

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

Synchronous Buck Boost Switching Controller IC for USB Power Delivery

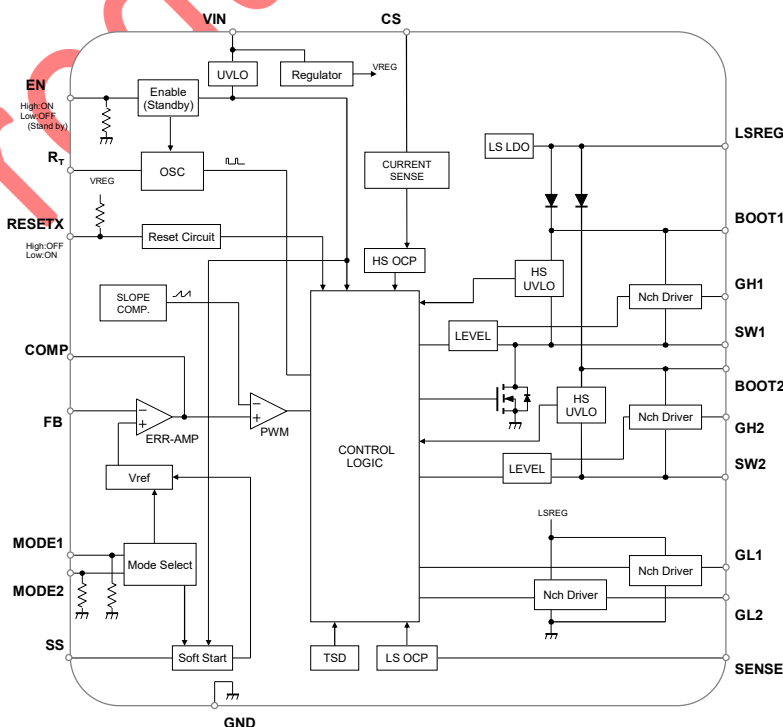
■ FEATURES

- Programmable output voltage control for USB PD
5V, 9V, 15V, 20V (2bit logic input control)
- Wide input voltage range
4.8V to 36V (45V maximum ratings)
- Nch. MOSFET available for all external FETs
- Synchronous operation in all switching topologies
- High efficiency power conversion 90%
- Oscillation frequency 100kHz to 700kHz
- Discharge function at RESETX enable
- Adjustable soft start function
- Protection circuit
 - Over current protection
 - Under voltage lockout
 - Thermal shutdown circuit
- Package EQFN24-LE

■ APPLICATIONS

- USB PD power block

■ BLOCK DIAGRAM



■ DESCRIPTION

The NJW4210 is a buck boost switching controller IC for USB Power Delivery (USB PD) with output voltage select function.

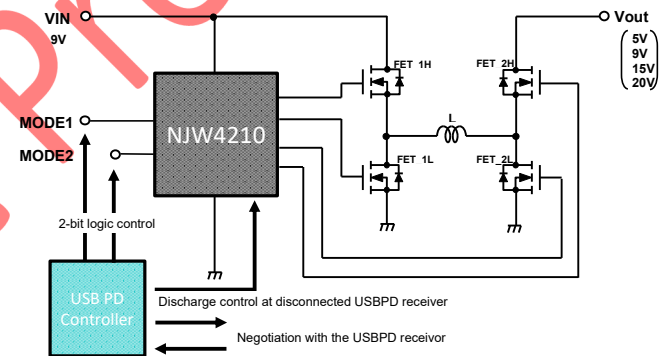
The NJW4210 built-in Nch. MOSFET driver and performs synchronous rectification operation in all switching topologies (boost, step-down, buck-boost).

The NJW4210 has output voltage select function with 2-bit logic input and is compatible with USB PB standard voltages 5V, 9V, 15V and 20V.

The NJW4210 has multiple protection circuits and mounted in a small leadless package EQFN24.

