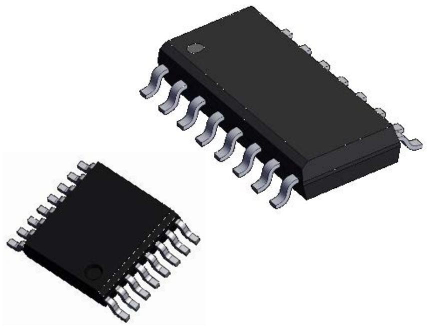
Data Sheet

AELT-8000 Series

Line Driver IC with High-Voltage Quad Differential Output



Description

The Broadcom® AELT-8000 Series is an industrial-power line driver featuring four identical short-circuit-proof differential line drivers, capable of handling up to 36V of driver supply with a joint enable function, and operating at a maximum frequency of up to 5 MHz.

The AELT-8000 is equipped with a thermal shutdown feature that provides over-temperature protection during overload conditions. Its high data rate, combined with wide operating voltage and temperature range, makes it an ideal, versatile, and robust line driver suitable for typical industrial line driver applications.

The small-outline SOIC and TSSOP packages offer excellent thermal power dissipation, making them suitable for use in space-limited applications.

Key Features

- Operating frequency: up to 5 MHz
- Driver supply range: 4.5V to 36V
- Pin compatible to 26xx31, xx7272
- Short-circuit-proof tri-state outputs
- Low propagation delay: 80 ns (typical)
- High impedance CMOS-compatible and TTL-compatible buffered inputs with hysteresis
- Operating temperature range: –40°C to 125°C
- Over-temperature protection circuit
- Under-voltage monitoring

Applications

- Line driver for 5V to 36V control systems
- Rotary and linear encoder interfacing
- Industrial controls
- Sensor systems

NOTE: This product is not specifically designed or manufactured for use in any specific device. Customers are solely responsible for determining the suitability of this product for its intended application and liable for all loss, damage, expense, or liability in connection with such use.

Pin Assignment

Figure 1: SOIC-16

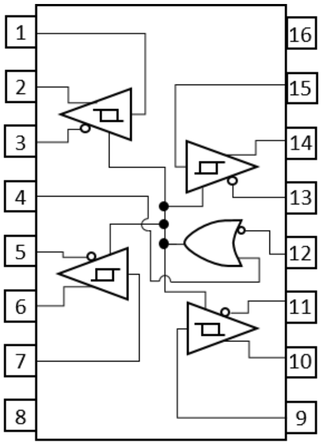


Figure 2: TSSOP-16

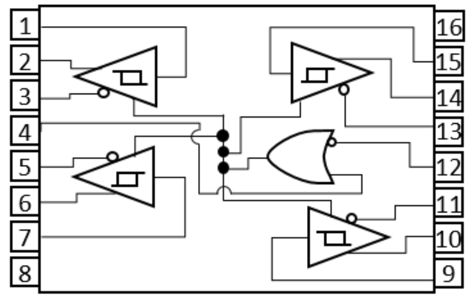


Table 1: Pin Configurations

Number	Name	Type	Description
1	A_{IN}	I	Input A
2	A+	O	Driver Output A
3	A–	O	Inverted Driver Output A
4	ENH	I	Enable Active HIGH
5	B–	O	Inverted Driver Output B
6	B+	O	Driver Output B
7	B_{IN}	I	Input B
8	GND	S	Ground

Number	Name	Type	Description
9	C_{IN}	I	Input C
10	C+	O	Driver Output C
11	C–	O	Inverted Driver Output C
12	ENL	I	Enable Active LOW
13	D–	O	Inverted Driver Output D
14	D+	O	Driver Output D
15	D_{IN}	I	Input D
16	VDD	S	Supply Voltage

