



THE DATASHEET OF ATMEGA128-16AU



Features

- Ideally Suited for Automatic Insertion
- Complementary PNP Types: BC856–BC858
- For Switching and AF Amplifier Applications
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **An automotive-compliant part is available under separate datasheet ([BC846AQ-BC848CQ](#))**

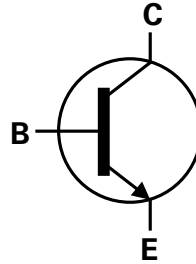
Mechanical Data

- Package: SOT23
- Package Material: Molded Plastic, "Green" Molding Compound
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.008 grams (Approximate)

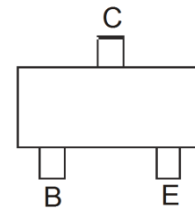


SOT23

Top View



Device Symbol

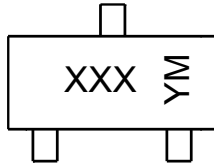

 Top View
Pin-Out

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Packing	
				Qty.	Carrier
BC846A-7-F	SOT23	K1Q	7	3,000	Reel
BC846B-7-F	SOT23	K1R	7	3,000	Reel
BC846B-13-F	SOT23	K1R	13	10,000	Reel
BC847A-7-F	SOT23	K1Q	7	3,000	Reel
BC847A-13-F	SOT23	K1Q	13	10,000	Reel
BC847B-7-F	SOT23	K1R	7	3,000	Reel
BC847B-13-F	SOT23	K1R	13	10,000	Reel
BC847C-7-F	SOT23	K1M	7	3,000	Reel
BC847C-13-F	SOT23	K1M	13	10,000	Reel
BC848A-7-F	SOT23	K1Q	7	3,000	Reel
BC848B-7-F	SOT23	K1R	7	3,000	Reel
BC848B-13-F	SOT23	K1R	13	10,000	Reel
BC848C-7-F	SOT23	K1M	7	3,000	Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



XXX = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: L = 2024)
 M or \bar{M} = Month (ex: 9 = September)

Date Code Key

Year	2007	-	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Code	U	-	L	M	N	P	R	S	T	U	V	W
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CB0}	BC846A/B	80
		BC847A/B/C	50
		BC848A/B/C	30
Collector-Emitter Voltage	V _{CEO}	BC846A/B	65
		BC847A/B/C	45
		BC848A/B/C	30
Emitter-Base Voltage	V _{EB0}	BC846A/B	6.0
		BC847A/B/C	5.0
		BC848A/B/C	
Continuous Collector Current	I _C	100	mA
Peak Collector Current	I _{CM}	200	mA
Peak Emitter Current	I _{EM}	200	mA

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation	P _D	(Note 5)	310
		(Note 6)	350
Thermal Resistance, Junction to Ambient	R _{θJA}	(Note 5)	403
		(Note 6)	357
Thermal Resistance, Junction to Leads	R _{θJL}	350	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-65 to +150	°C

ESD Ratings (Note 8)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
 - Same as Note 5, except the device is mounted on 15mm x 15mm 1oz copper.
 - Thermal resistance from junction to solder-point (at the end of the leads).
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