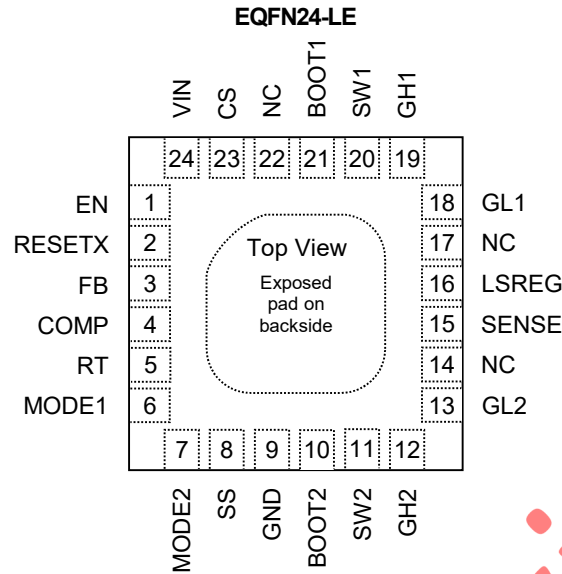
These features make the NJW4210 suitable for USB PD devices.

■ TYPICAL APPLICATION



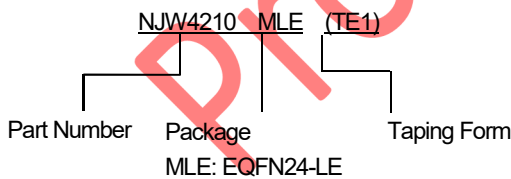
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PIN CONFIGURATIONS



PIN NO.	SYMBOL	DESCRIPTION	PIN NO.	SYMBOL	DESCRIPTION
1	EN	Enable input	13	GL2	Low-side drive output 2
2	RESETX	Reset input (Enable High)	14	N.C.	N.C.
3	FB	Voltage feedback input	15	SENSE	Switching current sense input
4	COMP	Error amp output	16	LSREG	Internal regulator output
5	RT	Oscillation frequency setting(RT)	17	N.C.	N.C.
6	MODE1	Mode select 1 input	18	GL1	Low-side drive output 1
7	MODE2	Mode select 2 input	19	GH1	High-side drive output 1
8	SS	Soft start setting pin	20	SW1	Switching node voltage input 1
9	GND	Ground	21	BOOT1	Bootstrap input 1
10	BOOT2	Bootstrap input 2	22	N.C.	N.C.
11	SW2	Switching node voltage input 2	23	CS	Input current sense input
12	GH2	High-side drive output 2	24	VIN	Supply voltage input

PRODUCT NAME INFORMATION



ORDERING INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ (pcs)
NJW4210MLE (TE1)	EQFN24-LE	yes	yes	yes	4210	31	1000

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■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS		UNIT
VIN pin voltage	V _{IN}	-0.3 to +45		V
CS pin voltage	V _{CS}	-0.3 to +45		V
VIN pin to CS pin voltage	V _{IN-VCS}	7		V
BOOTx voltage	V _{BOOT1} V _{BOOT2}	-0.3 to +45		V
GHx pin voltage	V _{GH1} V _{GH2}	-0.3 to +45		V
SWx pin voltage	V _{SW1} V _{SW2}	-0.3 to +45		V
BOOTx pin to SWx pin voltage	V _{BOOT1-VSW1} V _{BOOT2-VSW2}	+7		V
GHx pin to SWx pin voltage	V _{GH1-VSW1} V _{GH2-VSW2}	+7		V
GLx pin voltage	V _{GL1} V _{GL2}	-0.3 to +7		V
LSREG pin voltage	V _{LSREG}	-0.3 to +7		V
SENSE pin voltage	V _{SENSE}	-0.3 to +7		V
EN pin voltage	V _{EN}	-0.3 to +45		V
RESETX pin voltage	V _{RESETX}	-0.3 to +45		V
RT pin voltage	V _{RT}	-0.3 to +7		V
FB pin Voltage	V _{FB}	-0.3 to +7		V
COMP pin voltage	V _{COMP}	-0.3 to +7		V
MODEx pin voltage	V _{MODE1} V _{MODE2}	-0.3 to +7		V
SS pin Voltage	V _{SS}	-0.3 to +7		V
Power Dissipation(Ta=25°C)	P _D	EQFN24-LE	1000 ⁽¹⁾ 2400 ⁽²⁾	mW
Junction Temperature	T _J	-40 to +150		°C
Storage Temperature	T _{stg}	-50 to +150		°C

