

DIO2087X

Micro-power CMOS input RRIO 1.4 V Push-Pull Output Comparator

Features

- Ultra low power consumption:
1.35 μ A (Typ) at $V_+ = 1.4$ V
- Wide supply voltage range: 1.4 to 5.5 V
- Propagation delay: 1.1 μ s (Typ) at $V_+ = 1.4$ V
- Push-pull output current drive:
25 mA (Typ) at $V_+ = 5$ V
- Rail-to-rail input
- -40°C to 85°C operating temperature range
- Available in the Green SOT23-5, SC70-5, SOIC-8, MSOP-8, SOP-14 and TSSOP-14 Packages

Applications

- RC timers
- Window detectors
- IR receiver
- Multivibrators
- Alarm and monitoring circuits

Descriptions

The DIO2087X is an ultra low-power comparator with a typical power supply current of 1.35 μ A. It has the best-in-class power supply current versus propagation delay performance. The propagation delay is as low as 1.1 μ s with 100 mV overdrive at 1.4 V supply.

Designed to operate over a wide range of supply voltages, from 1.4 to 5.5 V, with guaranteed operation at 1.4 V, 2.5 V and 5.0 V, the DIO2087X is ideal for use in a variety of battery-powered applications. With rail-to-rail common mode voltage range, the DIO2087X is well suited for single-supply operation.

Featuring a push-pull output stage, the DIO2087X allows for operation with absolute minimum power consumption when driving any capacitive or resistive load.

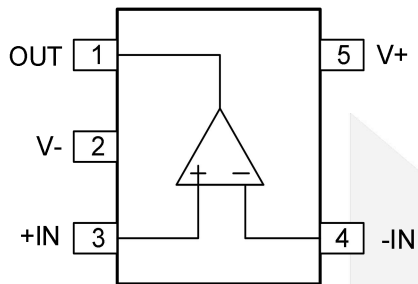
DIO2087X is available in the Green SOT23-5, SC70-5, SOIC-8, MSOP-8, SOP-14 and TSSOP-14 packages. The DIO2087X is ideal for use in handheld electronics and mobile phone applications. It is rated over the -40°C to 85°C temperature range

Ordering Information

Order Part Number	Top Marking	RoHS	T_A	Package	
DIO20871ST5	YW71	Green	-40 to 85°C	SOT23-5	Tape & Reel, 3000
DIO20871SC5	YW71	Green	-40 to 85°C	SC70-5	Tape & Reel, 3000
DIO20871ASC5	W71A	Green	-40 to 85°C	SC70-5	Tape & Reel, 3000
DIO20871AST5	W71A	Green	-40 to 85°C	SOT23-5	Tape & Reel, 3000
DIO20872SO8	D20872	Green	-40 to 85°C	SOIC-8	Tape & Reel, 2500
DIO20872MP8	D20872	Green	-40 to 85°C	MSOP-8	Tape & Reel, 3000
DIO20874CS14	D20874	Green	-40 to 85°C	SOP-14	Tape & Reel, 2500
DIO20874TP14	D20874	Green	-40 to 85°C	TSSOP-14	Tape & Reel, 2500
DIO20875SO8	D20875	Green	-40 to 85°C	SOIC-8	Tape & Reel, 2500
DIO20875MP8	D20875	Green	-40 to 85°C	MSOP-8	Tape & Reel, 3000