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Supply Voltage	VDD	0	40	V	
Voltage at Inputs	x_{IN} ()	0	VDD	V	x is one of the input channels: A, B, C, or D
Voltage at Input Enable	V_{IN} ()	0	VDD	V	
Voltage at Output	V ()	0	VDD	V	
ESD Susceptibility at All Pins	V_d ()	–2	+2	kV	HBM, JS-001-2014
Junction Temperature	T_j	–40	150	°C	
Storage Temperature	T_S	–40	150	°C	
Thermal Resistance	R_{JA}	25	45	°C/W	No load, junction-to-ambient
Moisture Sensitive Level	MSL	—	1	—	

CAUTION! Subjecting the product to stresses beyond those listed in this section may cause permanent damage to the devices. These are stress ratings only and do not imply that the devices will function beyond these ratings. Exposure to the extremes of these conditions for extended periods may affect product reliability.

Electrical Characteristics

Typical operating conditions: VDD = 5V, T_A = 25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Supply Parameters						
Operating Frequency	$f_{OPERATE}$	—	—	—	5	MHz
Permissible Supply Voltage	VDD	—	4.5	5	36	V
Operating Ambient Temperature	T_A	—	–40	—	125	°C
Supply Current in VDD	ICC	VDD = 5V, ENL = low, ENH = high outputs not loaded	—	8	—	mA
		VDD = 36V, ENL = low, ENH = high, outputs not loaded	—	16	—	mA
Tristate Current Consumption in VDD	ICC (TRI)	VDD = 5V, ENL = high, ENH = low, outputs not loaded	—	3	—	mA
		VDD = 36V, ENL = high, ENH = low, outputs not loaded	—	10	—	mA
Clamp Voltage is Low at ENH, ENL	Vclamp Δ low	IΔ = –1 mA	—	–0.6	—	V
Clamp Voltage is High at ENH, xIN[a], ENL	Vclamp Δ high	IΔ = 1 mA	—	VDD + 0.7	—	V
Clamp Voltage is Low at xOUT[b]	Vclamp Δ low	VDD = 0V, IΔ = –10 mA	—	–0.75	—	V
Clamp Voltage is High at xOUT	Vclamp Δ high	VDD = 0V, IΔ = 10 mA	—	1.5	—	V
Driver Input						
Driver Threshold Voltage Low	V_{TH-}	—	—	1.2	—	V
Driver Threshold Voltage High	V_{TH+}	—	—	1.7	—	V
Driver Input Hysteresis	$V_{\Delta HYS}$	—	—	0.5	—	V
Driver Input Leakage Current	I_{IL}	xIN = 0V / VDD	—	0	—	μA
Enable Input Threshold Voltage Low	V_{TH-EN}	—	—	1.2	—	V
Enable Input Threshold Voltage High	V_{TH+EN}	—	—	1.7	—	V
Enable Input Hysteresis	$V_{\Delta HYS\_EN}$	—	—	0.5	—	V
Input Current at ENL	I_{IL} – ENL	ENL = 0V	—	–40	—	μA
Driver Output						
Low Side Short-Circuit Current	I_{SC} (LS)	VDD = 5V, xOUT = VDD	—	185	—	mA
High Side Short-Circuit Current	I_{SC} (HS)	VDD = 5V, xOUT = 0V	—	185	—	mA
Low Side Switch Output Resistance	R_{OUT} (LS)	I_{LOAD} = 40 mA	—	13	—	Ω
High Side Switch Output Resistance	R_{OUT} (HS)	I_{LOAD} = –40 mA	—	22	—	Ω
Output Leakage Current	I_{Leak}	ENL = high, ENH = low	—	0	—	μA
Driver Output Timing						
Propagation Delay from 50% Point of Rising Edge of Input Pulse to Zero Crossing of Differential Outputs with a C Load of 100 pF	t_{PLH}	VDD = 5V, C_{load} = 100 pF	—	65	—	ns
		VDD = 12V, C_{load} = 100 pF	—	70	—	ns
		VDD = 36V, C_{load} = 100 pF	—	75	—	ns
Propagation Delay from 50% Point of Falling Edge of Input Pulse to Zero Crossing of Differential Outputs with a C Load of 100 pF	t_{PHL}	VDD = 5V, C_{load} = 100 pF	—	70	—	ns
		VDD = 12V, C_{load} = 100 pF	—	75	—	ns
		VDD = 36V, C_{load} = 100 pF	—	80	—	ns