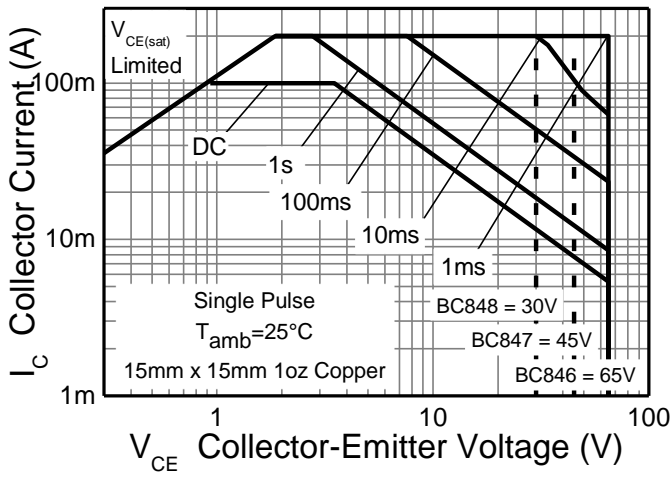


Figure 1. Safe Operating Area

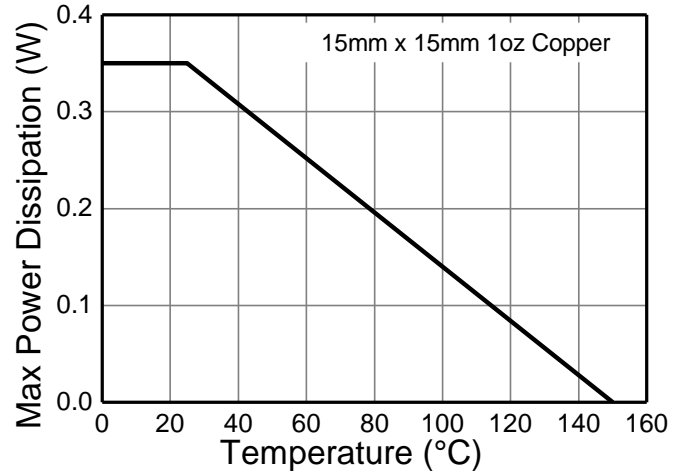


Figure 2. Derating Curve

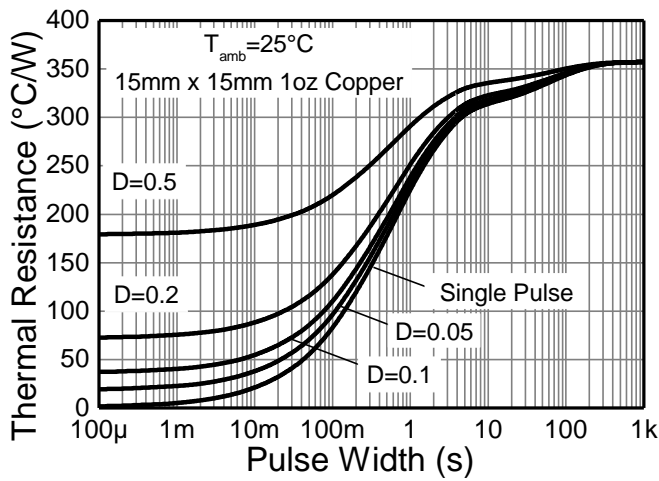


Figure 3. Transient Thermal Impedance

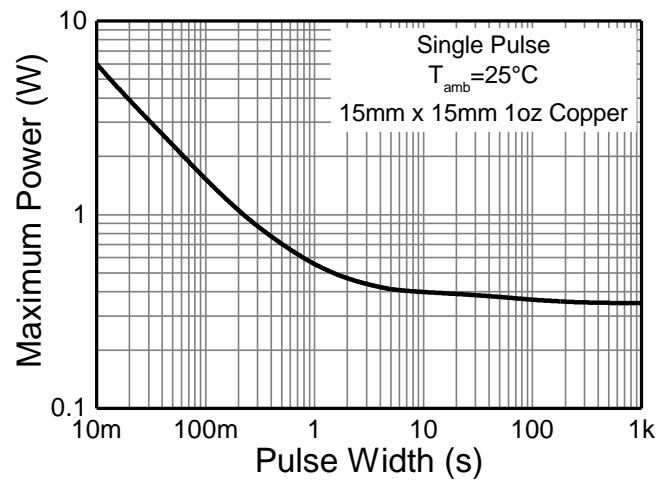


Figure 4. Pulse Power Dissipation

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BC846A/B	BV _{CBO}	80	—	—	V	I _C = 10μA
	BC847A/B/C		50				
	BC848A/B/C		30				
Collector-Emitter Breakdown Voltage (Note 9)	BC846A/B	BV _{CEO}	65	—	—	V	I _C = 10mA
	BC847A/B/C		45				
	BC848A/B/C		30				
Emitter-Base Breakdown Voltage	BC846A/B	BV _{EBO}	6	—	—	V	I _E = 1μA
	BC847A/B/C		5				
	BC848A/B/C						
Collector Cutoff Current		I _{CBO}	—	—	15 5	nA μA	V _{CB} = 30V V _{CB} = 30V, T _J = +150°C
Collector Emitter Cutoff Current	BC846A/B	I _{CES}	—	—	15	nA	V _{CE} = 80V
	BC847A/B/C				15		V _{CE} = 50V
	BC848A/B/C				15		V _{CE} = 30V
Emitter Base Cutoff Current		I _{EBO}	—	—	100	nA	V _{EB} = 5V
Small Signal Current Gain (Note 9)	BC846A/BC847A/BC848A	h _{FE}	—	200	—	—	I _C = 2.0mA, V _{CE} = 5V f = 1.0kHz
	BC846B/BC847B/BC848B			330			
	BC847C/BC848C			600			