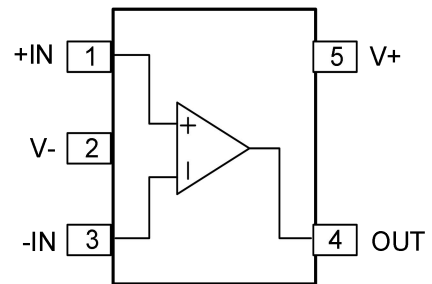
Pin Assignments

DIO20871



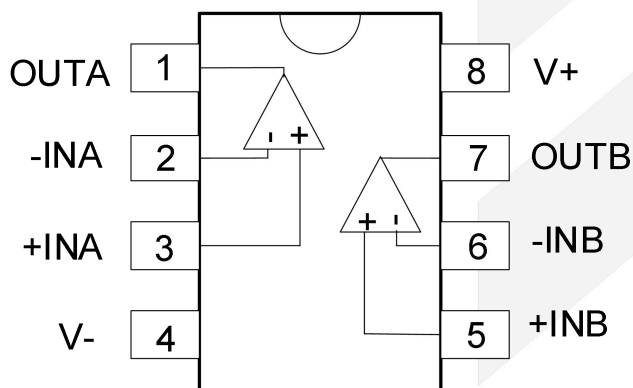
SOT23-5/SC70-5

DIO20871A



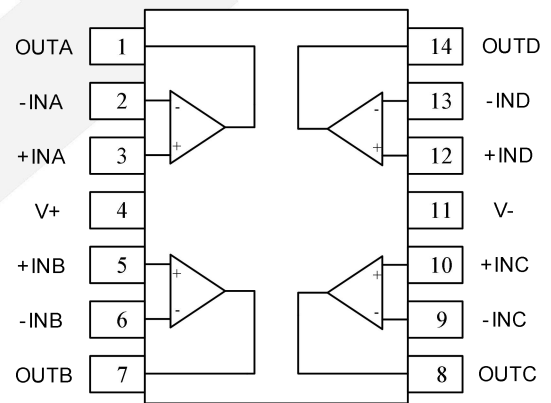
SOT23-5/SC70-5

DIO20872



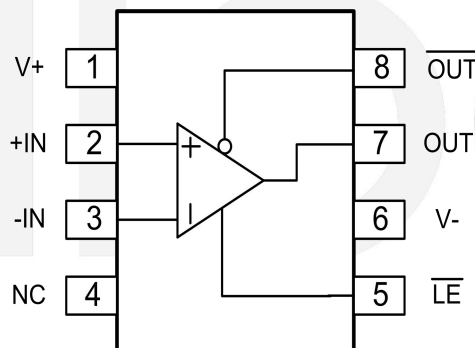
SOIC-8/MSOP-8

DIO20874



SOP-14/TSSOP-14

DIO20875



SOIC-8/MSOP-8

Figure 1 Pin Assignment (Top view)

Pin Description

Pin name	Description
OUTX	Output
V-	Negative supply
+INX	Positive Input
-INX	Negative Input
V+	Positive supply
$\overline{\text{LE}}$	Enable
$\overline{\text{OUT}}$	Negative output
NC	No connect

Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Rating” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maxim rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Rating	Unit
	Supply voltage (V+ – V-)	7.5	V
	Input voltage	(V-)-0.5 to (V+)+0.5V	V
	Difference input voltage	±2.5V	V
T _A	Operating temperature range	-40 to 85	°C
T _{STG}	Storage temperature range	-55 to 150	°C
T _J	Junction temperature	160	°C
T _L	Lead temperature range	260	°C
ESD	HBM, JEDEC: JESD22-A114	4000	V
	CDM, JEDEC: JESD22-C101	400	

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Rating	Unit
	Supply voltage	1.4 to 5.5	V
T _A	Operating temperature range	-40 to 85	°C

Electrical Characteristics: $V_+ = 1.4 \text{ V}$

At $T_A = 25^\circ\text{C}$, $V_+ = 1.4 \text{ V}$, $V_- = 0 \text{ V}$, $V_{LE} = 1.4 \text{ V}$, $V_{CM} = V_+/2$ and $V_O = V_-$, unless otherwise noted.

