Key Features

- AEC-Q100 qualified for automotive applications
  - Temperature grade 1: -40℃ to 125℃, T_A
- Device junction temperature range
  - -40℃ to 150℃ T_J
- 3 V to 60 V wide input voltage range with up to 65 V transient
- RJR830xx : Maximum output current: 300mA
- Low quiescent current
  - 0.4 uA typical when EN = Low
  - 5.0 uA typical at light loads
- 2% output-voltage accuracy over line, load and temperature
- Typical dropout voltage: 450 mV at 300 mA load current for fixed 5 V output version
- Stable with low-ESR (0.001Ω to 5Ω) ceramic output-stability capacitor (1uF to 200uF)
- Fixed 5 V,3.3 V,2.5 V and 1.8V output voltage
- Adjustable output voltage max 15V
- Integrated fault protection
  - Over Temperature Protection
  - Over Current Protection
  - Short-circuit protection
- Package Options
  - SOP8-EP

Applications

- Applications with direct battery connection
- Infotainment
- Dashboard
- Body control module

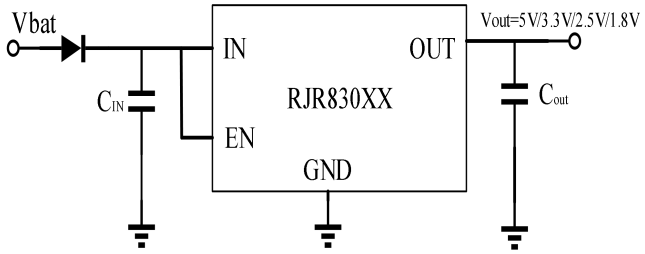
Description

The RJR830 series is a low-dropout linear regulator designed for up to 60V V_{IN} applications. With only a 5.0-μA typical quiescent current at light load, the device is an optimal solution for powering micro-controllers and controller area network and local interconnect network transceivers in standby systems. The device features integrated short-circuit and over current protection. This device operates in ambient temperatures from –40°C to +125°C.

Device Information

Part Number	*Output voltage*	*Package*
RJR83050-QHSPR	5.0V	SOP8-EP
RJR83033-QHSPR	3.3V	SOP8-EP
RJR83025-QHSPR	2.5V	SOP8-EP
RJR83018-QHSPR	1.8V	SOP8-EP

Typical Application



Typical Application Circuit (fixed output)

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1. Pin Configuration and Functions

RJR83050、RJR83033、RJR83025、RJR83018 : SOP8-EP

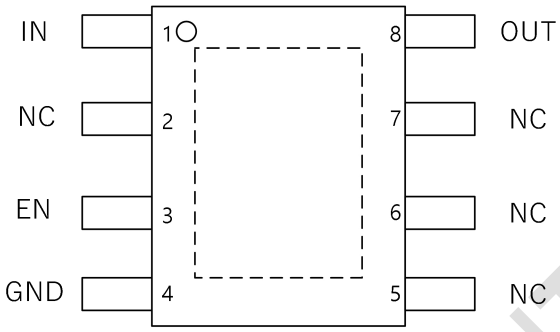


Figure 1 SOP8-EP, Pin-out, Top View

PIN NO.	SYMBOL	FUNCTION
1	IN	Power supply pin.
2,5,6,7	NC	Not connected.
3	EN	Enable.
4	GND	Ground reference.
8	OUT	Regulated output voltage pin.

2. Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
V_{IN}	Unregulated input	-0.3	65	V
V_{EN}	Enable input	-0.3	V_{IN}	V
V_{OUT}	Regulated output	-0.3	7	V
T_J	Junction temperature range	-40	150	℃
T_{stg}	Storage temperature range	-40	150	℃

3. ESD Ratings

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model	AEC Q100-002	±4	kV
CDM	Charged Device Model	AEC Q100-011	±750	V

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4. Recommended Operating Conditions

