General Description

The CCA1224 is a bus interface IC with driver and receiver function. The bus driver provides two or combined inputs and a differential current bus output. The receiver uses the driver outputs as input and delivers the signal to an open collector output. This device is functional and pin compatible to the obsolete part no. HA12240.

Typical applications are automotive audio equipment controllers.

1.1 FEATURES

- Two or combined data inputs (3.3 V and 5.0 V)
- Hysteresis input comparator
- Current drive output typ. 3.8 mA
- Hysteresis comparator for receiver
- Wide receiver common-mode input range of 0 to 5V typ.
- Open collector receiver output
- Operating VCC 5 V ±0.5 V
- Standby function (IVCC < 1 µA)
- ESD protection 2 kV
- on all IO pins
- SOP8 package
- Automotive qualified (AECQ100)

1.2 SCHEMATIC

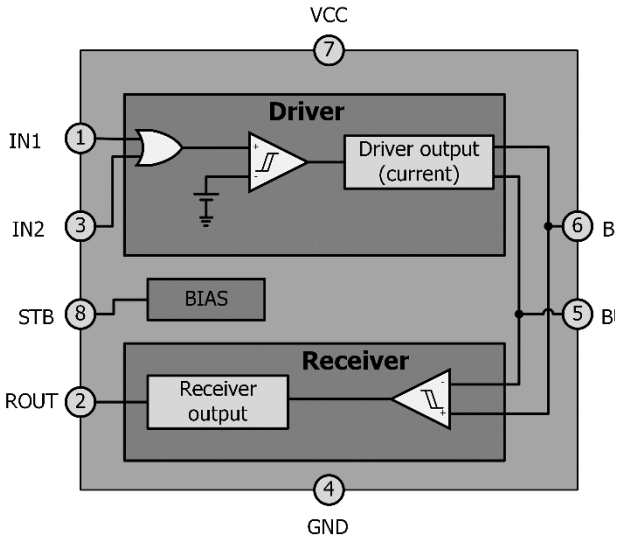


Figure 1: Block Diagram

2 Pinout

2.1 PACKAGE

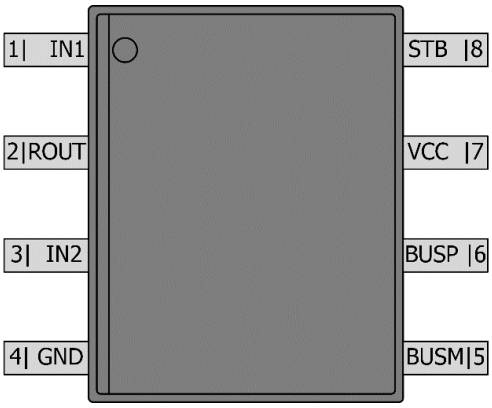
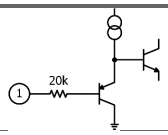
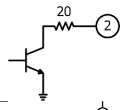
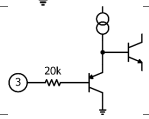
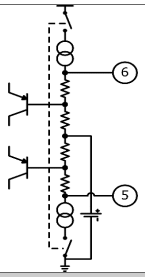
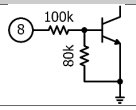


Figure 2: Package SOP8 (3.9x4.9mm)

2.2 PIN DESCRIPTIONS

Table 1: Pin Descriptions

Symbol	Pin no.	Type	Description	Schematic
IN1	1	IN	Data input 1	
ROUT	2	OUT	Receiver output (open collector)	
IN2	3	IN	Data input 2	
GND	4	PWR	Ground	
BUSM	5	IN/OUT	Minus bus driver output, receiver input	
BUSP	6	IN/OUT	Plus bus driver output, receiver input	
VCC	7	PWR	Voltage supply	
STB	8	IN	Stand by input: H => operating mode; L => standby mode	