Symbol	Parameter	Condition	Min	Typ	Max	Unit
I_S	Supply current	$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, $V_{CM} = 0.3 \text{ V}$		1.20		μA
		$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, $V_{CM} = 1.1 \text{ V}$		1.35		
V_{OS}	Input offset voltage		-5	0	5	mV
$\Delta V_{OS}/\Delta T$	Input offset average drift			2.7		$\mu\text{V}/^\circ\text{C}$
CMRR	Common mode rejection ratio	V_{CM} stepped from 0 to 0.3 V		60		dB
		V_{CM} stepped from 0.8 to 1.4 V		78		
		V_{CM} stepped from 0 to 1.4 V		68		
PSRR	Power supply rejection ratio	$V_+ = 2.5$ to 5.5 V , $V_{CM} = (-V_+) + 0.5 \text{ V}$		80		dB
V_{IH}	Latch Enable pin high input voltage			0.85		V
V_{IL}	Latch Enable pin Low input voltage			0.5		V
I_{IL}	Latch Enable pin bias current	$V_{LE} = 0 \text{ V}$		7.5		nA
V_{OH}	Output swing high	$V_+ = 1.8 \text{ V}$, $I_O = 500 \mu\text{A}$		1.65		V
		$V_+ = 1.8 \text{ V}$, $I_O = 1 \text{ mA}$		1.55		
V_{OL}	Output swing low	$V_+ = 1.8 \text{ V}$, $I_O = -500 \mu\text{A}$		100		mV
		$V_+ = 1.8 \text{ V}$, $I_O = -1 \text{ mA}$		200		
I_{OUT}	Output current	Source		0.98		mA
		Sink		1.38		
	Propagation delay (High to Low)	Overdrive = 10 mV		3.5		μs
		Overdrive = 100 mV		1.1		
	Propagation delay (Low to High)	Overdrive = 10 mV		2.2		μs
		Overdrive = 100 mV		1.4		
t_{Rise}	Rise time	Overdrive = 10 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		160		ns
		Overdrive = 100 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		160		
t_{Fall}	Fall time	Overdrive = 10 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		160		ns
		Overdrive = 100 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		160		

Electrical Characteristics: $V_+ = 2.5\text{ V}$

At $T_A = 25^\circ\text{C}$, $V_+ = 2.5\text{ V}$, $V_- = 0\text{ V}$, $\bar{V}_{LE} = 2.5\text{ V}$, $V_{CM} = V_+/2$ and $V_O = V_-$, unless otherwise noted.