Symbol	Parameter	Min	Typ.	Max	Unit
V_{IN}	Unregulated input	3		60	V
V_{EN}	Enable input	0		V_{IN}	V
C_{OUT}	Output Capacitor Requirements	1		200	μF
ESR	Output Capacitor ESR Requirements	0.001		5	Ω
T_A	Ambient Temperature Range	-40		125	℃
T_J	Junction temperature range	-40		150	℃

5. Thermal Information

5.1 Thermal Information in SOP8-EP Package

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	45	℃/W
$R_{\theta JB}$	Junction-to-board thermal resistance	42	℃/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	88.8	℃/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	10.7	℃/W

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6. Specifications

6.1 Electrical Characteristics

All test conditions: V_{IN} = 13.5 V, T_A = -40℃ to +125℃. Unless otherwise noted, typical value is at T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
Supply Input Voltage and Current						
V_{IN}	Input Supply Voltage Range		3		60	V
UVLO	V_{IN} Under-Voltage Lockout Threshold	Ramp Vin down until the output turns off		2.1	2.8	V
		hysteresis		100		mV
I_{SD}	Shutdown Current	V_{EN} = 0 V		0.4	2	μA
I_Q	Quiescent Current	I_{OUT} = 0 mA		4	6.5	μA
		I_{OUT} = 0.1 mA		5	7.5	μA
Enable Input Voltage and Current						
$V_{IH,EN}$	EN Logic Input High (Enable)		2.7		V_{IN}	V
$V_{IL,EN}$	EN Logic Input Low (Disable)		0		0.6	V
I_{EN}	EN Pin Leakage Current	V_{EN} = 2.7 V to 60 V			200	nA
Regulated Output Voltage and Current						
V_{OUT_ERR}	Output Accuracy	V_{IN} = 6 V to 40 V, I_{OUT} = 1 mA to 300 mA	-2%		2%	
		V_{IN} = 60 V ,I_{OUT} = 1mA to 100mA				
V_{Line_Reg}	Line Regulation	V_{IN} = 6 V to 60 V, I_{OUT} = 10 mA		30	40	mV
V_{Load_Reg}	Load Regulation	I_{OUT} = 1 mA to 300 mA		20	40	mV
V_{DO}	Dropout Voltage	I_{OUT} = 150 mA, V_{OUT} = 5V		200	400	mV
		I_{OUT} = 300 mA, V_{OUT} = 5V		450	800	mV
I_{OUT}	Output Current Range	V_{OUT} in regulation	0		300	mA
I_{CL}	Output Current Limit	V_{OUT} is forced to 0.9*V_{OUT}(NOM)	400	600	800	mA
t_{SU}	Start-Up Time	R_{LOAD}=500Ω, V_{OUT} = 5V, C_{OUT}=22μF, V_{OUT} from 10% to 90%		2		ms
PSRR	Power supply ripple rejection	V_{Ripple_pp} = 0.5 V, I_{OUT} = 10 mA, Frequency = 100 Hz, C_{OUT} = 2.2 uF		60		dB
		V_{Ripple_pp} = 0.5 V, I_{OUT} = 10 mA, Frequency = 1 kHz, C_{OUT} = 2.2 uF		40		dB
Temperature Range						
T_{SD}	Device thermal shutdown temperature			150		℃
T_{HYST}	Device thermal shutdown temperature hysteresis			20		℃

