

High-Performance Non-Isolated AC-DC

1 Description

CN1303A integrates a PWM controller and 1200V MOSFET which makes it ideal for low-power, non-isolated switching power supplies that require a minimal number of external components. CN1303A integrates high voltage startup to achieve ultra-low standby power consumption and frequency dithering technology to simplify system EMI design.

CN1303A provides excellent protection functions, including under voltage lockout protection (UVLO), over voltage protection (OVP), over temperature protection (OTP), overload protection (OCP), output short-circuit protection (SCP).

2 Features

- Built-in 1200V MOSFET
- 12V output voltage (CN1303AUFU12 and CN1303ASHR12)
- 15V output voltage (CN1303AUFU15 and CN1303ASHR15)
- 40kHz (typical) maximum switching frequency
- Burst skip-cycle mode control in light load for high efficiency
- Frequency shuffling for EMI improvement
- Soft-start
- Output short circuit protection
- VDD under voltage lockout protection
- VDD over voltage protection
- Overload protection
- Over temperature protection

3 Applications

- Switching power supply
- Smart Meter
- Small household appliances
- Non-isolated auxiliary power supply

4 Ordering Information

Product No.	Package	Quantity/Tube
CN1303AUFU12	DIP-7	50/Tube
CN1303AUFU15	DIP-7	50/Tube
CN1303ASHR12	SOP-8	4000/Tape
CN1303ASHR15	SOP-8	4000/Tape

5 Marking

Product No.	Marking
CN1303AUFU12	CN03A12 YYWW
CN1303AUFU15	CN03A15 YYWW
CN1303ASHR12	CN03A12 YYWW
CN1303ASHR15	CN03A15 YYWW

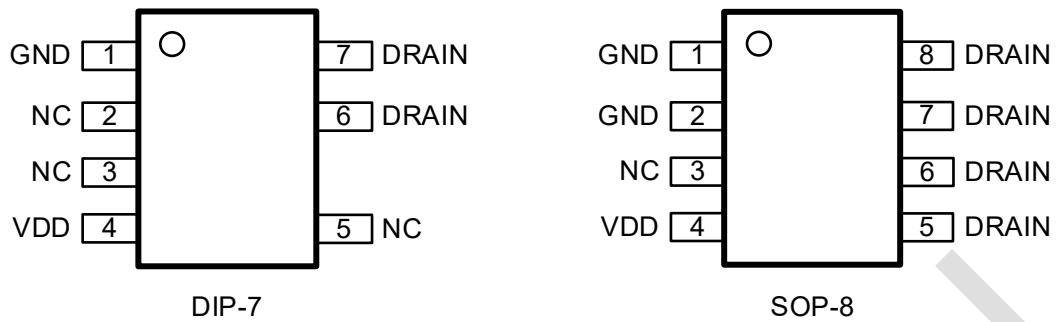
Note: YY=Year; WW=Week

Green (RoHS & HF): CHIPNORTH defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your CHIPNORTH representative directly.
Moisture sensitivity level (MSL): 3