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Delay Skew (tPLH – tPHL)	t_{DELAY} Δ	VDD = 4.5V ~ 36V	—	7	—	ns
Output Rise Time with a C Load of 100 pF	t_{RISE}	VDD = 5V, C_{load} = 100 pF	—	35	—	ns
		VDD = 12V, C_{load} = 100 pF	—	45	—	ns
		VDD = 36V, C_{load} = 100 pF	—	65	—	ns
Output Fall Time with a C Load of 100 pF	t_{FALL}	VDD = 5V, C_{load} = 100 pF	—	25	—	ns
		VDD = 12V, C_{load} = 100 pF	—	30	—	ns
		VDD = 36V, C_{load} = 100 pF	—	35	—	ns
Undervoltage Detection						
Undervoltage Threshold Low	V_{TRIG}	—	—	3.8	—	V
Undervoltage Threshold High	V_{REC}	—	—	3.9	—	V
Undervoltage Hysteresis	V_{HYS}	—	—	100	—	mV
Undervoltage Lockout Delay	t_{SHUT} Δ	—	—	7	—	µs
Over-Temperature Detection						
Shutdown Temperature Threshold[c]	T_{OFF}	ENL = low, ENH = high	—	165	—	°C
Temperature Hysteresis	$T\Delta_{OFF}$	ENL = low, ENH = high	—	25	—	°C

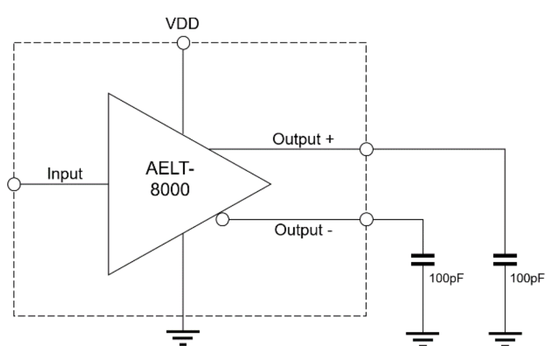
a. xIN = Any input (A_{IN}, B_{IN}, C_{IN}, or D_{IN})

b. xOUT = Any output (A+, A–, B+, B–, C+, C–, D+, or D–)

c. AELT-8000 will trigger thermal shutdown when T_j > 165°C, under stress conditions.

Test Circuit Diagram

Figure 3: Example of a Test Circuit Diagram with AELT-8000 Series, Implementing 100-pF Load at Each Output



Functional Output Modes

Table 2: Ouput Modes for the AELT-8000 Series

Input	Enables		Output +	Output –
	ENH	ENL		
High	High	X	High	Low
Low	High	X	Low	High
High	X	Low	High	Low
Low	X	Low	Low	High
X	Low	High	Z	Z

NOTE:

- X = Either / Irrelevant
- Z = High Impedance

Timing Diagrams

The following are examples of the timing characteristics of AELT-8000 input and output waveforms.