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6.2 Typical characteristics

At TA =-40℃ to +125℃,VIN=13.5V,and V_EN>2V （unless otherwise noted）

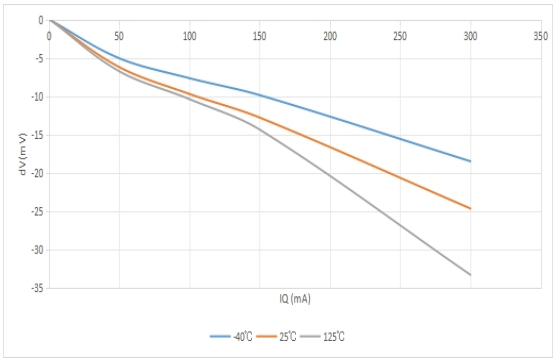


Figure 3 Load regulation ΔVQ load versus output current I_Q

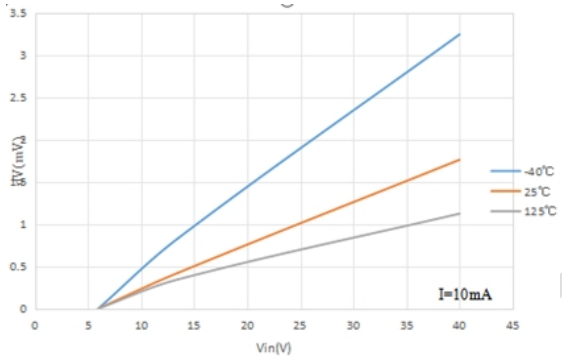


Figure 4 line regulation ΔVQ load versus input voltage VI

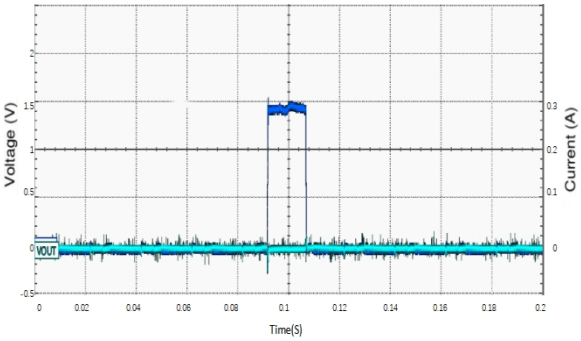


Figure 5 V_{OUT}=5V,C_{IN}=1uF,C_{OUT}=1uF,
I_{OUT}=1mA~300mA~1mA ,slew rate=1mA/us

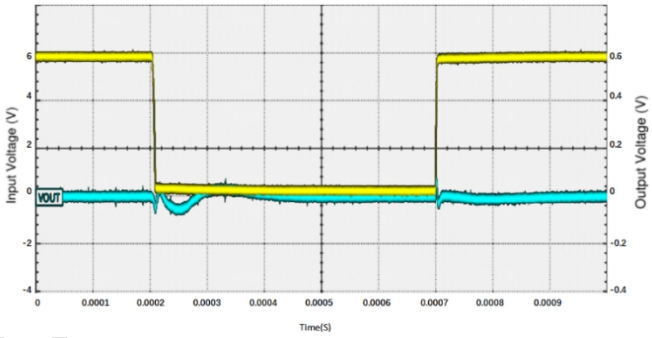


Figure 6 V_{OUT}=5V,C_{IN}=0uF,C_{OUT}=10uF.
V_{IN}=13.5V~7.5V~13.5V ,slew rate=1V/us

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7. Detailed Description

7.1 Overview

The RJR830 series is a 60V, 300mA, low-dropout linear regulator with ultralow quiescent current. The quiescent current of the device is only 5.0uA under light load, and is quite suitable for the automotive application.

