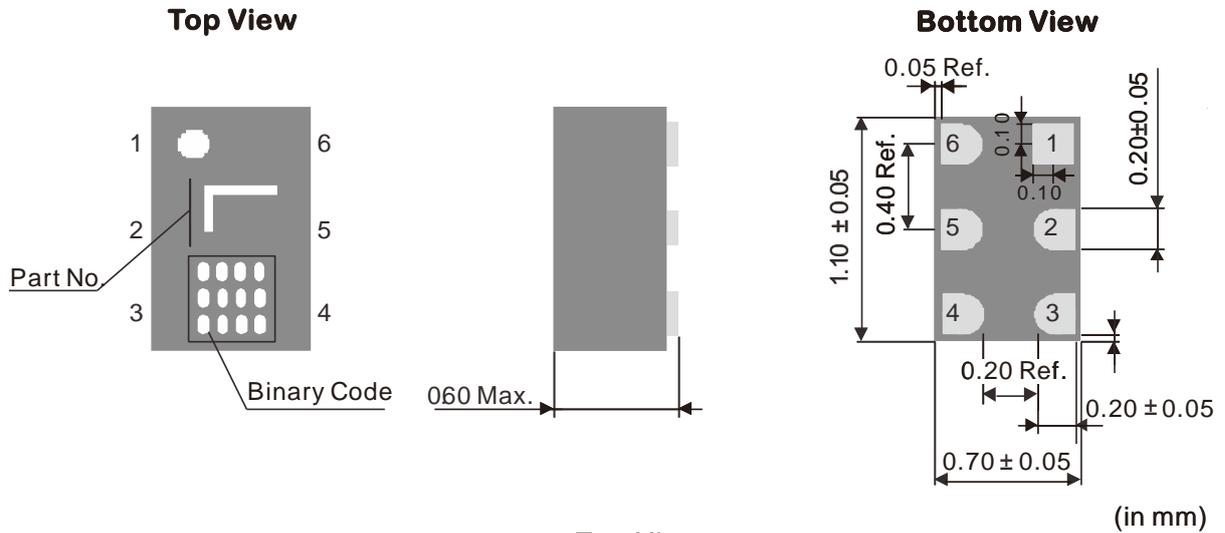
Reference#	Parts Series	Constant
C1,C2	GRM033	1pF
L1,L2	- (ERJ1R)	- (0ohm)
R1,R2	- (ERJ1R)	- (0ohm)
[C3,C4,C5] (*1)	[GRM033]	[10pF]

(*1)Remark: DC blocking capacitors on RF ports are necessary when DC voltages are applied from external circuits.

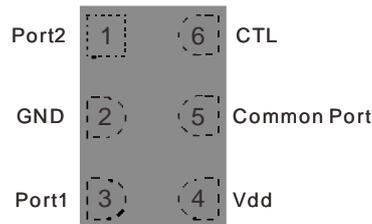
RF Performance IL/ISO/RL

Symbol	Parameter	Conditions	Typ.	Unit
IL	Insertion Loss: Common port to RF Port1 Common port to RF Port2	10-1000MHz	0.40	dB
		1000-2500MHz	0.45	dB
		2500-5925MHz	0.70	dB
		5925-7125MHz	0.80	dB
ISO	Isolation: Common port to RF Port1 Common port to RF Port2	10-1000MHz	56	dB
		1000-2500MHz	52	dB
		2500-5925MHz	40	dB
		5925-7125MHz	35	dB
RL	Return Loss: Common Port	10-1000MHz	25	dB
		1000-2500MHz	24	dB
		2500-5925MHz	18	dB
		5925-7125MHz	16	dB