Figure 4: Propagation Delay Time

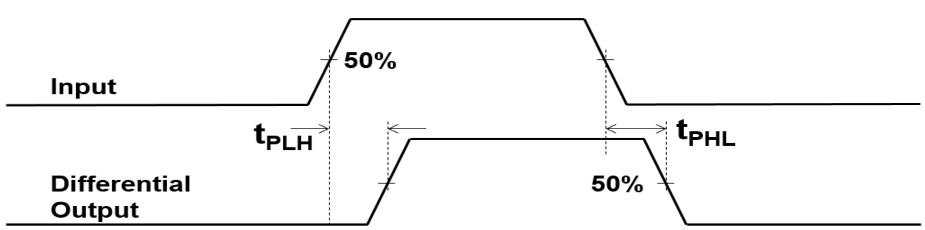
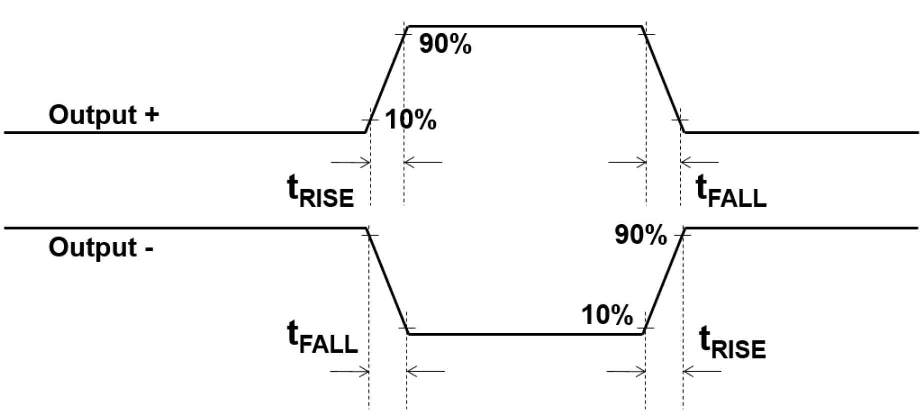


Figure 5: Rise Time and Fall Time of Differential Output Waveforms



Differential Output Diagrams

Figure 6: Example of Typical Line-End Signal with C_{load} = 100 pF, VDD = 5V, $f_{OPERATE}$ = 5 MHz