7.2 Block Diagram

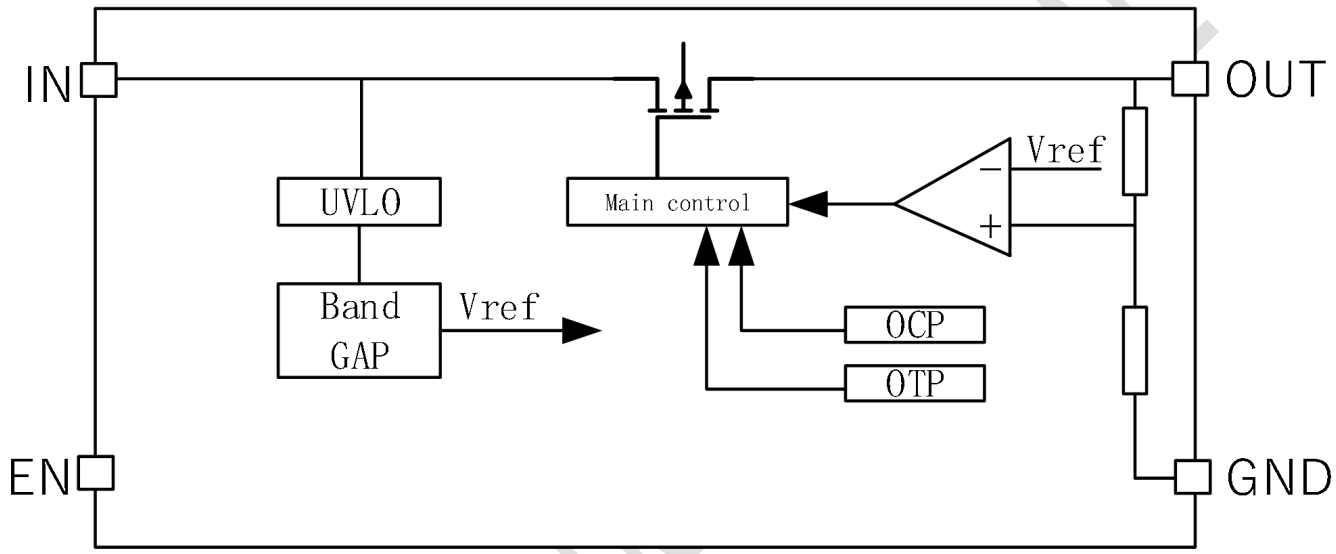


Figure 7 function block diagram of fixed Vout version

7.3 Feature Description

7.3.1 Device Enable

The EN pin is a high-voltage-tolerant pin. Connect this pin to an external micro-controller or a digital circuit to enable and disable the device, when the voltage of EN pin is higher than EN rising threshold (minimum 2.7V), the chip is on, when the voltage of EN pin is lower than EN falling threshold (maximum 0.6V).Please don't let the EN PIN float.

7.3.2 Under voltage Shutdown

An under-voltage lockout (UVLO) circuit is integrated in the device. when the voltage of VIN is lower than threshold voltage V_{UVLO}, the device is kept off .and when the voltage of VIN is higher than the required threshold voltage, the device restarts to work.

7.3.3 Current Limit

The current limit protection circuit is integrated in the device. when the current of load is higher than the current limit threshold or output pin is shorted to ground, the current of output is limited at a threshold value.

7.3.4 Thermal Shutdown

A thermal shutdown (TSD) circuit is integrated in the device. when junction temperature of the device is higher

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than the TSD trip point, the output turns off immediately. When the junction temperature of the device falls below the TSD trip point minus the thermal shutdown hysteresis, the output turns on again.

7.4 Typical Application

7.4.1 Application circuit

The RJR830 series is a 300mA low-dropout linear regulator with ultralow quiescent current. Figure 9 shows a typical application circuit for the RJR830 series.

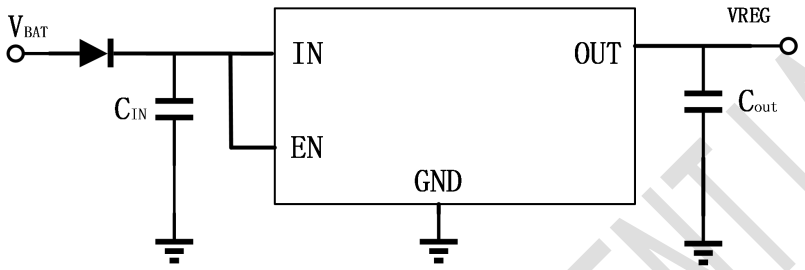


Figure 9 typical application circuit of RJR830 series

7.4.2 Input Capacitor

Although an input capacitor is not required for stability. A decoupling capacitor is needed with a minimum 0.1uF capacitor from IN to GND. This capacitor counteracts reactive input sources and improves transient response, input ripple rejection, and PSRR. The voltage rating must be greater than the maximum input voltage.

7.4.3 Output Capacitor

To ensure the stability of the RJR830 series, the device requires an output capacitor with a value in the range from 1 µF to 200 µF and with an ESR range between 0.001 Ω and 5 Ω. It is recommended to select a ceramic capacitor with low ESR to improve the load transient response.