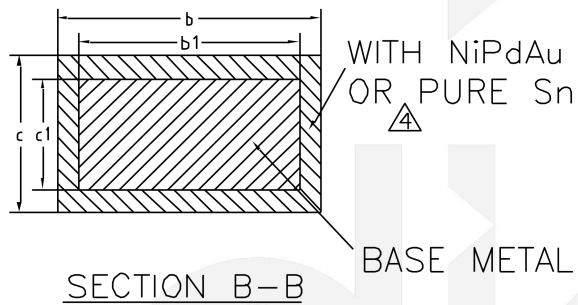
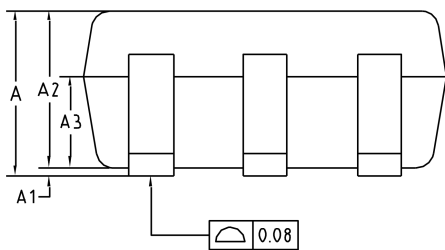
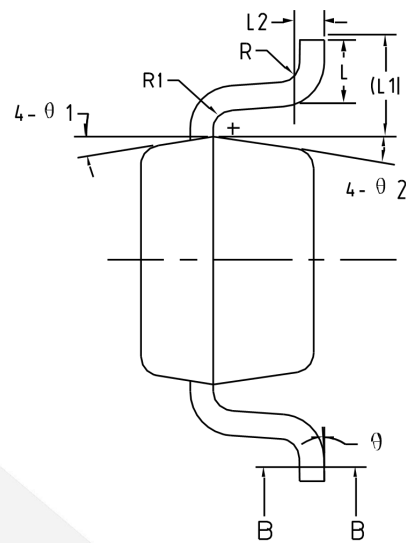
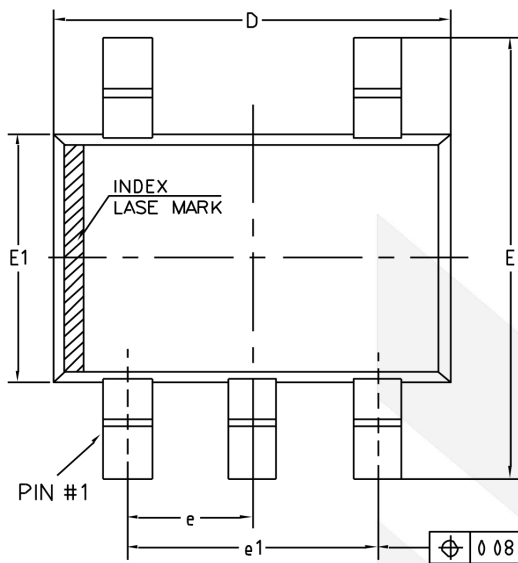
Symbol	Parameter	Condition	Min	Typ	Max	Unit
I_S	Supply current	$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, $V_{CM} = 0.3\text{ V}$		1.25		μA
		$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, $V_{CM} = 2.2\text{ V}$		1.4		
V_{OS}	Input offset voltage		-5	0	5	mV
$\Delta V_{OS}/\Delta T$	Input offset average drift			2		$\mu\text{V}/^\circ\text{C}$
CMRR	Common mode rejection ratio	V_{CM} stepped from 0 to 1.4 V		77		dB
		V_{CM} stepped from 1.9 to 2.5 V		85		
		V_{CM} stepped from 0 to 2.5 V		77		
PSRR	Power supply rejection ratio			90		dB
V_{IH}	Latch Enable pin High input voltage			1.41		V
V_{IL}	Latch Enable pin Low input voltage			0.98		V
I_{IL}	Latch Enable pin bias current	$\bar{V}_{LE} = 0\text{ V}$		13.5		nA
A_{VO}	Large signal voltage gain			90		dB
V_{OH}	Output swing high	$I_O = 500\text{ }\mu\text{A}$		2.4		V
		$I_O = 1\text{ mA}$		2.3		
V_{OL}	Output swing low	$I_O = -500\text{ }\mu\text{A}$		60		mV
		$I_O = -1\text{ mA}$		120		
I_{OUT}	Output current	Source		5.8		mA
		Sink		7.1		
	Propagation delay (High to Low)	Overdrive = 10 mV		2.8		μs
		Overdrive = 100 mV		0.95		
	Propagation delay (Low to High)	Overdrive = 10 mV		2.00		μs
		Overdrive = 100 mV		1.10		
t_{Rise}	Rise time	Overdrive = 10 mV, $C_L = 30\text{ pF}$, $R_L = 1\text{ M}\Omega$		80		ns
		Overdrive = 100 mV, $C_L = 30\text{ pF}$, $R_L = 1\text{ M}\Omega$		50		
t_{Fall}	Fall time	Overdrive = 10 mV, $C_L = 30\text{ pF}$, $R_L = 1\text{ M}\Omega$		80		ns
		Overdrive = 100 mV, $C_L = 30\text{ pF}$, $R_L = 1\text{ M}\Omega$		50		