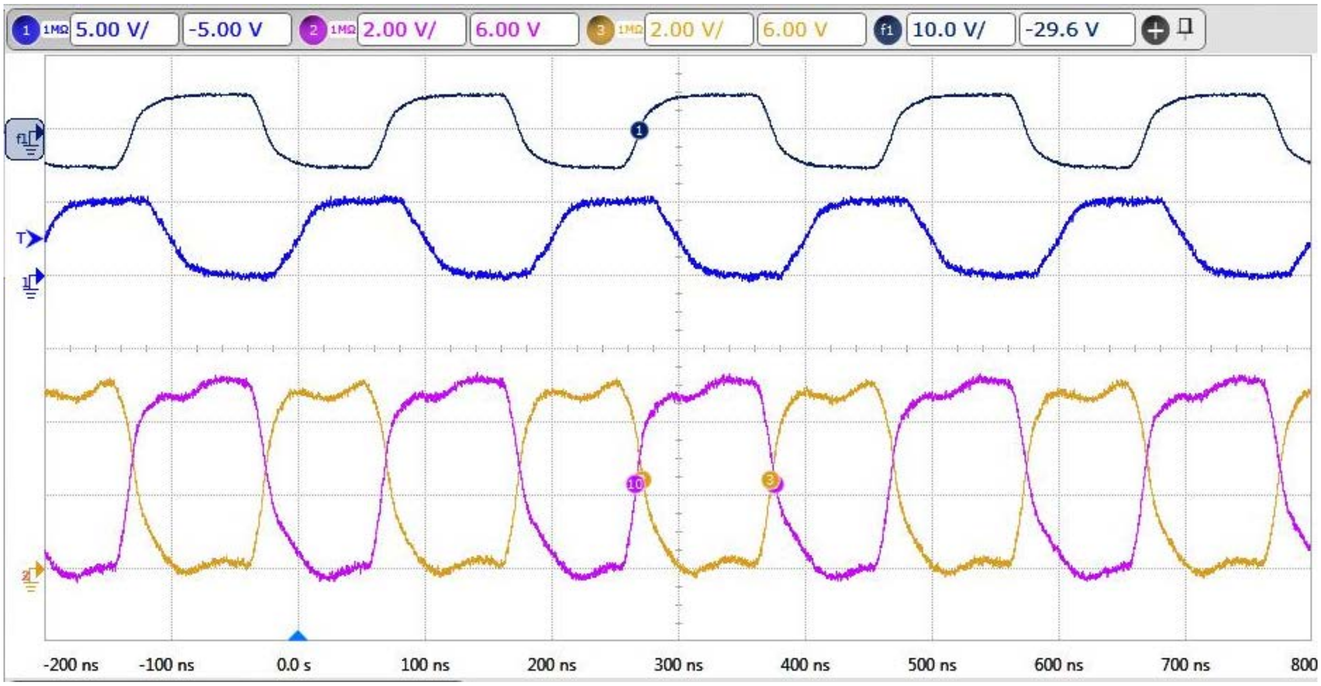
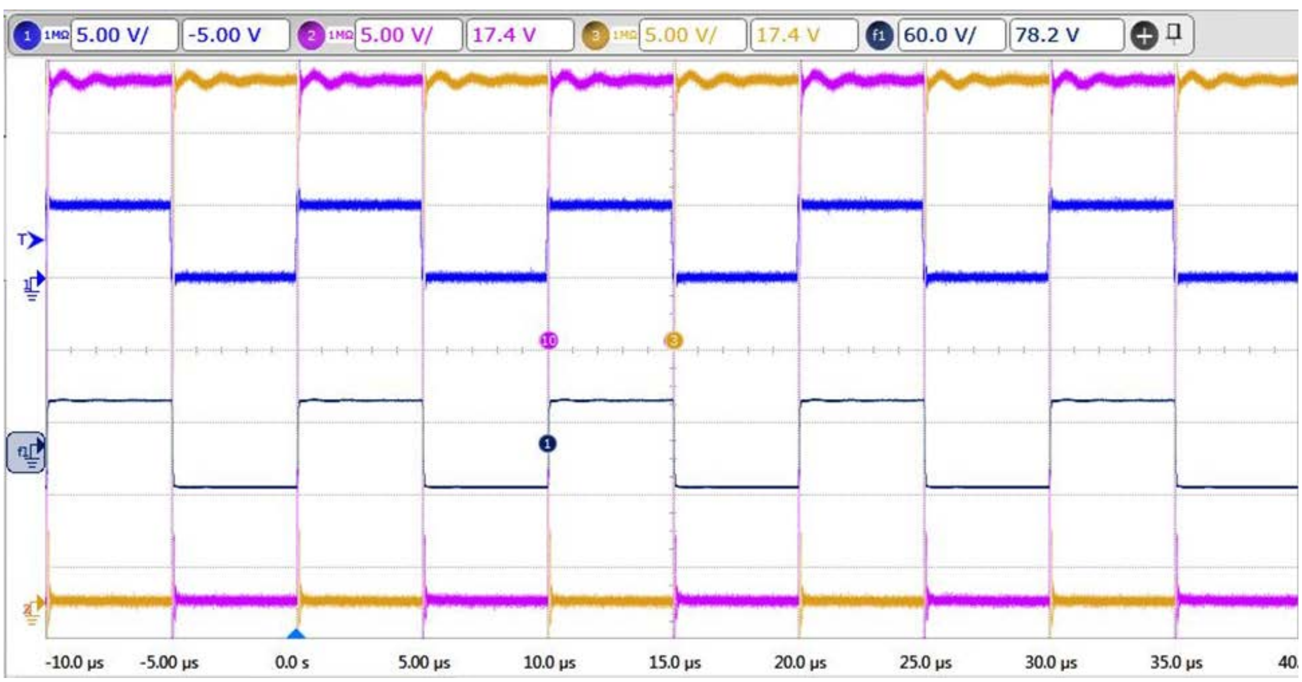