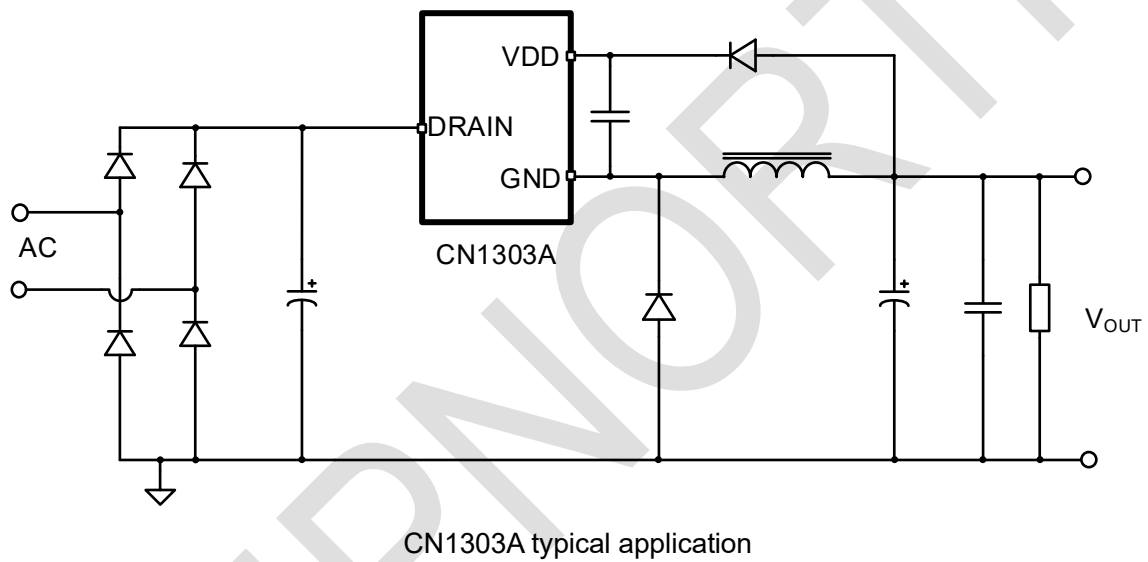
6 Product Description

Product No.	Output Voltage
CN1303AUFU12	12V
CN1303AUFU15	15V
CN1303ASHR12	12V
CN1303ASHR15	15V