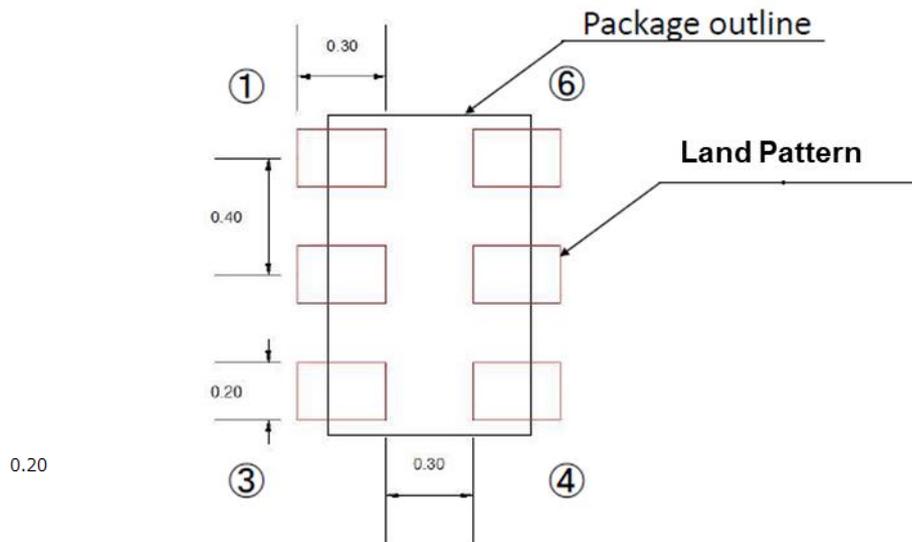
■ Package Outline, Pin Layout, Marking



Top View



■ Land Pattern

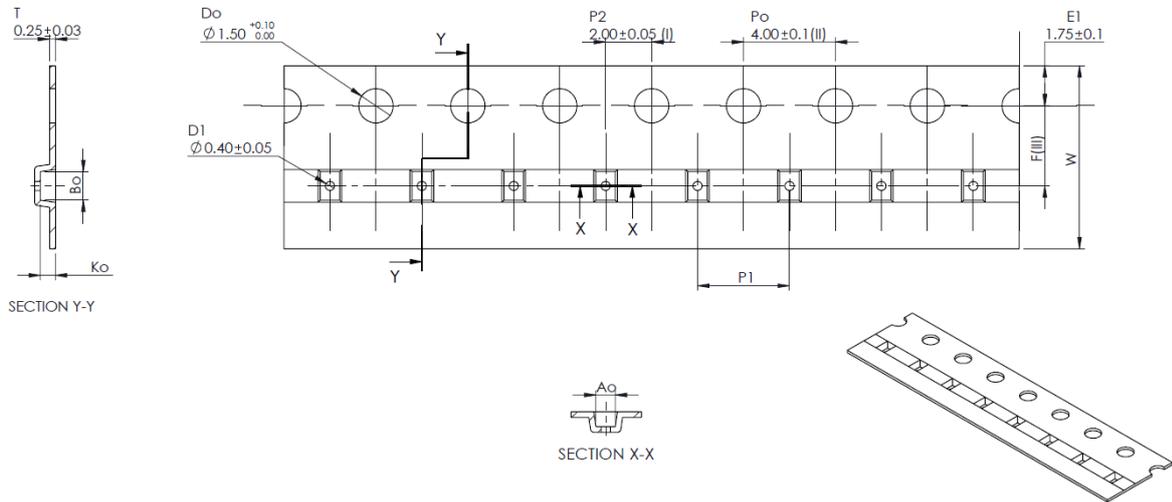


■ Solder Mounting Condition

260 degC max reflow

■ Tape and Reel

Tape



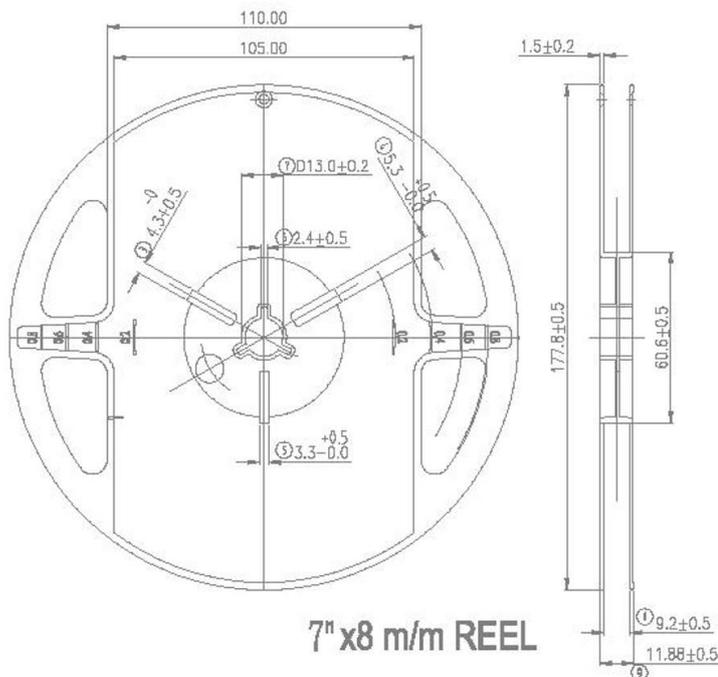
Ao	0.85 +/- 0.05
Bo	1.25 +/- 0.05
Ko	0.65 +/- 0.03 (V)
F	3.50 +/- 0.05
P1	4.00 +/- 0.10
W	8.00 +/- 0.10

CONDITIONALLY COMPLY TO EIA - 481 - E	Customer confirmation for TOOL-UP
W = 8.00 +/- 0.10	Approved by:
D1 = 0.40 +/- 0.05	
Tool Code : ROTARY - 20	Date:
Estimated max. length : 500 meter/15X10CY-CORE 96	