Figure 7: Example of Typical Line-End Signal with C_{load} = 100 pF, VDD = 36V, $f_{OPERATE}$ = 100 kHz

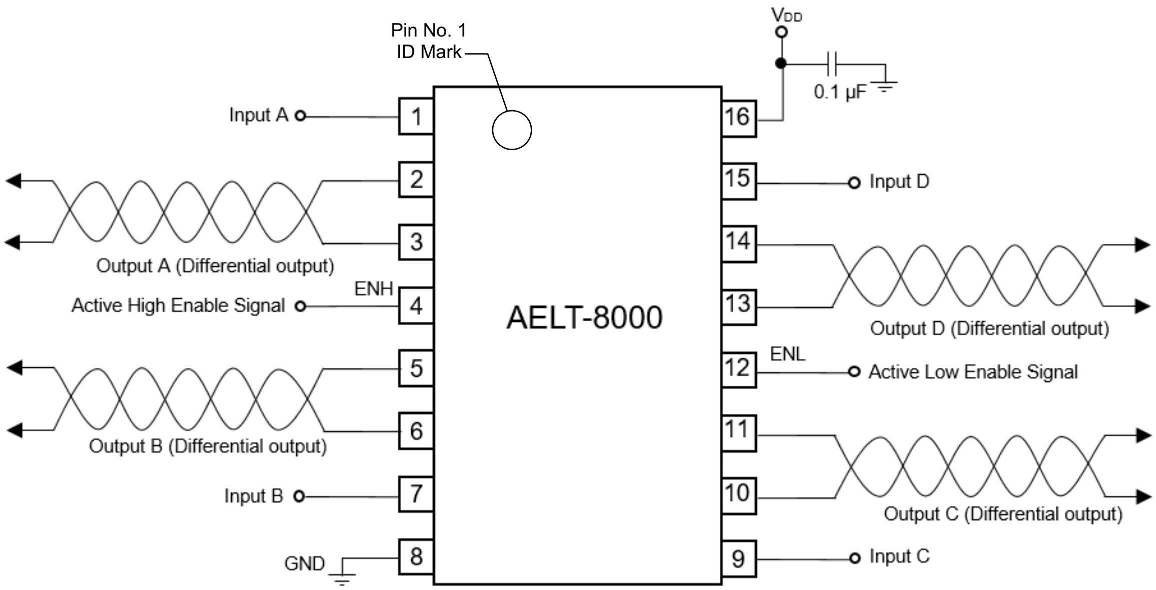


NOTE: Differential = Output+ – Output– (MATH), Input = blue, Output+ = purple, Output– = yellow

Application Example

Figure 8 shows an example of the differential output configuration with all channels used. This configuration includes the recommended use of a 0.1-μF coupling capacitor at the VDD line.