(1): Mounted on glass epoxy board. (101.5×114.5×1.6mm;based on EIA/JEDEC standard,2layers, with Exposed Pad)

(2): Mounted on glass epoxy board. (101.5×114.5×1.6mm;based on EIA/JEDEC standard,4layers, with Exposed Pad)

(For 4Layers: Applying 99.5×99.5mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	V _{IN}	4.8 to 36	V
EN pin voltage	V _{EN}	0 to 40	V
RESETX pin voltage	V _{RESETX}	0 to 5.5	V
MODEx pin voltage	V _{MODE1} V _{MODE2}	0 to 5.5	V
Timing Resistor	R _T	6.8 to 56	kΩ
Operating Frequency	f _{OSC}	100 to 700	kHz
CLSREG	C _{LSREG}	1	μF
CBOOT	C _{BOOT}	0.1	μF
Operating Temperature	T _{opr}	-40 to +125	°C

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

■ ELECTRICAL CHARACTERISTICS

(Unless otherwise noted, $V_{IN}=12V$, $V_{EN}=5V$, $V_{SENSE}=0V$, $R_T=10k\Omega$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
GENERAL CHARACTERISTICS						
Quiescent Current	I_Q	Not Switching	–	4	4.5	mA
Standby Current	I_{Q_STBY}	$V_{EN} = L$	–	1	2	μA
UNDER VOLTAGE LOCKOUT						
ON Threshold Voltage	V_{T_ON}	$V_{IN} = L \rightarrow H$	4.5	4.65	4.8	V
OFF Threshold Voltage	V_{T_OFF}	$V_{IN} = H \rightarrow L$	4.3	4.45	4.6	V
Hysteresis Voltage	V_{HYS}		100	200	–	mV
EN CONTROL (EN)						
ON Threshold Voltage	V_{THH_EN}	$V_{EN} = L \rightarrow H$	1.6	–	V_{IN}	V
OFF Threshold Voltage	V_{THL_EN}	$V_{EN} = H \rightarrow L$	0	–	0.5	V
Input Bias Current	I_{EN}	$V_{EN} = 5V$	–	2	4.5	μA
RESET CONTROL (RESETX)						
ON Threshold Voltage	V_{THH_RESETX}	$V_{RESETX} = H \rightarrow L$	0	–	0.5	V
OFF Threshold Voltage	V_{THL_RESETX}	$V_{RESETX} = L \rightarrow H$	2	–	5.5	V
Input Bias Current	I_{RESETX}	$V_{RESETX} = 0V$	–	-5	-8	μA
ERROR AMP.						
Reference Voltage 1	V_{B1}	MODE1 = L, MODE2 = L	-1.0%	0.5	+1.0%	V
Reference Voltage 2	V_{B2}	MODE1 = H, MODE2 = L	-1.5%	0.9	+1.5%	V
Reference Voltage 3	V_{B3}	MODE1 = L, MODE2 = H	-1.5%	1.5	+1.5%	V
Reference Voltage 4	V_{B4}	MODE1 = H, MODE2 = H	-1.5%	2	+1.5%	V
Input Bias Current	I_{FB}		-0.1	–	0.1	μA
SOFT START						
SS pin Output Current	I_{SS}		12	16	20	μA
CURRENT SENSE (SENSE)						
Threshold Voltage	V_{SENSE}		100	130	160	mV
Input Bias Current	I_{SENSE}	$V_{SENSE} = 5V$	–	–	0.1	μA
Cool Down Time	t_{COOL}		–	110	–	ms
CURRENT SENSE (CS)						
Threshold Voltage	V_{CS}		100	130	160	mV
Input Bias Current	I_{CS}	$V_{IN} - V_{CS} = 5V$	–	–	0.1	μA
Cool Down Time	t_{COOL}		–	110	–	ms
OSCILLATOR						
Oscillating Frequency 1	f_{OSC1}	$R_T = 56k\Omega$	90	100	110	kHz
Oscillating Frequency 2	f_{OSC2}	$R_T = 10k\Omega$	450	500	550	kHz
Oscillating Frequency 3	f_{OSC3}	$R_T = 6.8k\Omega$	630	700	770	kHz
PWM COMPARATOR						
Minimum OFF Time	$t_{OFF-min}$		–	350	–	ns
Minimum ON Time	t_{ON-min}		–	80	–	ns