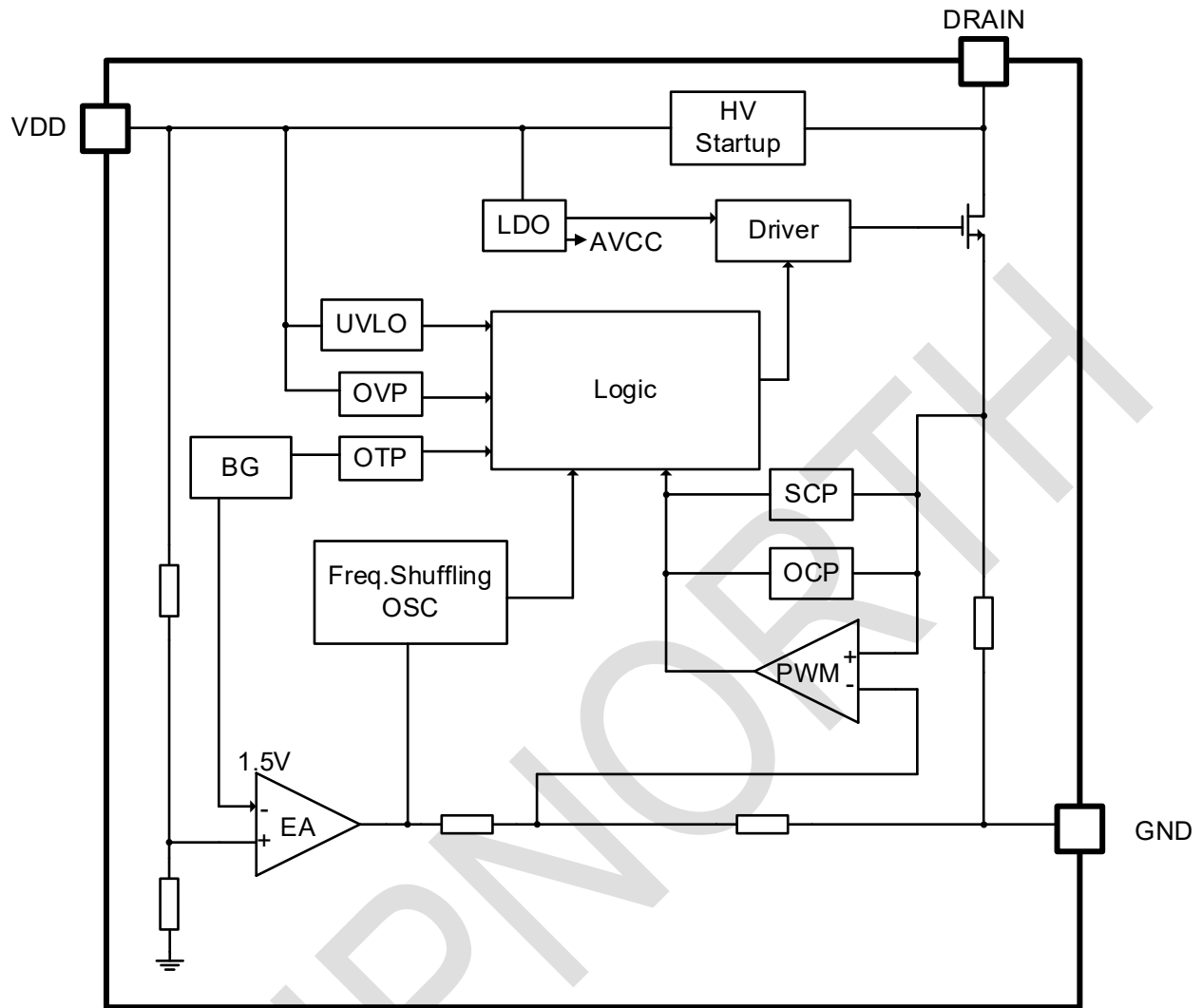
7 Pinout



8 Typical Application



9 Block Diagram



10 Pin Descriptions

Pin Name	Pin No.		Descriptions
	DIP-7	SOP-8	
GND	1	1/2	Ground
VDD	4	4	Operating voltage input pin
NC	2/3/5	3	No connection
DRAIN	6/7	5/6/7/8	Built-in high-voltage MOSFET drain pin

11 Specifications

11.1 Absolute Maximum Ratings

Parameter	Value	Units
VDD pin withstand voltage	35	V
DRAIN pin withstand voltage	1200	V
Ambient temperature	-40~105	°C
Storage Temperature Range	-55~150	°C
Soldering Temperature	260 (soldering, 10s)	°C

Note: The limit parameter is a threshold that can't be exceeded under any condition (even an instant). Once the chip runs beyond the limit parameters, it may cause aging or permanent damage. The limit parameter only emphasizes numerical values and does not necessarily indicate that the chip can work properly under these limits.