Input Impedance (Note 9)	BC846A/BC847A/BC848A	h _{ie}	—	2.7	—	kΩ	
	BC846B/BC847B/BC848B			4.5			
	BC847C/BC848C			8.7			
Output Admittance (Note 9)	BC846A/BC847A/BC848A	h _{oe}	—	18	—	μS	
	BC846B/BC847B/BC848B			30			
	BC847C/BC848C			60			
Reverse Voltage Transfer Ratio (Note 9)	BC846A/BC847A/BC848A	h _{re}	—	1.5 x 10 ⁻⁴	—	—	
	BC846B/BC847B/BC848B			2 x 10 ⁻⁴			
	BC847C/BC848C			3 x 10 ⁻⁴			
DC Current Gain (Note 9)	BC846A/BC847A/BC848A	h _{FE}	110	180	220	—	I _C = 2.0mA, V _{CE} = 5V
	BC846B/BC847B/BC848B		200	290	450		
	BC847C/BC848C		420	520	800		
Collector-Emitter Saturation Voltage (Note 9)		V _{CE(sat)}	—	90	250	mV	I _C = 10mA, I _B = 0.5mA
				200	600		I _C = 100mA, I _B = 5.0mA
Base-Emitter Turn-On Voltage (Note 9)		V _{BE(on)}	580	660	700	mV	I _C = 2mA, V _{CE} = 5V
			—	—	770		I _C = 10mA, V _{CE} = 5V
Base-Emitter Saturation Voltage (Note 9)		V _{BE(sat)}	—	700	—	mV	I _C = 10mA, I _B = 0.5mA
				900			I _C = 100mA, I _B = 5mA
Output Capacitance		C _{obo}	—	3	—	pF	V _{CB} = 10V, f = 1.0MHz
Transition Frequency		f _T	100	300	—	MHz	V _{CE} = 5V, I _C = 10mA f = 100MHz
Noise Figure		NF	—	2	10	dB	V _{CE} = 5V, I _C = 200μA R _S = 2kΩ, f = 1kHz Δf = 200Hz