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

■ **ELECTRICAL CHARACTERISTICS**

(Unless otherwise noted, $V_{IN}=12V$, $V_{EN}=5V$, $V_{SENSE}=0V$, $R_T=10k\Omega$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LDO						
Output Voltage	V_{LSREG}	$V_{IN}=12V$	4.5	5.0	5.5	V
Dropout Voltage	$V_{DROPOUT}$	$I_{LSREG}=-50mA$	300	400	500	mV
GATE DRIVER						
HS Output ON Resistance	R_{GHH1} R_{GHH2} R_{GLH1} R_{GLH2}	$I_{GxHx}=-50mA$	–	3	4.5	Ω
LS Output ON Resistance	R_{GHL1} R_{GHL2} R_{GLL1} R_{GLL2}	$I_{GxLx}=+50mA$	–	3	4.5	Ω
SW1 pin Shunt Switch ON Resistance	R_{ON-SW1}		–	35	–	Ω
MODE CONTROL (MODEx)						
ON Threshold Voltage	V_{THH_MODE1} V_{THH_MODE2}	$V_{THH_MODEx}=L \rightarrow H$	2	–	5.5	V
OFF Threshold Voltage	V_{THL_MODE1} V_{THL_MODE2}	$V_{THL_MODEx}=H \rightarrow L$	0	–	0.5	V
Input Bias Current	I_{MODE1} I_{MODE2}	$V_{THL_MODEx}=5V$	–	10	12	μA