11.2 Typical Output Power

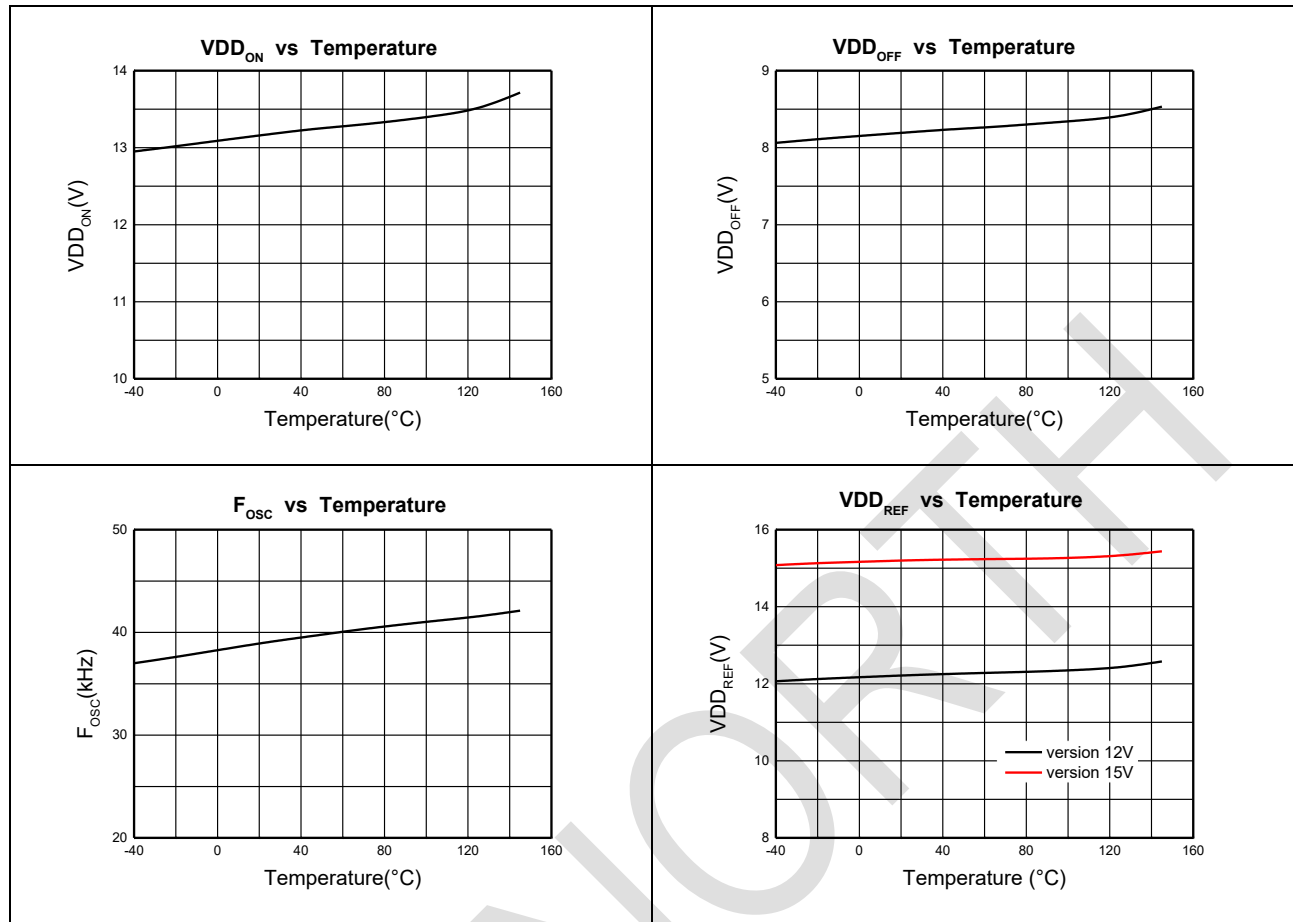
Product No.	Input Voltage Range	Open Frame Power	Peak Power
CN1303AUFU12/15	220Vac±30%	6W	7W
	380Vac±30%	7W	8W
CN1303ASHR12/15	220Vac±30%	5W	6W
	380Vac±30%	6W	7W

11.3 Electrical Characteristics

Test conditions: TA=25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
High Voltage Startup						
Startup Charging Current	I _{START_UP}	VDD=0.1V	1.2	1.6	2	mA
Chip Power Supply Section						
Operating Current	I _{VDD_OP}	VDD=13.5V		0.66		mA
UVLO Threshold Voltage	V _{DDON}			13	14	V
	V _{DDOFF}		7.65	8.15		V
VDD Over-Voltage Protection	V _{DDOVP}			23	24.5	V
VDD Feedback Voltage	V _{DDREF}	CN1303AUFU12		12		V
		CN1303AUFU15		15		V
		CN1303ASHR12		12		V
		CN1303ASHR15		15		V
Current Detection Section						
Leading-Edge Blanking Time	T _{LEB}		300	350	450	ns
CS Limit Threshold	I _{OC}		1.6	1.8	2	A
Built-in Oscillator Section						
Switching Frequency	F _{OSC}		36	40	44	kHz
Frequency Shuffling Range	Δf/F _{OSC}			±8		%
Modulation Frequency	F _M			78		Hz
Maximum Duty Cycle	D _{MAX}		45	50	55	%
Burst-Mode Frequency	F _{Burst}		20	22		kHz
Over-Temperature Protection Section						
Over-Temperature Protection	T _{SD}			150		°C
Over-Temperature Protection Hysteresis	T _{HYST}			25		°C
Built-In MOSFET Section						
Drain-Source Breakdown Voltage	BV _{DSS}		1200			V
MOSFET On-Resistance	R _{DS_ON}			10		Ω

11.4 Characteristic Curve



12 Detailed Description

12.1 Overview

CN1303A integrates a PWM controller and 1200V MOSFET making it ideal for low-power, non-isolated switching power supplies that require a minimal number of external components. CN1303A integrates high voltage startup to achieve ultra-low standby power consumption and frequency shuffling technology to simplify system EMI design. CN1303A provides excellent protection functions, including under voltage lockout protection (UVLO), over voltage protection (OVP), over temperature protection (OTP), overload protection (OCP), output short-circuit protection (SCP).