3 Absolute Maximum Ratings

Table 2: Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	VCC	static	-0.7		36	V
Power dissipation QFN48	P_{TOT_QFN48}	Multilayer PCB, Exp. Pad soldered, ϑ_{AMB} = 60°C			2	W
Power dissipation QFN24	P_{TOT_QFN24}	Multilayer PCB, Exp. Pad soldered, ϑ_{AMB} = 60°C			1.5	W
Junction Temperature	ϑ_{JUNC}				150	°C
ESD-sensitivity	V_{ESD}	Human Body Model EIA/JESD22-A114-B	2			kV
Storage Temperature	$\vartheta_{STORAGE}$		-55		155	°C
Soldering Temperature	ϑ_{SOLDER}	12 s max			260	°C
FIT Rate					50	FIT

Functional operation is only guaranteed within operating conditions listed under “Electrical Characteristics”. Exposure to absolute maximum rating conditions for extended periods of time may affect device reliability. Exposure to conditions beyond those ratings may cause permanent damage to the device.

4 Electrical Characteristics

Electrical characteristics are valid for the whole specified temperature range and supply voltage range, if not otherwise noted.

4.1 GENERAL PARAMETERS

Table 3: General Parameters

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	VCC		4.5	5	5.5	V
Supply Current	I_{VCC}		0.8		8.5	mA
Operating Temperature	ϑ_{AMB}		-40		105	°C
Thermal Resistance Ambient	ϑ_{JA_SOPN-8}	Junction to Ambient		100		K/W

4.2 DRIVER

Table 4: Driver

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
High-level input voltage IN1	V_{IHS1}	V1 = 0 V -> 5 V; V3 = 0 V; V6 – V5 = 110 mV ↑	2.1			V
Low-level input voltage IN1	V_{ILS1}	V1 = 5 V -> 0 V; V3 = 0 V; V6 – V5 = 30 mV ↓			1.65	V
High-level input current IN1	I_{IHS1}	V1 = 5 V	-1	0	1	µA
Low-level input current IN1	I_{ILS1}	V1 = 0 V	-1	0.1	1	µA
High-level input voltage IN2	V_{IHS2}	V3 = 0 V -> 5 V; V1 = 0 V; V6 – V5 = 110 mV ↑	2.1			V
Low-level input voltage IN2	V_{ILS2}	V3 = 5 V -> 0 V; V1 = 0 V; V6 – V5 = 30 mV ↓			1.65	V
High-level input current IN2	I_{ILS2}	V3 = 5 V	-1	0	1	µA
Low-level input current IN2	I_{ILS2}	V3 = 0 V	-1	0.1	1	µA
High-level output voltage BUSP	V_{OHDP}	V1 or V3 > 2.1 V	1.8	2.5	3.2	V
Low-level output voltage BUSM	V_{OHDM}	V1 or V3 > 2.1 V	1.8	2.5	3.2	V
High-level output current (BUSP out; BUSM in)	I_{OH}	V1 or V3 > 2.1 V	3.1	3.8	4.5	mA
Low-level output voltage BUSP, BUSM	V_{OLD}	V1 and V3 < 1.65 V	2.3	2.5	2.7	V
Driver output resistance	R_O	V1 or V3 > 2.1 V **Fehler! Verweisquelle konnte nicht gefunden werden.**. 3; measure $I6_1$ at V6 = V_{OLD} + 0.3 V then measure $I6_2$ at V6 = V_{OLD} - 0.3 V; R_O = 0.6 V / ($I6_1$ - $I6_2$)	5	10	15	kΩ
Driver delay time low -> high	T_{DDR}	V1 = 4.5 V ↑; V6 – V5 = 110 mV ↑;		80	150	ns
Driver delay time high -> low	T_{DDF}	V1 = 0.5 V ↓; V6 – V5 = 30 mV ↓;		40	70	ns

4.3 RECEIVER

Table 5: Receiver

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
High-level input voltage at low common-mode BUSP-BUSM	V_{IH1}	V6 = 0 V -> 5 V; V5 = 0 V; V1 = 0 V; V3 = 0 V; V2 = 4 V ↑; V_{IH1} = V6 – V5	45	80	110	mV
High-level input voltage at high common-mode BUSP-BUSM	V_{IH2}	V6 = 0 V -> 5 V; V5 = 4.5 V; V1 = 0 V; V3 = 0 V; V2 = 4 V ↑; V_{IH2} = V6 – V5	45	80	110	mV
Low-level input voltage at low common-mode BUSP-BUSM	V_{IL1}	V6 = 5 V -> 0 V; V5 = 0 V; V1 = 0 V; V3 = 0 V; V2 = 1 V ↓; V_{IL1} = V6 – V5	30	50	95	mV
High-level input voltage at high common-mode BUSP-BUSM	V_{IL2}	V6 = 5 V -> 0 V; V5 = 4.5 V; V1 = 0 V;	30	50	95	mV