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

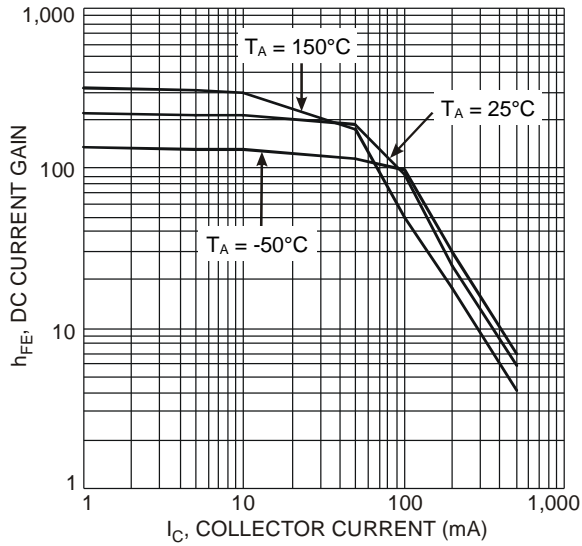


Figure 5. Typical DC Current Gain vs. Collector Current

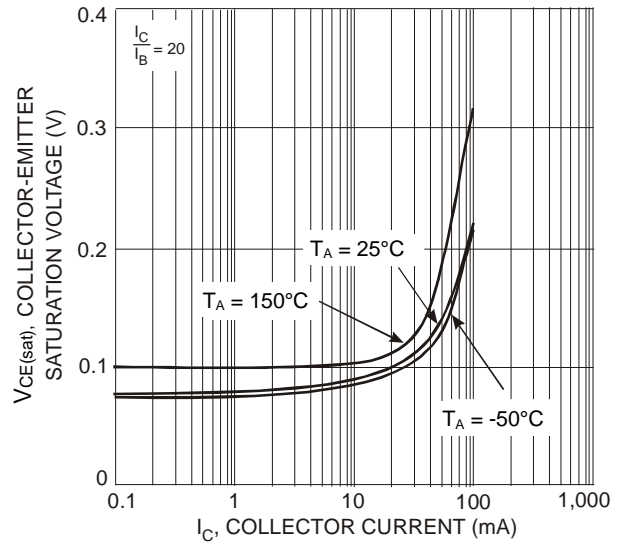


Figure 6. Typical Collector-Emitter Saturation Voltage vs. Collector Current

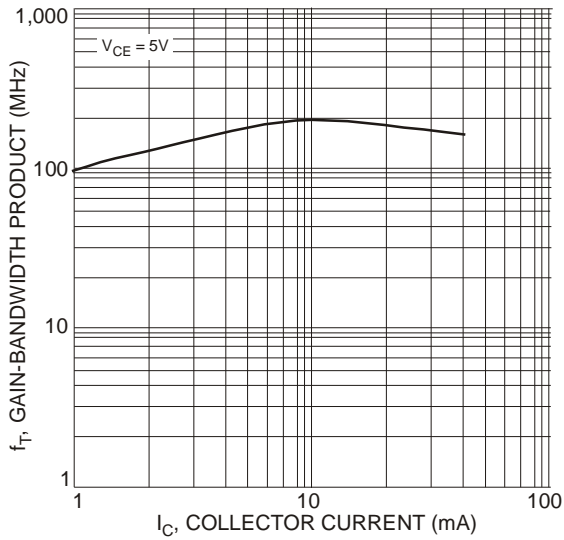
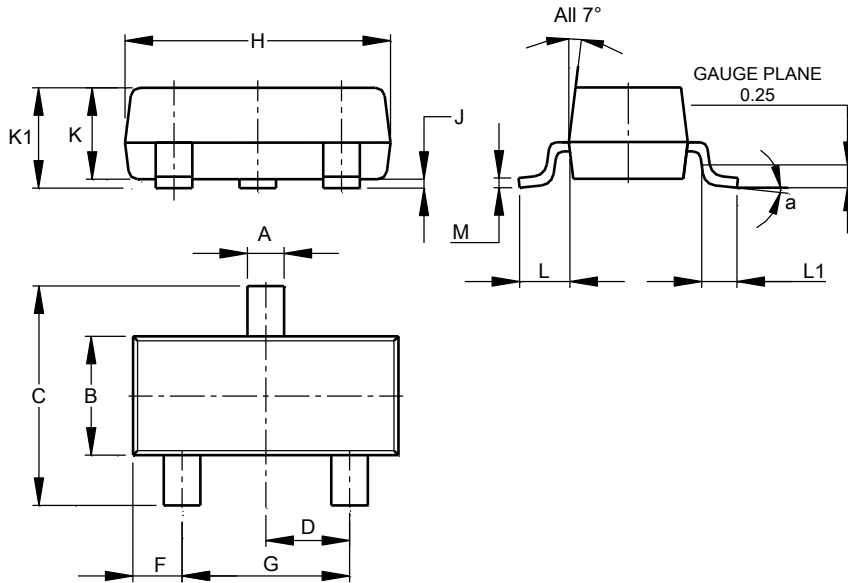


Figure 7. Typical Gain-Bandwidth Product vs. Collector Current

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23

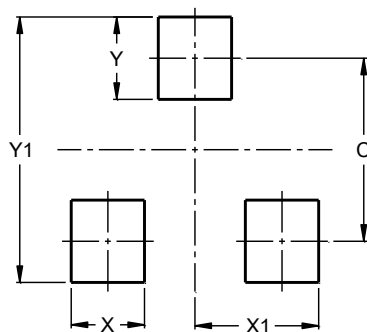


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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