12.2 Functional Description

12.2.1 Startup

The built-in high voltage starter MOS provides 1.6mA current to charge the external VDD capacitor. Once the VDD voltage reaches 13V, CN1303A starts to work immediately, at this time the high voltage starter MOS will stop charging the VDD capacitor, the VDD capacitor discharges to maintain the chip working, the VDD voltage drops slightly, then the output provides energy through isolation diode to the VDD capacitor to keep the VDD capacitor voltage stable.

12.2.2 Constant-voltage Operating Mode

CN1303A samples the output voltage via the VDD pin, the VDD voltage is divided by an internal voltage divider resistor to generate a feedback voltage. When the feedback voltage falls below the internal reference voltage V_{REF} , the chip turns on the integrated high-voltage power transistor to charge the inductor. When the inductor current reaches the loop-set peak value, the chip turns off the integrated high-voltage power transistor, and the system diode provides freewheeling current to the inductor. Additionally, CN1303A integrates a load compensation function, which improves constant-voltage accuracy and achieves a good load regulation.

12.2.3 PWM/PFM Hybrid Modulation Mode

During load reduction, the system enters a PWM/PFM hybrid modulation mode, causing both the peak inductor current and the operating frequency to decrease. When the load is extremely light, the system enters Burst skip-cycle mode, where the peak inductor current remains constant. The system operates in Burst mode, reducing the switching frequency to improve efficiency under light load conditions.

12.2.4 Soft Start

CN1303A features soft-start function that reduces the switching frequency to prevent high current spikes caused by the non-isolated system entering deep CCM mode during startup.

12.2.5 Protection Features

CN1303A provides excellent protection functions, including over temperature protection (OTP), overload protection (OCP), under voltage lockout protection (UVLO), and these protections feature self-recovery mode.

Over-temperature protection: When the junction temperature exceeds 150°C, CN1303A enters over-temperature protection mode and the output is shut off. When the junction temperature drops below 125°C, the chip restarts.

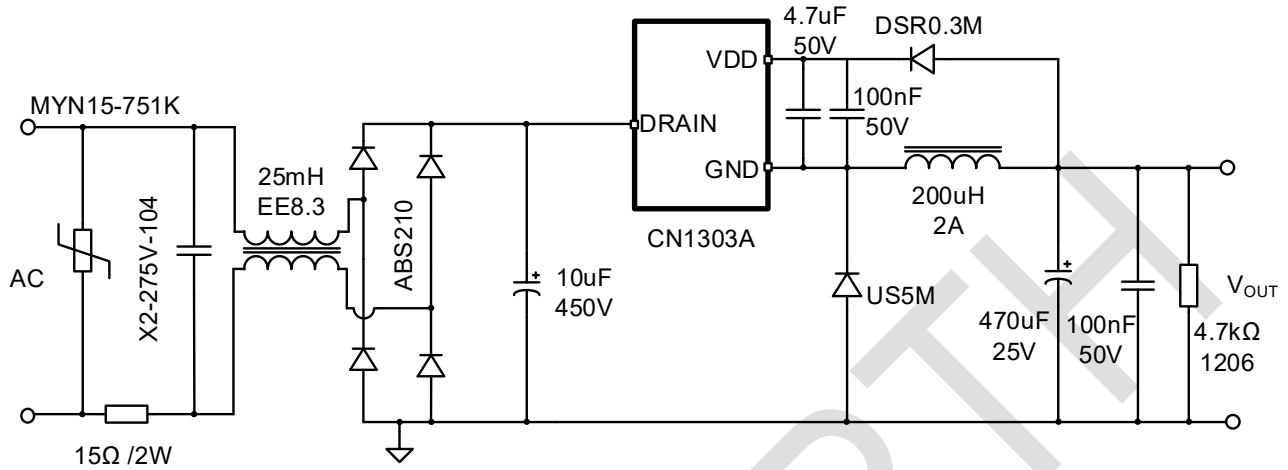
Overload protection: When the output remains in an overload or short-circuit state for over 80ms, the chip enters a hiccup protection mode.