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
		V3 = 0 V; V2 = 1 V ↓; V_{IL2} = V6 – V5				
Input hysteresis voltage at low common-mode BUSP-BUSM	V_{IHYS1}	V_{IHYS1} = V_{IH1} - V_{IL1}	15	30	45	mV
Input hysteresis voltage at high common-mode BUSP-BUSM	V_{IHYS2}	V_{IHYS2} = V_{IH2} - V_{IL2}	15	30	45	mV
High-level common-mode input voltage BUSM	V_{HCOM}	V5 = 0 V -> 5 V; V1 = 0 V; V3 = 0 V; V_{HCOM} = V5 when V2 = 4 V ↓; V6 – V5 = 110 mV	4.5			V
Low-level common-mode input voltage BUSM	V_{LCOM}	V5 = 0 V -> 5 V; V1 = 0 V; V3 = 0 V; V_{HCOM} = V5 when V4 = 1 V ↑; V6 – V5 = 30 mV	5			V
Receiver input resistance	R_I	V1 and V3 < 1.65 V **Fehler! Verweisquelle konnte nicht gefunden werden.**. 3; measure $I6_3$ at V6 = V_{OLD} + 0.3 V then measure $I6_4$ at V6 = V_{OLD} - 0.3 V; R_I = 0.6 V / ($I6_3$ - $I6_4$)	25	35	45	kΩ
High-level receiver output leakage current ROUT	I_{ROH}	V1 = 5 V; V3 = 0 V; V2 = 5 V	-1	0	1	µA
Standby 1 receiver output leakage current ROUT	I_{ROS1}	V1 = 0 V; V3 = 0 V; V8 = 0 V; VCC = 0 V; V2 = 5 V	-1	0	1	µA
Standby 2 receiver output leakage current ROUT	I_{ROS2}	V1 = 0 V; V3 = 0 V; V8 = 0 V; V2 = 5 V	-1	0	1	µA
Low-level 1 receiver output voltage ROUT	V_{ROL1}	V1 = 0 V; V3 = 0 V; I2 = 1.5 mA			0.6	V
Low-level 2 receiver output voltage ROUT	V_{ROL2}	V1 = 0 V; V3 = 0 V; I2 = 200 µA			0.3	V
Receiver delay time low -> high	T_{RDR}	V6 – V5 = 110 mV ↑; V2 = 4.5 V ↑		600	700	ns
Receiver delay time high -> low	T_{RDF}	V6 – V5 = 30 mV ↓; V2 = 0.5 V ↓		110	150	ns

4.4 BIAS AND VCC

Table 6: BIAS and VCC

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent current high V_{CC}	I_{CCH}	V1 or V3 > 2.1 V	3		8.5	mA
Quiescent current low V_{CC}	I_{CCL}	V1 and V3 < 1.65 V	0.8		1.8	mA
Standby driver output leakage current BUSP	I_{DOS}	V8 = 0 V; V1 or V3 > 2.1 V; V6 = 5 V	-1		1	µA
Standby supply leakage current V_{CC}	I_{VCCS}	V8 = 0 V; V1 or V3 > 2.1 V;	-1		1	µA
Standby high-level input voltage STB	V_{STBH}	V8 = 0 V -> 5 V; V1 = 0 V; V3 = 0 V; V_{STBH} = V8 when V5, V6 = 2.3 V ↑	0.9		2	V
Standby low-level input voltage STB	V_{STBL}	V8 = 5 V -> 0 V; V1 = 5 V; V3 = 0 V; V_{STBH} = V8 when I_{VCC} = 1 µA ↓	0.9		2	V

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Standby high-level input current STB	I_{STBH}	V8 = 5 V; V1 = 5 V; V3 = 0 V;		50	100	µA
Standby low-level input current STB	I_{STBL}	V8 = 0 V; V1 = 5 V; V3 = 0 V;	-1	0	1	µA