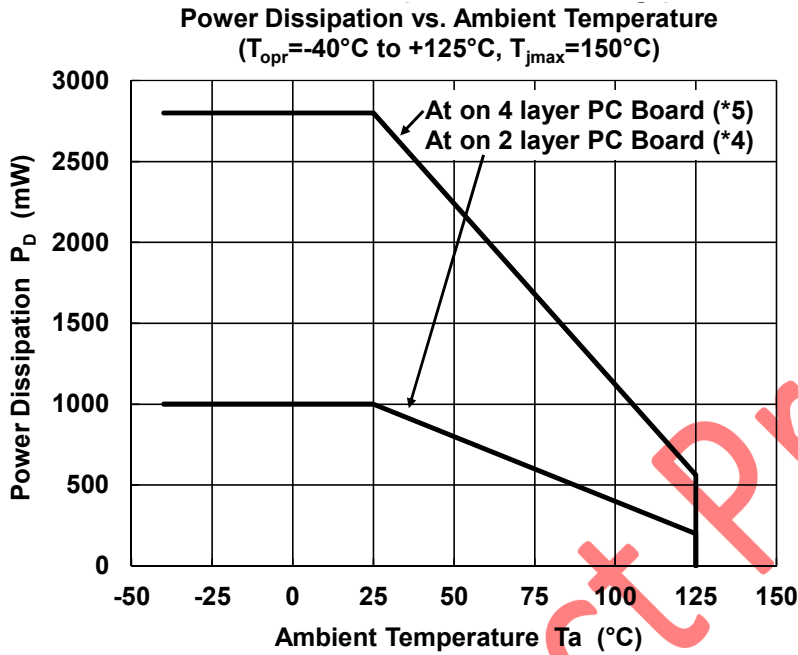
Product Preview

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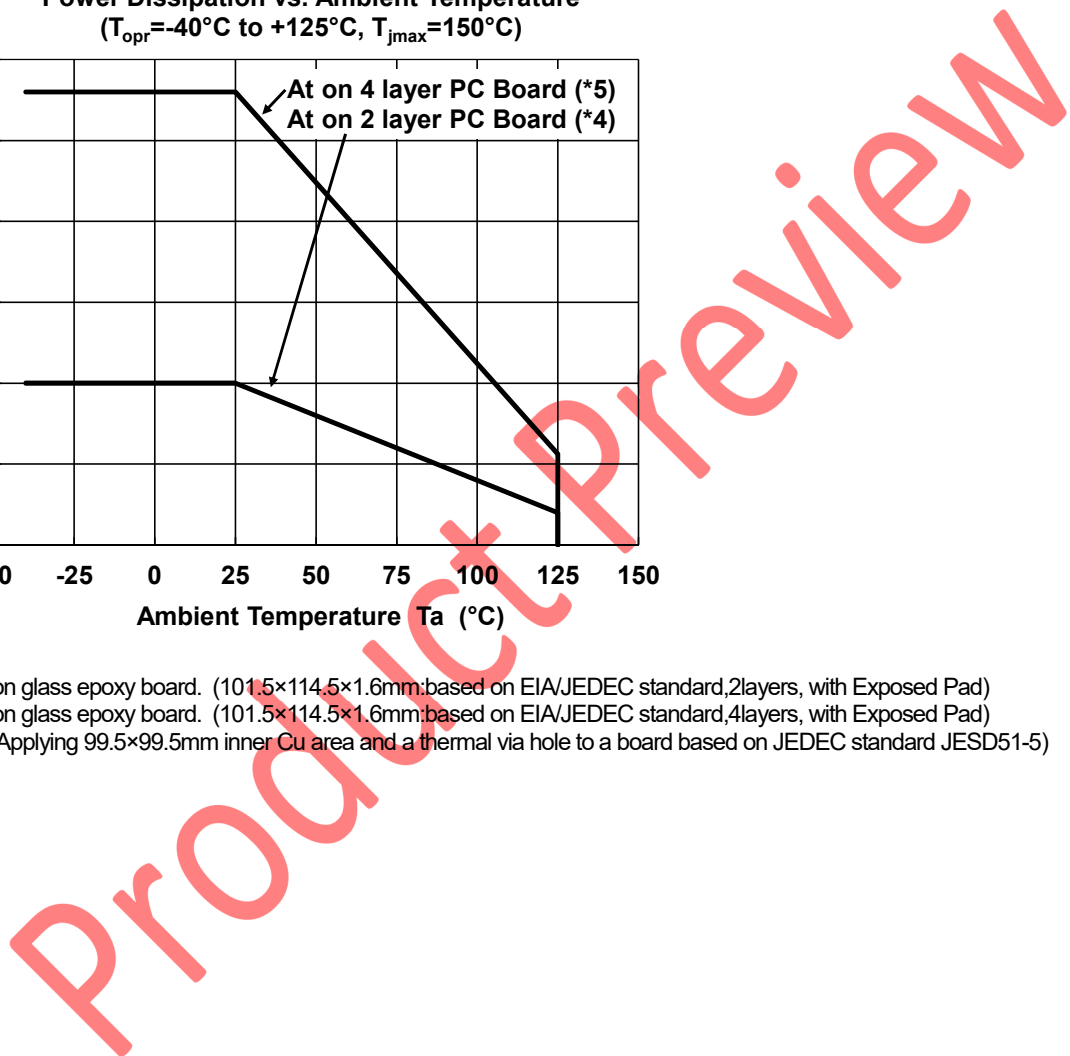
■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	VALUE	UNIT
Junction-To-Ambient Thermal Resistance EQFN24-LE	θ_{ja}	2-Layer / 4-Layer 126 ⁽⁴⁾ / 45 ⁽⁵⁾	°CW
Junction-To-Top of Package Characterization Parameter EQFN24-LE	ψ_{jt}	2-Layer / 4-Layer / High Power 4-Layer 8.0 ⁽⁴⁾ / 2.8 ⁽⁵⁾	°CW