Figure 8: Example of Differential Line Driver Application



Moisture Sensitivity Level

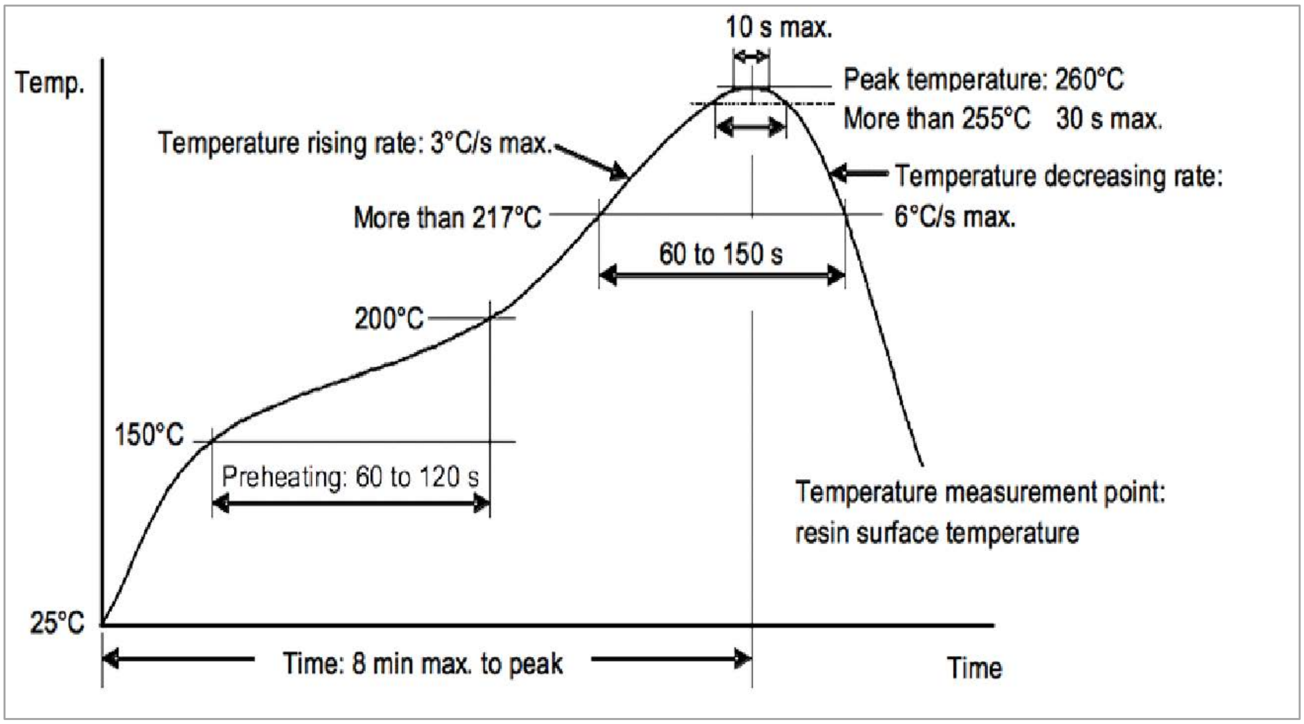
The AELT-8000 is specified to MSL 1.

CAUTION!

- Keep the components in the original packaging to protect them from contaminants.
- Store the components in a temperature-controlled and humidity-controlled environment.

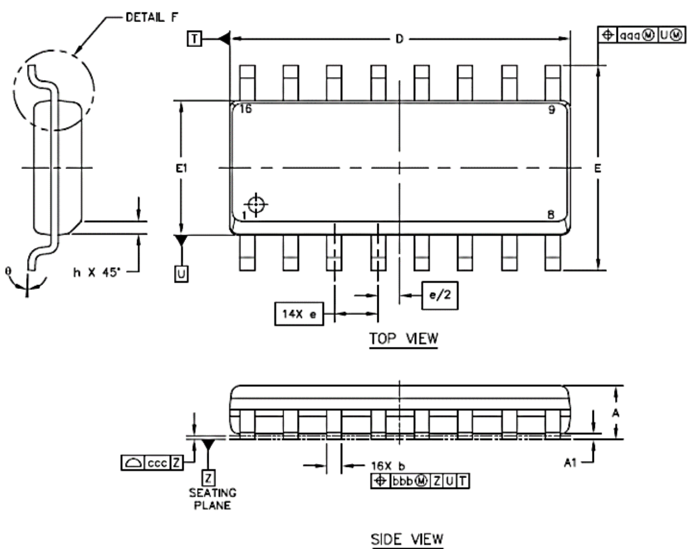
Recommended Lead-Free Reflow Soldering Temperature Profile