Electrical Characteristics: $V_+ = 5.0 \text{ V}$

At $T_A = 25^\circ\text{C}$, $V_+ = 5.0 \text{ V}$, $V_- = 0 \text{ V}$, $\bar{V}_{LE} = 5.0\text{V}$, $V_{CM} = V_+/2$ and $V_O = V_-$, unless otherwise noted.

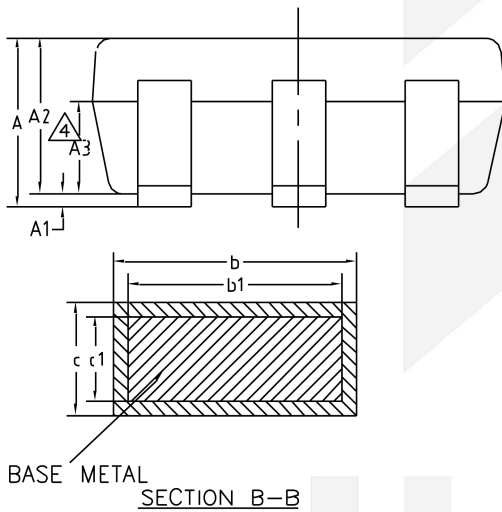
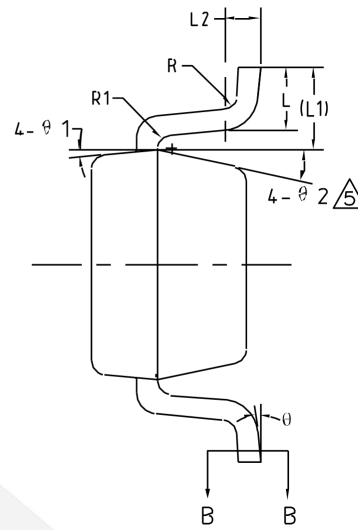
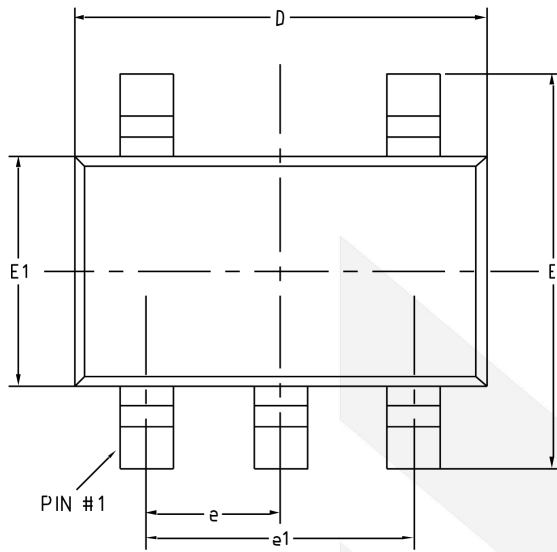
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_S	Supply current	$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, $V_{CM} = 0.3 \text{ V}$		1.35		μA
		$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$, $V_{CM} = 4.7 \text{ V}$		1.5		
V_{OS}	Input offset voltage		-5	1	5	mV
$\Delta V_{OS}/\Delta T$	Input offset average drift			2.7		$\mu\text{V}/^\circ\text{C}$
CMRR	Common mode rejection ratio	V_{CM} stepped from 0 to 3.9 V		85		dB
		V_{CM} stepped from 4.4 to 5 V		89		
		V_{CM} stepped from 0 to 5 V		85		
PSRR	Power supply rejection ratio	$V_+ = 2.5$ to 5.5 V , $V_{CM} = (-V_+) + 0.5 \text{ V}$		70		dB
V_{IH}	Latch Enable pin high input voltage			2.52		V
V_{IL}	Latch Enable Pin Low input voltage			1.97		V
I_{IL}	Latch Enable pin bias current	$V_{LE} = 0 \text{ V}$		26.5		nA
V_{OH}	Output swing high	$I_O = 500 \mu\text{A}$		4.95		V
		$I_O = 1 \text{ mA}$		4.90		
V_{OL}	Output swing low	$I_O = -500 \mu\text{A}$		30		mV
		$I_O = -1 \text{ mA}$		60		
I_{OUT}	Output current	Source		25		mA
		Sink		25		
	Propagation delay (High to Low)	Overdrive = 10 mV		3.50		μs
		Overdrive = 100 mV		0.95		
	Propagation delay (Low to High)	Overdrive = 10 mV		2.85		μs
		Overdrive = 100 mV		1.10		
t_{Rise}	Rise time	Overdrive = 10 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		75		ns
		Overdrive= 100 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		45		
t_{Fall}	Fall time	Overdrive = 10 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		75		ns
		Overdrive= 100 mV, $C_L = 30 \text{ pF}$, $R_L = 1 \text{ M}\Omega$		45		