7.4.4 Power Dissipation and thermal calculations

The power dissipation of the device consists of two parts:

1. MOSFET voltage drop from input to output.

2. other basic circuit in the device.so the power dissipation can be approximated using Equation 1:

$$P_D = (V_{IN} - V_{OUT}) * I_{OUT} + V_{IN} * I_Q \quad [1]$$

And the junction temperature (T_J) can be calculated by combining the top case temperature (T_c) and junction-to-case characterization parameter (ψ_{JC}).as shown in Equation 2:

$$T_J = \psi_{JC} * P_D + T_C \quad [2]$$

It's recommended to estimate the junction temperature for the application to avoid long-term operating temperatures exceeding 150 °C.

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8. Layout

8.1 Layout Guidelines

Layout is an important step for LDO power supplies. The input capacitor should be close to IN pin, the output capacitor should be close to current path. and the trace of input and output should be wide enough for rating current capability. To improve the thermal performance of the device, and to maximize the current output at high ambient temperature, spread the copper under the thermal pad as far as possible and put enough thermal vias on the copper under the thermal pad. Figure 10 shows an example layout.

8.2 Layout Example

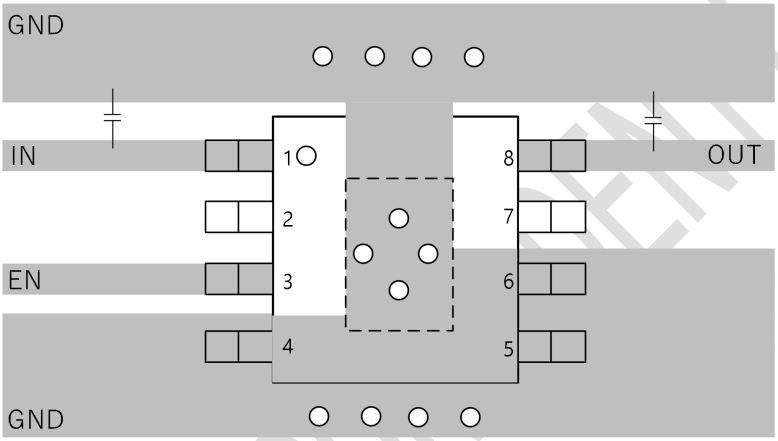


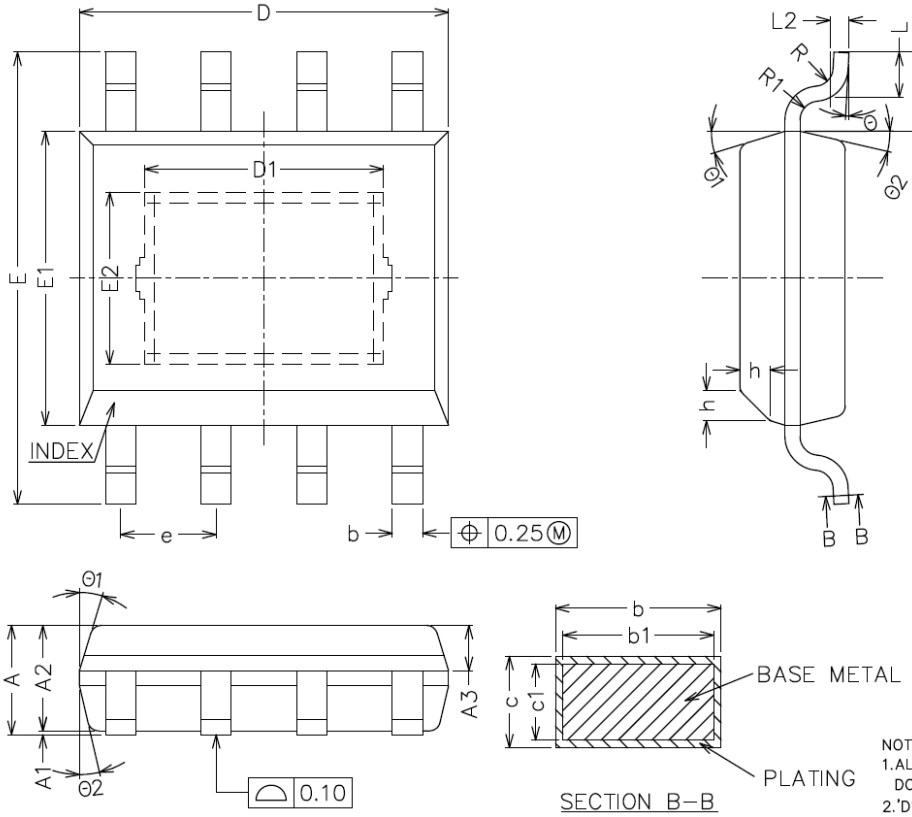
Figure 10 RJR830 series example layout diagram