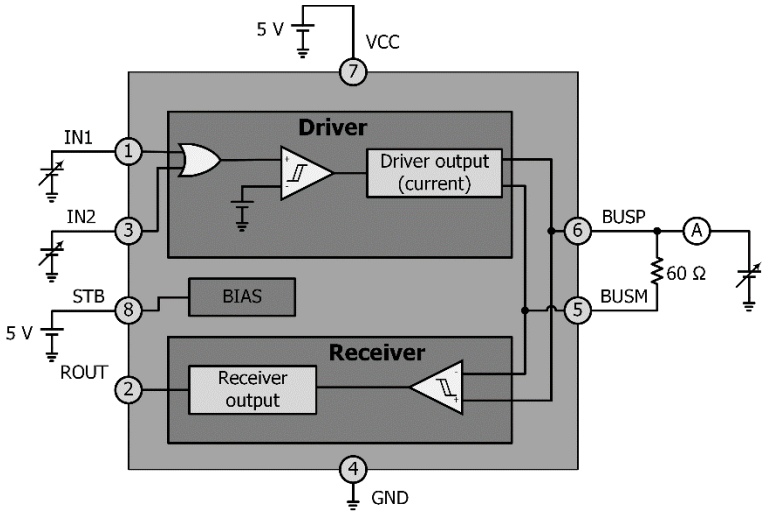


Figure 3: Measurement Circuits

5 Functional Description

5.1 DRIVER

The “Driver block” has two inputs and a differential current output. The inputs IN1 (Pin 1) and IN2 (Pin 3) are “or”-connected and their switching level and hysteresis are 3.3V and 5V compatible. The output BUSP (Pin 6) delivers a source current and BUSM (Pin 5) delivers a sink current of the same amount, so that with an external 60 Ohm Resistor between BUSP and BUSM the differential voltage is 230 mV (high) and 0 mV (low). The common-mode voltage is about 2.5 V, but the output can withstand external voltage up to VCC + 0.3V.

5.2 RECEIVER

The “Receiver block” has a differential voltage input and an open collector output. It share the Pins BUSP (Pin 6) and BUSM (Pin 5) with the driver block, but for the receiver block they are the differential voltage input. They have a large common-mode operating voltage from 0 V to 4.5 V and can withstand external voltage up to VCC + 0.3V. The receiver output ROUT is open collector, so that the supply voltage for the external resistor at this Pin determines the following logic level.

5.3 BIAS

The “Bias block” delivers an internal reference voltage (2.5 V), several reference currents and the chance with the signal of Pin STB (Pin 8) to activate or deactivate the supply for all function blocks, so that in the standby mode (V(STB) < 0.9 V) the power supply current falls to less than 1µA.