Physical Dimensions: SC70-5



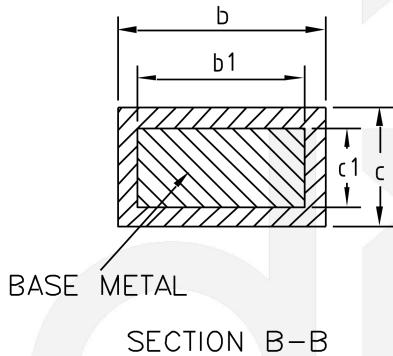
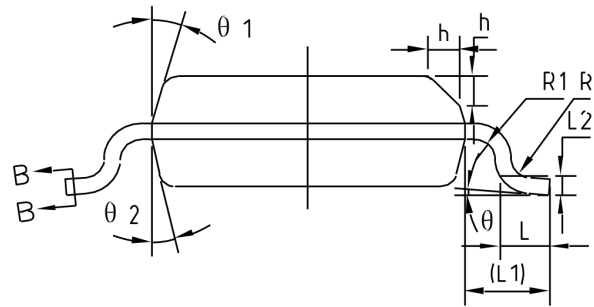
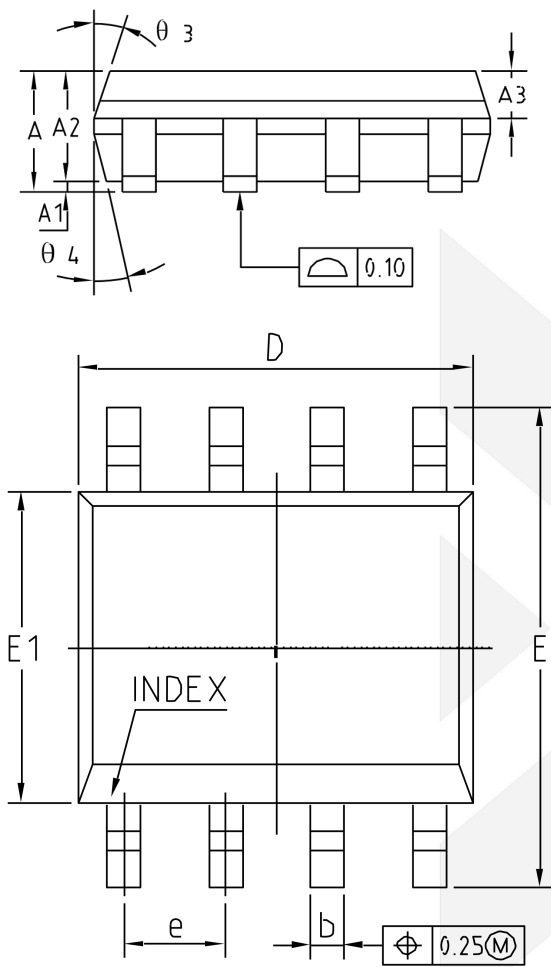
Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	0.85	-	1.05
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.47	0.52	0.57
b	0.22	-	0.29
b1	0.22	0.25	0.28
c	0.115	-	0.15
c1	0.115	0.13	0.14
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.25	1.30	1.35
e	0.65 BSC		
e1	1.30 BSC		
L	0.28	0.33	0.38
L1	0.50 REF		
L2	0.15 BSC		
R	0.10	-	-
R1	0.10	-	0.25
θ	0°	-	8°
$\theta 1$	6°	9°	12°
$\theta 2$	6°	9°	12°

Physical Dimensions: SOT23-5



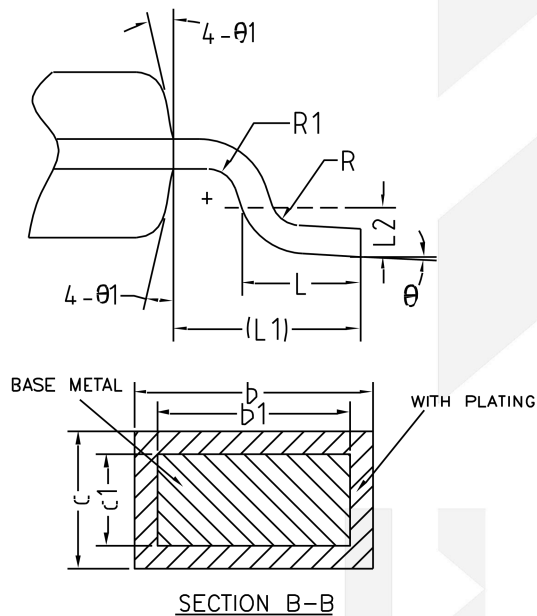
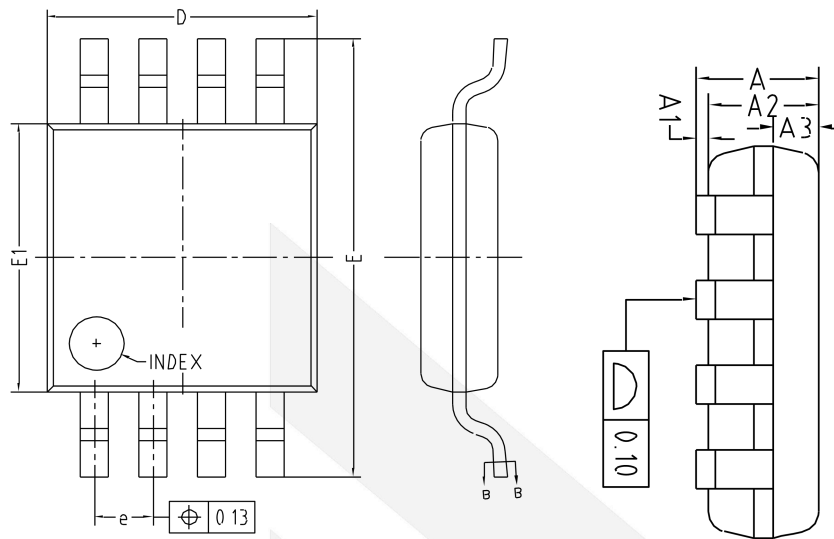
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Symbol	Min	Nom	Max
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.50
b1	0.36	0.38	0.45
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59 REF		
L2	0.25 BSC		
R	0.10	-	-
R1	0.10	-	0.25
θ	0°	-	8°
θ1	3°	5°	7°
θ2	6°	-	14°