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9. Package Information

9.1 SOP8-EP



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

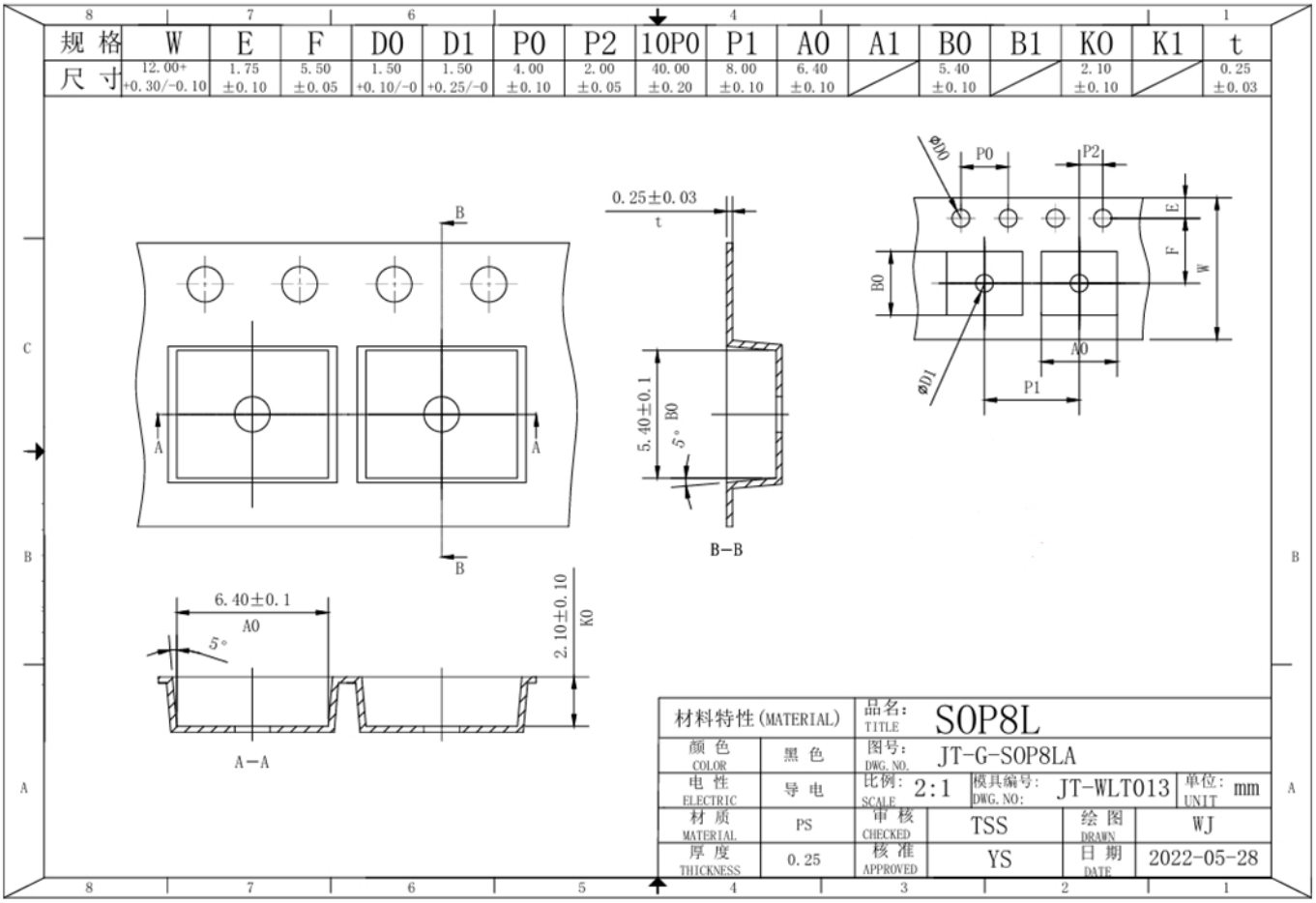
SYMBOL	MIN	NOM	MAX
A	1.35	1.45	1.65
A1	0	–	0.15
A2	1.35	1.40	1.50
A3	0.50	0.60	0.70
b	0.38	–	0.47
b1	0.37	0.40	0.43
c	0.17	–	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
D1	3.02	3.17	3.32
	1.98	2.13	2.28
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E2	2.13	2.28	2.43
	1.98	2.13	2.28
e	1.17	1.27	1.37
L	0.45	0.60	0.80
L1	1.04REF		
L2	0.25BSC		
R	0.07	–	–
R1	0.07	–	–
h	0.30	0.40	0.50
Θ	0°	–	8°
Θ1	15°	17°	19°
Θ2	11°	13°	15°