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



(1): Mounted on glass epoxy board. (101.5×114.5×1.6mm:based on EIA/JEDEC standard,2layers, with Exposed Pad)
 (2): Mounted on glass epoxy board. (101.5×114.5×1.6mm:based on EIA/JEDEC standard,4layers, with Exposed Pad)
 (For 4Layers: Applying 99.5×99.5mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)



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■ **TYPICAL CHARACTERISTICS**

In preparation

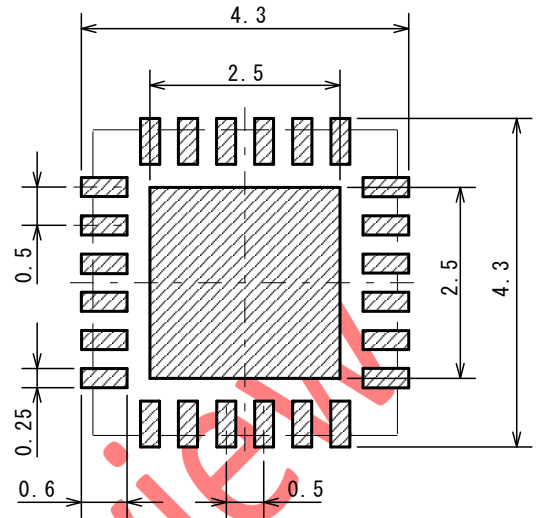
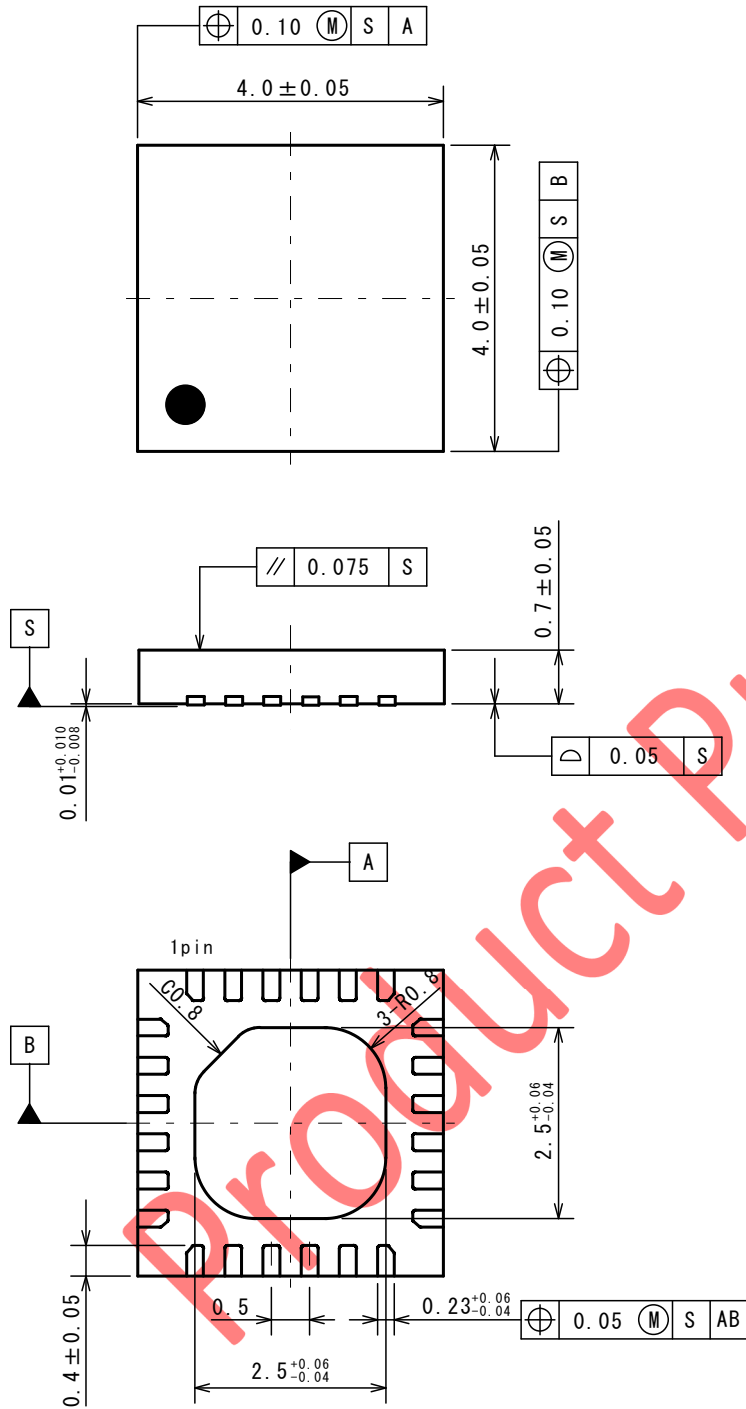
■ **APPLICATION NOTE**

