COMPLEX TRANSISTOR ARRAY FOR BIPOLAR TRANSISTOR HALF H-BRIDGE MOTOR/ACTUATOR DRIVER

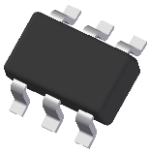
Features

- Epitaxial Planar Die Construction
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

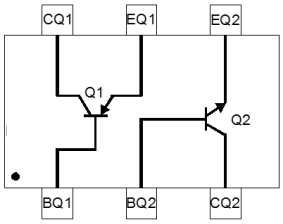
Mechanical Data

- Package: SOT363
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Schematic & Pin Configuration
- Terminals: Finish—Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.016 grams (Approximate)

SOT363



Existing Product
Top View



Device Schematic

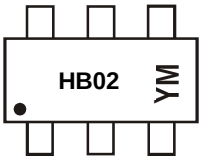
Ordering Information (Note 4)

Part Number	Compliance	Package	Packing	
			Quantity	Carrier
HBDM60V600X-7	Standard	SOT363	3000	Tape & 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

SOT363



HB02 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: I = 2021)
M = Month (ex: 9 = September)

Date Code Key

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Code	I	J	K	L	M	N	O	P	R	S	T	U

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

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

Characteristic	Symbol	Value	Unit
Operating and Storage Temperature Range	T_{OP}, T_{STG}	-55 to +150	°C

Thermal Characteristics: Total Device

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	200	mW
Thermal Resistance, Junction to Ambient Air (Note 5)	$R_{\Theta JA}$	625	°C/W

Maximum Ratings: Sub-Component Devices (@ T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Q1-PNP Transistor	Q2-NPN Transistor	Unit
Collector-Base Voltage	V_{CBO}	-60	80	V
Collector-Emitter Voltage	V_{CEO}	-60	65	V
Emitter-Base Voltage	V_{EBO}	-5.5	6	V
Collector Current - Continuous (Note 5)	I_C	-600	500	mA

Electrical Characteristics: PNP Transistor (Q1) (@ T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60	—	V	I_C = -10µA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60	—	V	I_C = -10mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5.5	—	V	I_E = -10µA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	-10	nA	V_{CB} = -50V, I_E = 0
Collector Cutoff Current	I_{CEX}	—	-50	nA	V_{CE} = -30V, $V_{EB(OFF)}$ = 0.5V
Base Cutoff Current	I_{BL}	—	-50	nA	V_{CE} = -30V, $V_{EB(OFF)}$ = -0.5V
ON CHARACTERISTICS (Note 6)					
DC Current Gain	h_{FE}	100 100 100 100 50	— — — 300 —	— — — — —	I_C = -100µA, V_{CE} = -10V I_C = -1.0mA, V_{CE} = -10V I_C = -10mA, V_{CE} = -10V I_C = -150mA, V_{CE} = -10V I_C = -500mA, V_{CE} = -10V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	-0.3 -0.5	V	I_C = -150mA, I_B = -15mA I_C = -500mA, I_B = -50mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	-0.95 -1.3	V	I_C = -150mA, I_B = -15mA I_C = -500mA, I_B = -50mA

Notes: 5. Device mounted on FR-4 substrate printed circuit board with 1 inch square 2oz copper pad area.
6. Short duration pulse test used to minimize self-heating effect.

Electrical Characteristics: NPN Transistor (Q2) (@ T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80	—	—	V	I_C = 100µA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	65	—	—	V	I_C = 1mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	—	—	V	I_E = 100µA, I_C = 0
Collector-Base Cutoff Current	I_{CBO}	—	—	100	nA	V_{CB} = 80V, I_E = 0
Collector Cutoff Current	I_{CES}	—	—	100	nA	V_{CE} = 90V, V_{BE} = 0
Emitter-Base Cutoff Current	I_{EBO}	—	—	100	nA	V_{EB} = 5V, I_C = 0
ON CHARACTERISTICS (Note 6)						
DC Current Gain	h_{FE}	250	—	—	—	V_{CE} = 1V, I_C = 10mA
		100	—	—	—	V_{CE} = 1V, I_C = 100mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	0.2	0.4	V	I_C = 100mA, I_B = 10mA
Base-Emitter Turn-on Voltage	$V_{BE(on)}$	0.7	0.75	0.8	V	V_{CE} = 1V, I_C = 100mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	—	0.95	V	I_C = 100mA, I_B = 5mA

Note: 6. Short duration pulse test used to minimize self-heating effect.