VDD under voltage lockout protection: When the VDD voltage drops below V_{DDOFF} , CN1303A restarts. Its automatic recovery time is adjusted by the VDD capacitor; the larger the VDD capacitor, the longer the recovery time.

13 Application Information

13.1 Typical Application

The following figure shows a typical schematic of single-phase AC input application circuit that can be used as a means of evaluating the performance of CN1303A

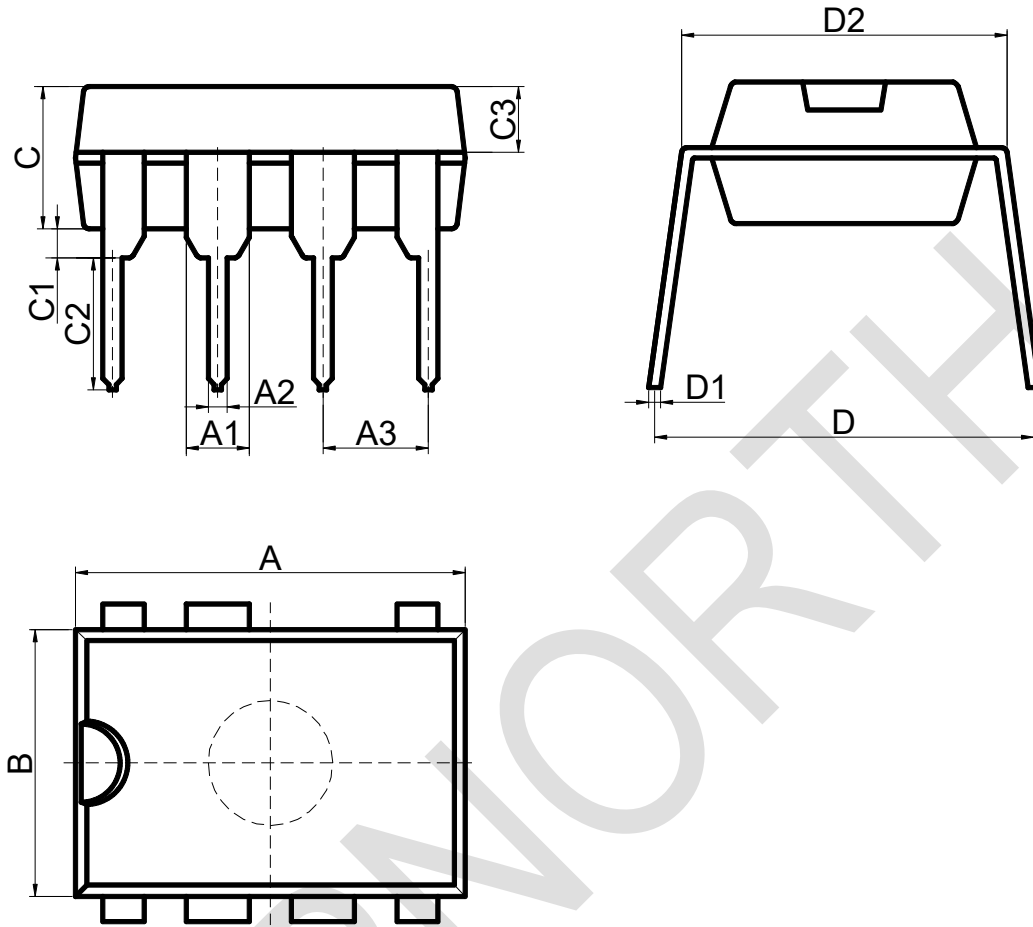


13.2 PCB Layout Guidelines

- The VDD capacitor should be placed as close as possible to the VDD pin;
- The trace connecting the GND pin to the inductor and freewheeling diode should be kept as short as possible;
- To avoid interference, avoid routing traces directly beneath the inductor.