Physical Dimensions: SOIC-8



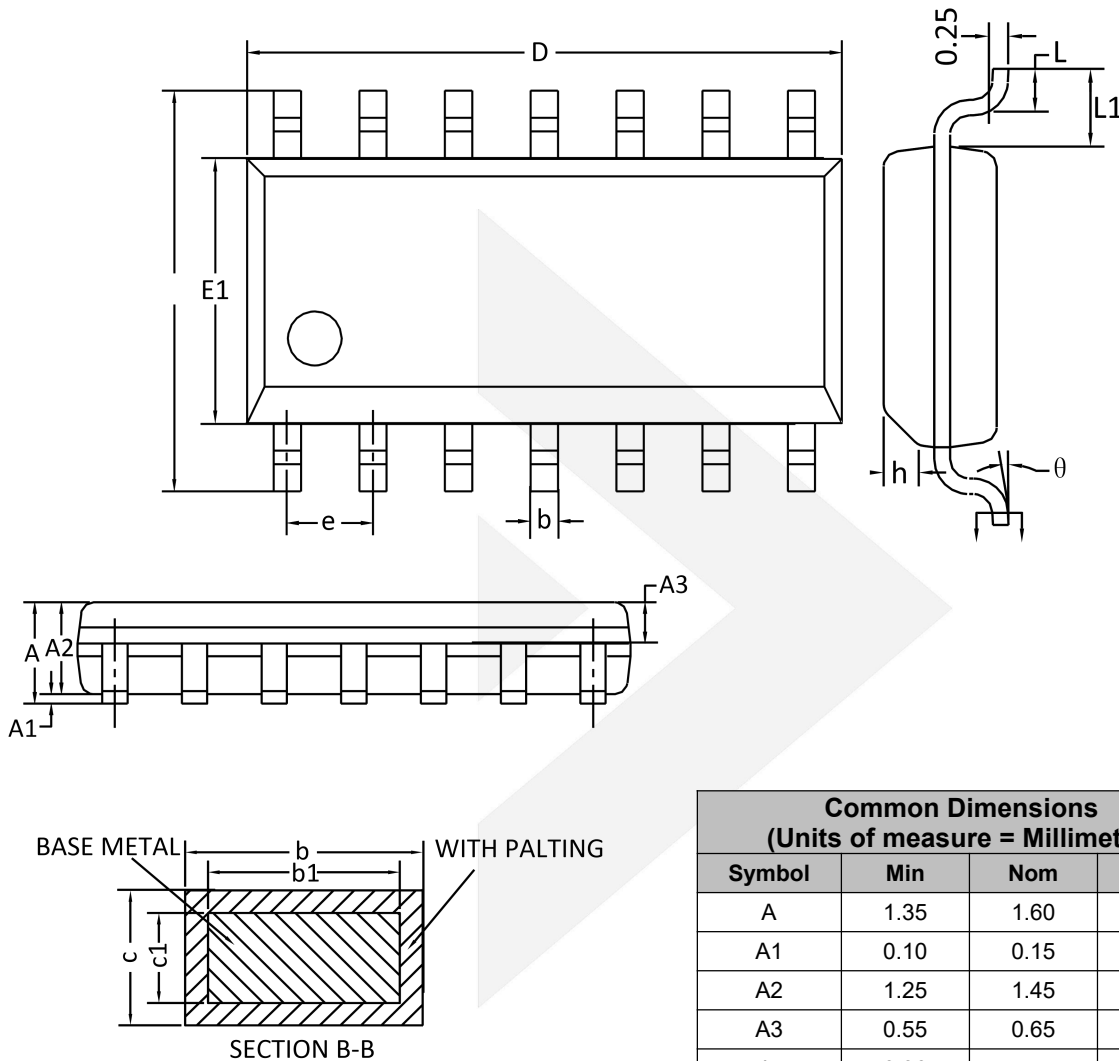
Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	1.35	1.55	1.75
A1	0.10	0.15	0.25
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	-	0.51
b1	0.37	0.42	0.47
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
h	0.30	0.40	0.50
θ	0°	-	8°
θ1	15°	17°	19°
θ2	11°	13°	15°
θ3	15°	17°	19°
θ4	11°	13°	15°