NOTES:
1.ALL DIMENSIONS REFER TO JEDEC STANDARD MS-012 BA
DO NOT INCLUDE MOLD FLASH OR PROTRUSION.
2.'D1' AND 'E2' ARE VARIABLES DEPENDING ON DIE PAD SIZES.

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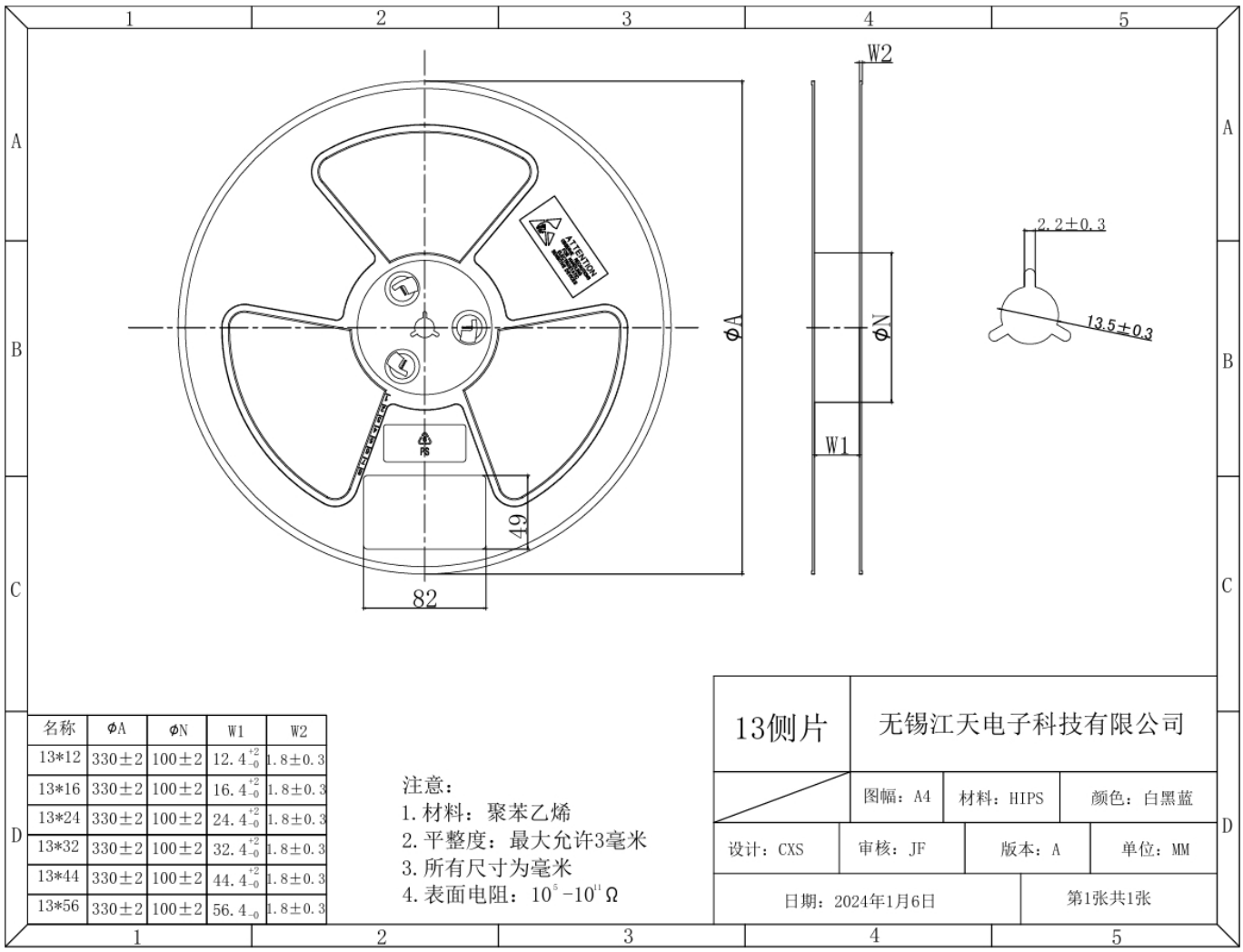
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9.2 Tape And Reel Information