Figure 9: Typical Lead-Free Reflow Soldering Profile



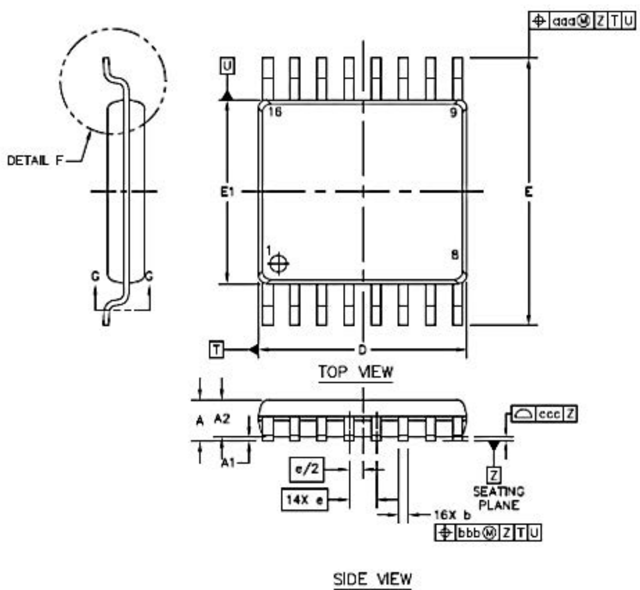
Package Outline and Dimensions

Figure 10: AELT-8000-S16, 16-pin SOIC Dimensions (mm)



Parameter	Symbol	Min.	Nom.	Max.
Total Thickness	A	1.35	—	1.75
Standoff	A1	0.10	—	0.25
Lead Width	b	0.35	—	0.49
L/F Thickness	c	0.19	—	0.25
Body Size	D	9.80	—	10.00
	E1	3.80	—	4.00
	E	5.80	—	6.20
Lead Pitch	e	1.27 BSC		
	L	0.40	—	1.25
	h	0.25	—	0.50
	θ	0°	—	7°
Lead Edge Offset	aaa	0.25		
Lead Offset	bbb	0.25		
Coplanarity	ccc	0.10		

Figure 11: AELT-8000-T16, 16-pin TSSOP Dimensions (mm)



Parameter		Symbol	Min.	Nom.	Max.
Total Thickness		A	—	—	1.10
Standoff		A1	0.05	—	0.15
Mold Thickness		A2	0.85	0.90	0.95
Lead Width (Plating)		b	0.19	—	0.30
Lead Width		b1	0.19	0.22	0.25
L/F Thickness (Plating)		c	0.09	—	0.20
L/F Thickness		c1	0.09	—	0.16
Body Size	X	D	4.90	5	5.10
	Y	E1	4.30	4.40	4.50
		E	6.20	6.40	6.60
Lead Pitch		e	0.65 BSC		
		L	0.45	0.6	0.75
Footprint		L1	1 REF		
		θ1	0°	—	8°
		θ2	14° (typical)		
		θ3	14° (typical)		
		R1	0.09	—	—
		R2	0.09	—	—
		S	0.20	—	—
Lead Edge Offset		aaa	0.20		
Lead Offset		bbb	0.10		
Coplanarity		ccc	0.10		
Mold Flatness		ddd	0.05		

Product Ordering Information

Table 3: Ordering Information

Ordering Part Number	Product Description	Package Size	Delivery Form
AELT-8000-S16	High Voltage Quad Differential Line Driver	SOIC-16, 4 mm x 10 mm	Tube, 48 pieces
AELT-8000-S100	High Voltage Quad Differential Line Driver	SOIC-16, 4 mm x 10 mm	Tape and Reel, 1000 pieces
AELT-8000-S102	High Voltage Quad Differential Line Driver	SOIC-16, 4 mm x 10 mm	Tape and Reel, 100 pieces
AELT-8000-T16	High Voltage Quad Differential Line Driver	TSSOP-16, 4.4 mm x 5 mm	Tube, 96 pieces
AELT-8000-T100	High Voltage Quad Differential Line Driver	TSSOP-16, 4.4 mm x 5 mm	Tape and Reel, 1000 pieces
AELT-8000-T102	High Voltage Quad Differential Line Driver	TSSOP-16, 4.4 mm x 5 mm	Tape and Reel, 100 pieces