In preparation

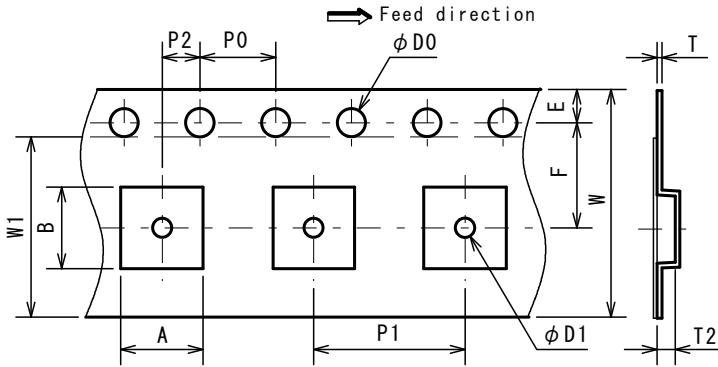
Product Preview

■ PACKAGE DIMENSIONS

■ EXAMPLE OF SOLDER PADS DIMENSIONS

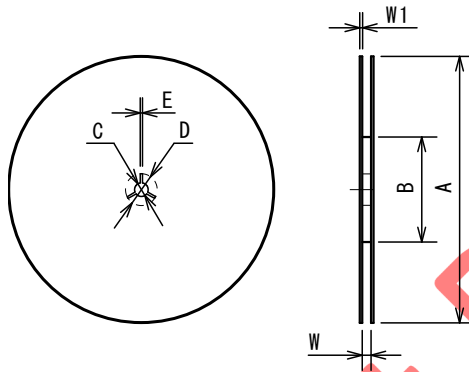


■ PACKING SPEC
TAPING DIMENSIONS



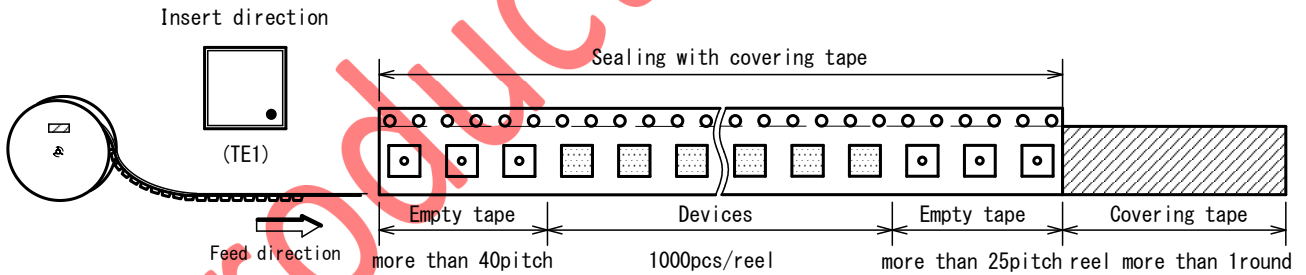
SYMBOL	DIMENSION	REMARKS
A	4.35±0.05	BOTTOM DIMENSION
B	4.35±0.05	BOTTOM DIMENSION
D0	1.5 ^{+0.1} ₀	
D1	1.0±0.1	
E	1.75±0.1	
F	5.5±0.05	
P0	4.0±0.1	
P1	8.0±0.1	
P2	2.0±0.1	
T	0.3±0.05	
T2	1.3±0.05	
W	12.0±0.3	
W1	9.5	THICKNESS 0.1max