- (I) Measured from centreline of sprocket hole to centreline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is ± 0.20.
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (IV) Other material available.
- (V) No CPK commitment for tolerance ±0.03.

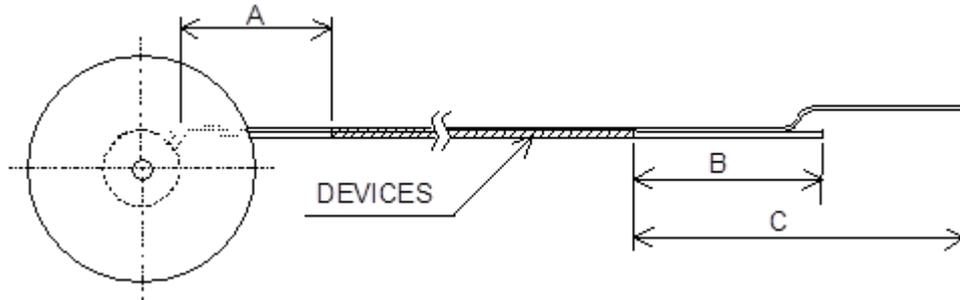
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Reel



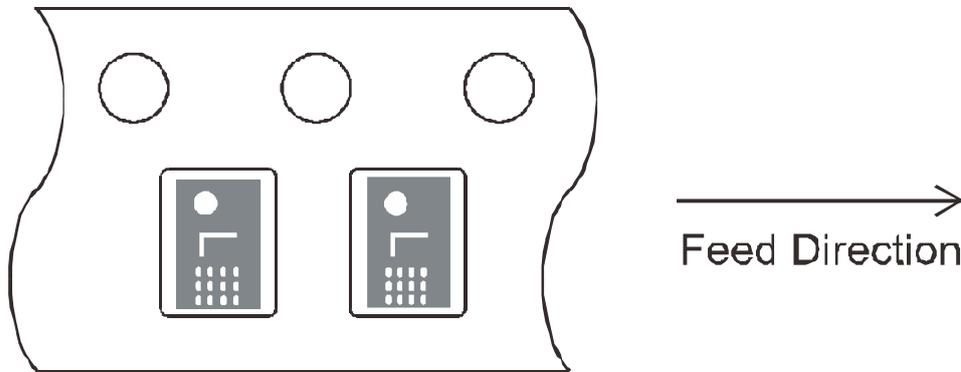
7" x 8 m/m REEL

Leader and Trailer Dimensions



Symbol	Items	Ratings (mm)
A	Trailer	160~
B	Leader with empty cavities	100~
C	Leader	400~

Device Direction



Packing Unit

5000pcs / reel



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