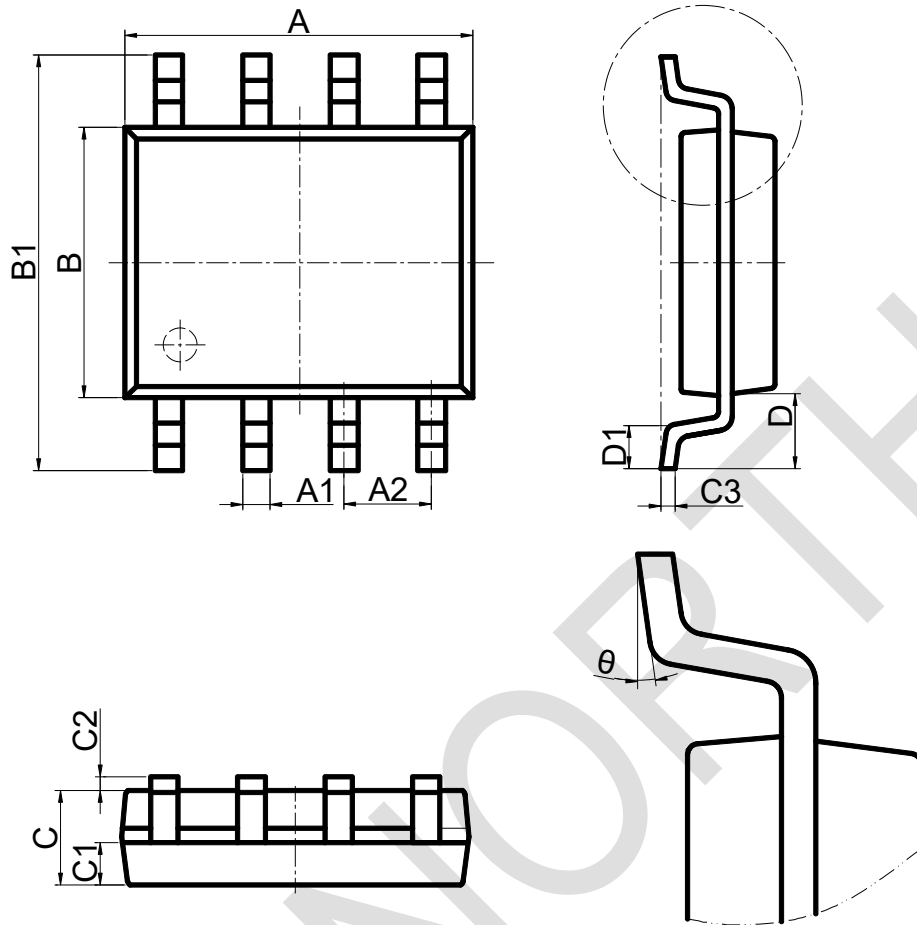
14 Package Information

DIP-7



Symbol	Dimension	Min(mm)	Nom(mm)	Max(mm)
A		9.15	9.25	9.35
A1		1.52REF		
A2		0.44	-	0.52
A3		2.54BSC		
B		6.25	6.35	6.45
C		3.20	3.30	3.40
C1		0.51	-	-
C2		3.00	-	-
C3		1.55	1.60	1.65
D		7.62	-	9.30
D1		0.25	-	0.29
D2		7.62REF		

SOP-8



Symbol	Dimension	Min(mm)	Nom(mm)	Max(mm)
A		4.80	4.90	5.00
A1		0.39	-	0.47
A2		1.27BSC		
B		3.80	3.90	4
B1		5.80	6.00	6.20
C		1.30	1.40	1.50
C1		0.60	0.65	0.70
C2		0.10	-	0.225
C3		0.20	-	0.24
D		1.05REF		
D1		0.50	-	0.80
θ		0	-	8°

15 Important Statement

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16 Revision History

Date	Version	Revision Notes
2026/09/08	R1.0	Official Release

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