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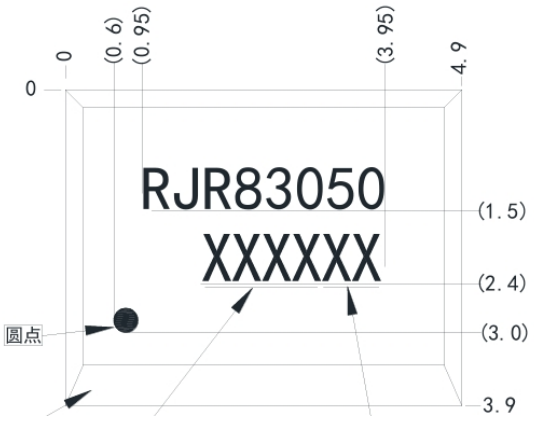


名称	ΦA	ΦN	W1	W2
13*12	330±2	100±2	12.4 $^{+2}_{-0}$	1.8±0.3
13*16	330±2	100±2	16.4 $^{+2}_{-0}$	1.8±0.3
13*24	330±2	100±2	24.4 $^{+2}_{-0}$	1.8±0.3
13*32	330±2	100±2	32.4 $^{+2}_{-0}$	1.8±0.3
13*44	330±2	100±2	44.4 $^{+2}_{-0}$	1.8±0.3
13*56	330±2	100±2	56.4 $^{+2}_{-0}$	1.8±0.3

注意：
1. 材料：聚苯乙烯
2. 平整度：最大允许3毫米
3. 所有尺寸为毫米
4. 表面电阻：10^5-10^{11}Ω

13侧片	无锡江天电子科技有限公司		
	图幅：A4	材料：HIPS	颜色：白黑蓝
设计：CXS	审核：JF	版本：A	单位：MM
日期：2024年1月6日		第1张共1张	

10 PrintForm Information



Line1: Part Number, fixed
Line2: Digit Date Code&2 bit flow code

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11 Order Information

Orderable Device	MSL	Package Type	Package Qty
RJR83050-QHSPR	3	SOP8-EP	2500
RJR83033-QHSPR	3	SOP8-EP	2500
RJR83025-QHSPR	3	SOP8-EP	2500
RJR83018-QHSPR	3	SOP8-EP	2500

12 Revision history

Revision	Description	Date
0.1	Initial version	2024/08
0.2	Update EC table & ordering information	2025/07
0.3	Update feature description	2025/08
0.4	Update operating voltage	2026/02

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