6 Application notes

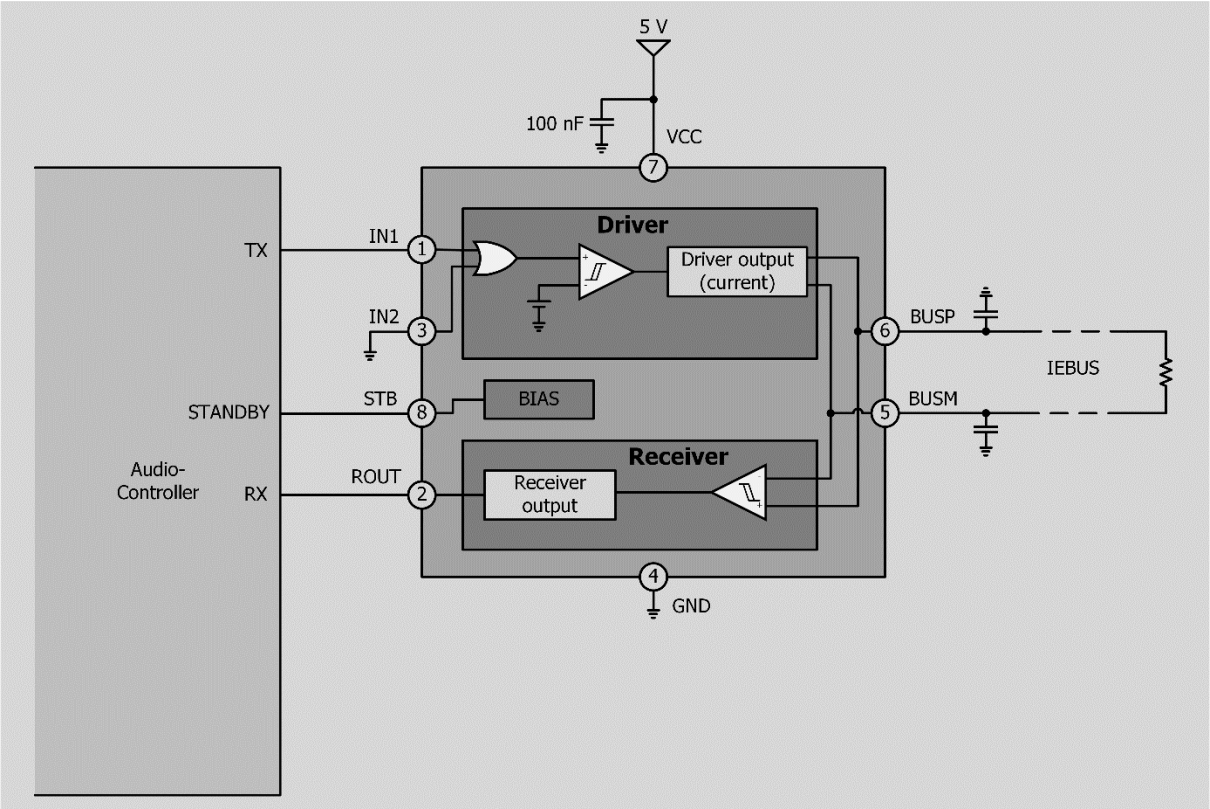


Figure 4: Application

7 Package Outline

7.1 SOP8 Package

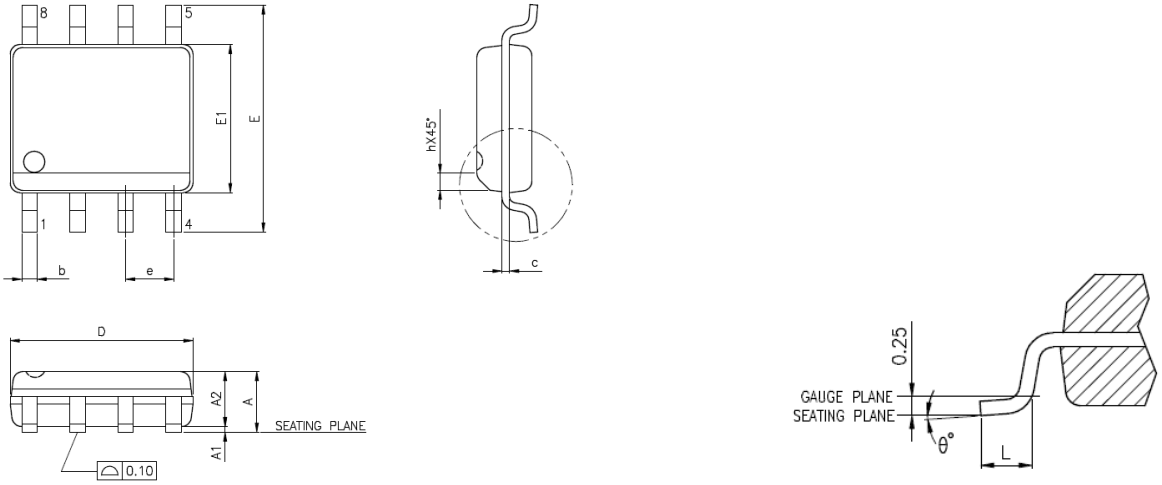


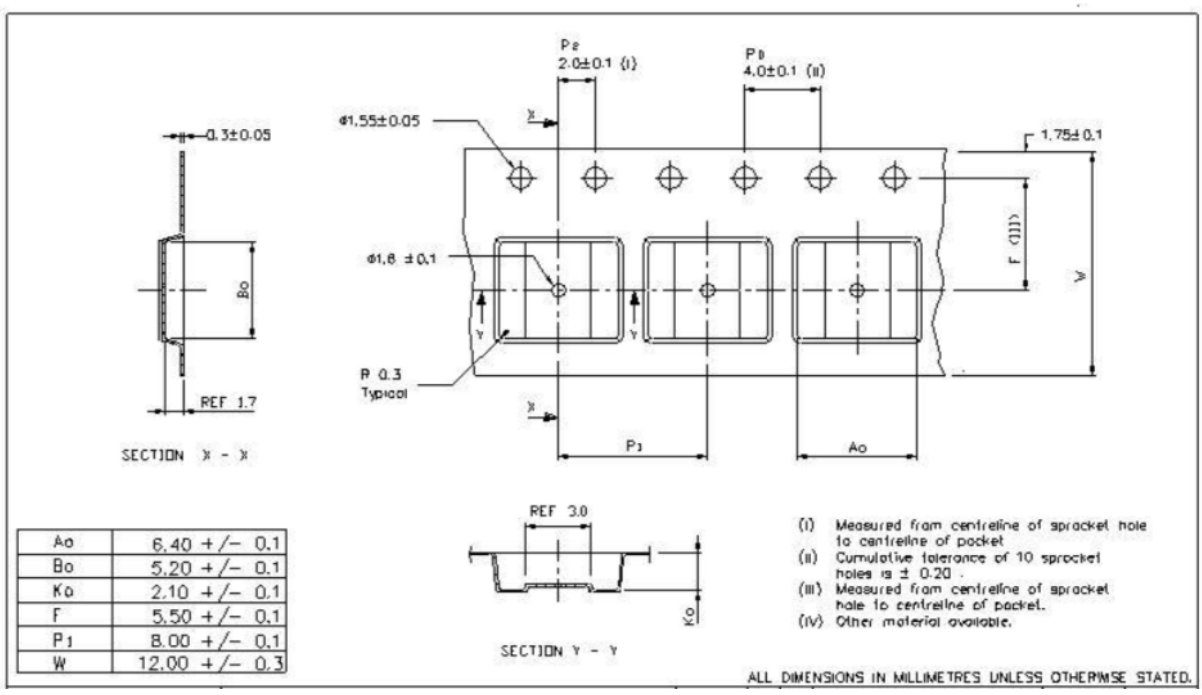
Figure 5: SOP8 Package

Symbol	A	A1	A2	b	C	D	E	E1	e	L	h	θ°
Min	--	0.10	1.25	0.31	0.10	4.90 BSC.	6.00 BSC.	3.90 BSC	1.27 BSC.	0.40	0.25	5.15
Max	1.75	0.25	--	0.51	0.25					1.27	0.50	5.25

NOTES:
1.JEDEC OUTLINE : MS-012 AA REV.F (STANDARD)
MS-012 BA REV.F (THERMAL)
2.DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH,
PROTRUSIONS OR GATE BURRS.MOLD FLASH, PROTRUSIONS
AND GATE BURRS SHALL NOT EXCEED 0.15mm.
PER SIDE.
3.DIMENSIONS "E1" DOES NOT INCLUDE INTER-LEAD FLASH,
OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS
SHALL NOT EXCEED 0.25mm PER SIDE.

8 Tape and Reel Information

8.1 TAPE INFORMATION



Ao	6.40 +/- 0.1
Bo	5.20 +/- 0.1
Ko	2.10 +/- 0.1
F	5.50 +/- 0.1
P1	8.00 +/- 0.1
W	12.00 +/- 0.3