Physical Dimensions: MSOP-8



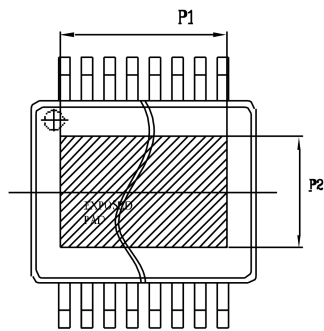
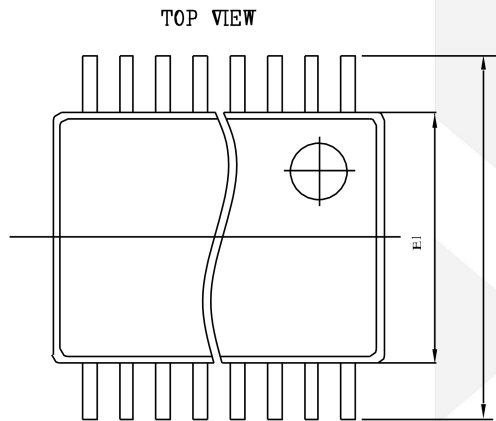
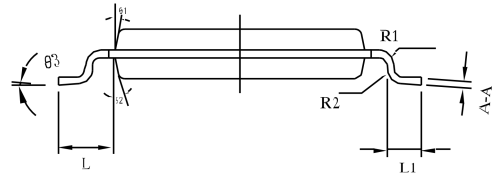
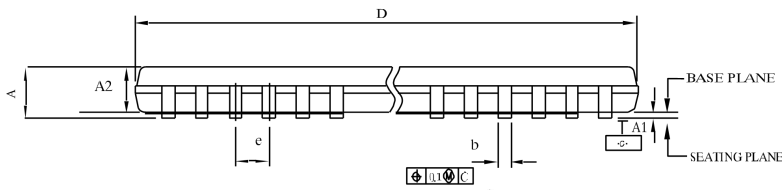
Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	-	-	1.10
A1	0	-	0.15
A2	0.75	0.85	0.95
A3	0.25	0.35	0.39
b	0.28	-	0.37
b1	0.27	0.30	0.33
c	0.15	-	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.55	0.65	0.75
L	0.40	0.60	0.80
L1	0.95 REF		
L2	0.25 BSC		
R	0.07	-	-
R1	0.07	-	-
θ	0°	-	8°
θ1	9°	12°	15°

Physical Dimensions: SOP-14



Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36	-	0.49
b1	0.35	0.40	0.45
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	8.45	8.65	8.85
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27 BSC		
h	0.25	-	0.50
L	0.45	0.60	0.80
L1	1.05 BSC		
Θ	0°	-	8°

Physical Dimensions: TSSOP-14



BOTTOM VIEW

Common Dimensions (Units of measure = Millimeter)		
Symbol	Min	Max
A		1.2
A1	0.05	0.15
A2	0.8	1.05
E	6.25	6.55
E1	4.3	4.5
D	4.9	5.1
L		1
L1	0.45	0.75
e	0.65	
b	0.19	0.3
R1	0.15 TYP	
R2	0.15 TYP	
A-A	0.09	0.2
θ1	12° TYP	
θ2	12° TYP	
θ3	0°	8°

CONTACT US

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