REEL DIMENSIONS

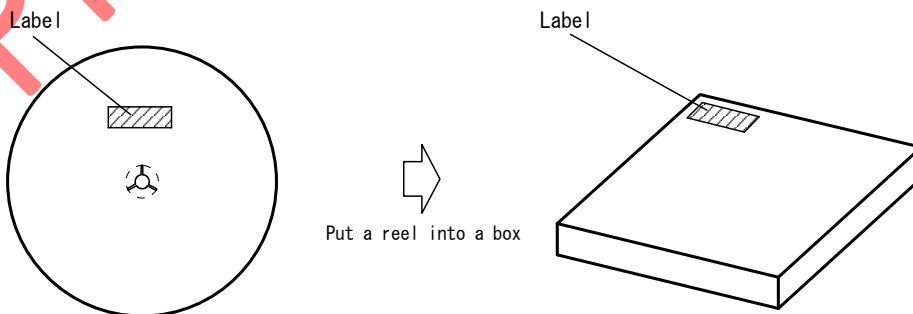


SYMBOL	DIMENSION
A	φ 180 ^{+0.5}
B	φ 60 ⁺¹ ₀
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	13 ^{+1.0} ₀
W1	1.2

TAPING STATE



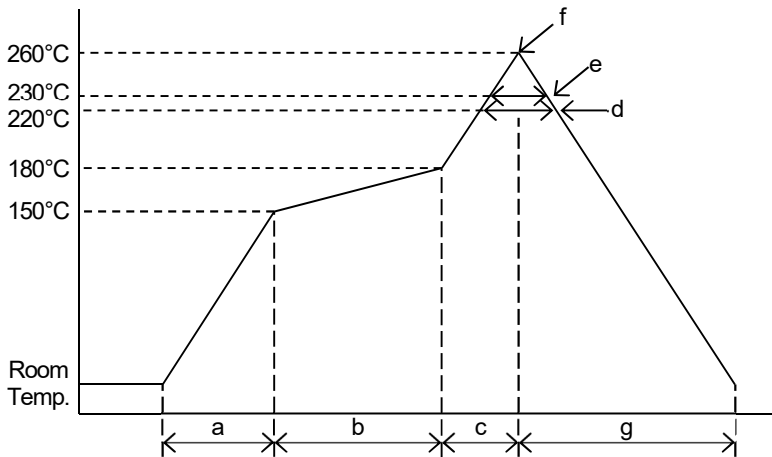
PACKING STATE



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■ **RECOMMENDED MOUNTING METHOD**

INFRARED REFLOW SOLDERING PROFILE



a	Temperature ramping rate	1 to 4°C/s
b	Pre-heating temperature	150 to 180°C
	Pre-heating time	60 to 120s
c	Temperature ramp rate	1 to 4°C/s
d	220°C or higher time	shorter than 60s
e	230°C or higher time	shorter than 40s
f	Peak temperature	lower than 260°C
g	Temperature ramping rate	1 to 6°C/s

The temperature indicates at the surface of mold package.

■ **REVISION HISTORY**

DATE	REVISION	CHANGES
March 31, 2021	Ver.0.8	Revised datasheet format

Product Preview

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[CAUTION]

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 - Vehicle Control Equipment (Airplane, railroad, ship, etc.)
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