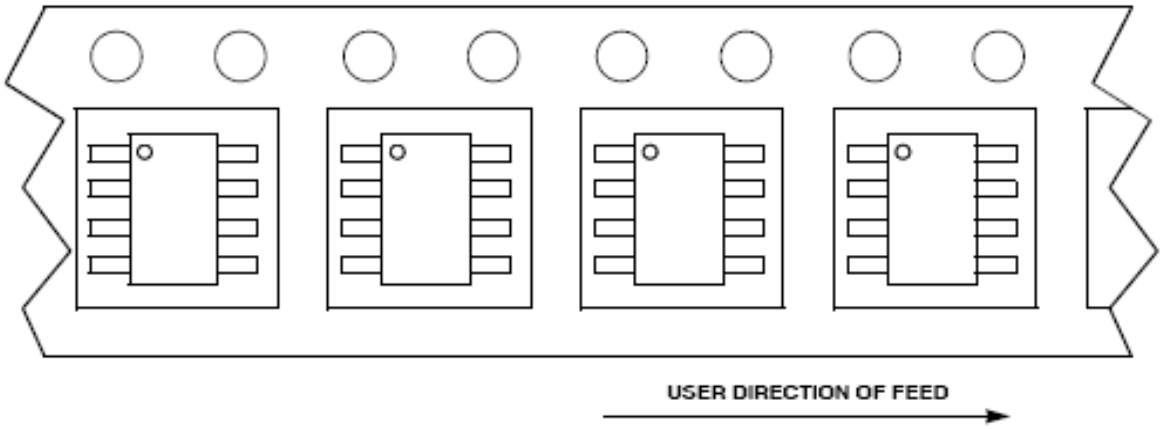
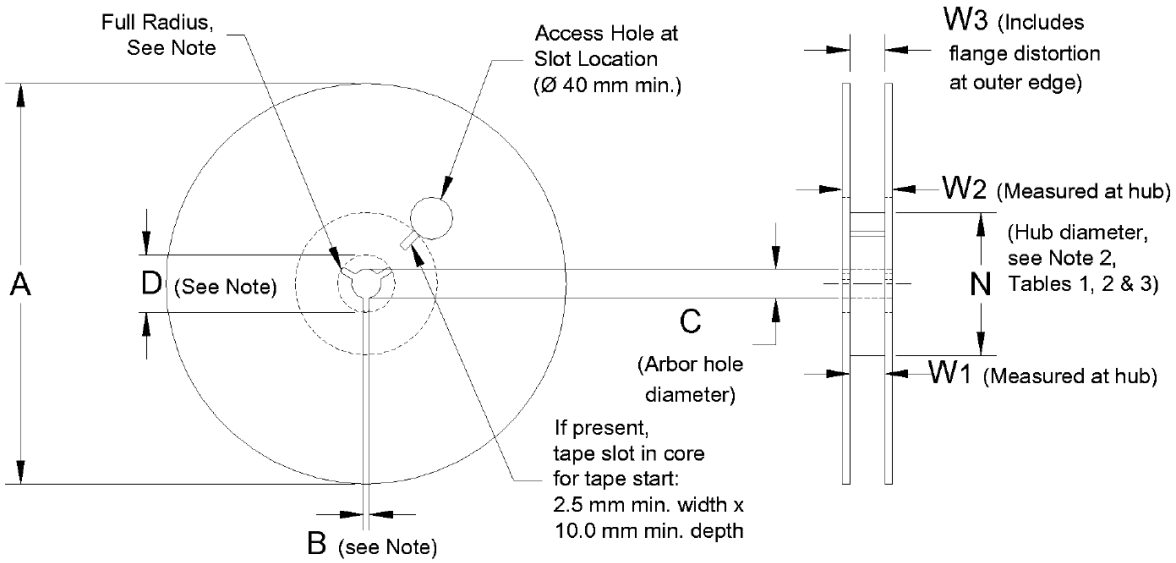


Figure 6: Tape Information

8.2 Reel Information



Note: Drive spokes optional; if used, dimensions B and D shall apply.

Figure 7: Reel Information

Symbol	A	B	C	D	W_1
Minimal	-	1.5	12.8	20.2	13.25
Typical	-	-	13.0	-	-
Maximum	330	-	13.5	-	13.75

9 Ordering Information

Table 7: Ordering Information

Part	Order No.	Package	Delivery	Quantity
CCA1224	CCA1224_SO-P8	SOPN-8	Tape & Reel	3.800 parts per reel

10 Revision History

Revision	Date	Description
1.4	31-Oct-2019	Updated Template
1.3	24-Jul-2015	Updated Form
1.2	30-Apr-2015	Change of Part Number
1.1	25-Mar-2015	Changes in Timing and Bus
1.0	28-Aug-2014	Initial version

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