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

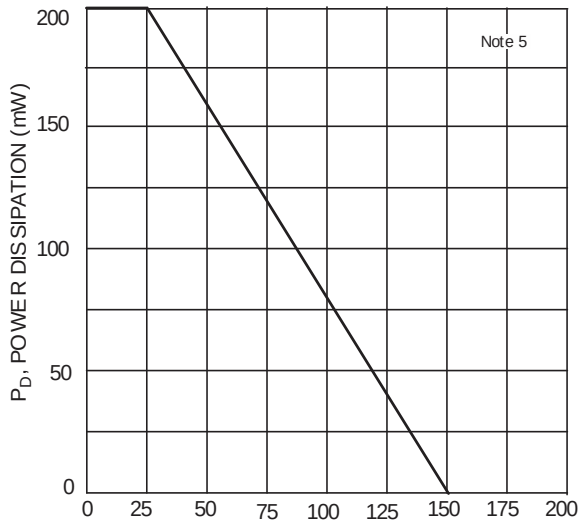


Fig. 1 Power Derating Curve

PNP Transistor (Q1) Plots

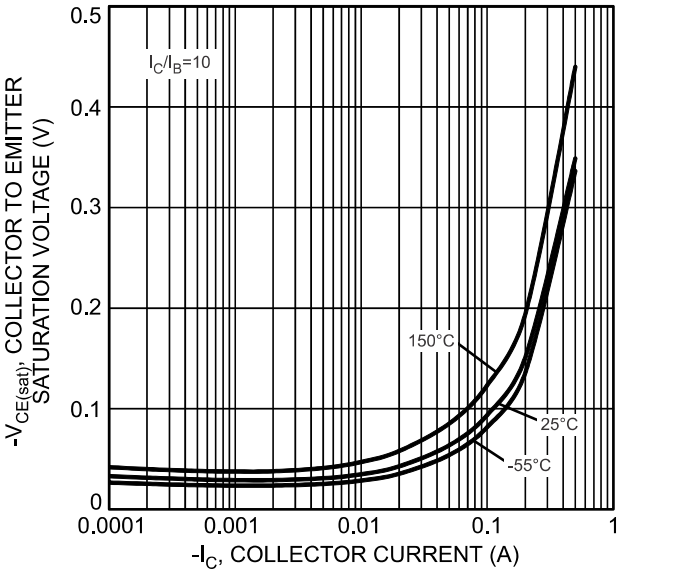


Fig 2. Collector Emitter Saturation Voltage vs. Collector Current

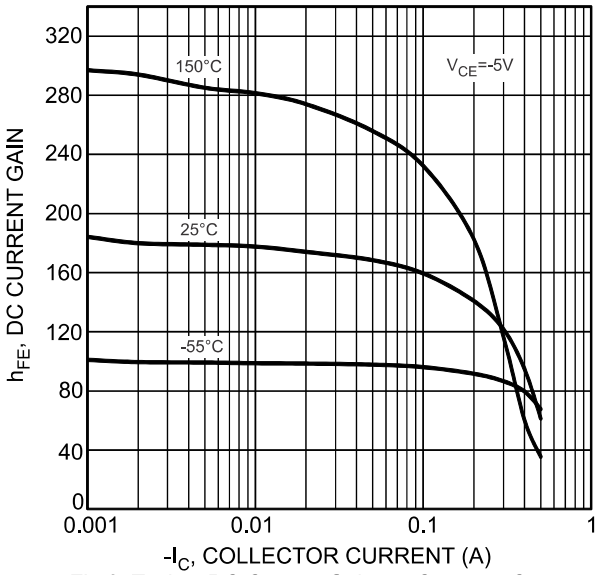


Fig 3. Typical DC Current Gain vs. Collector Current

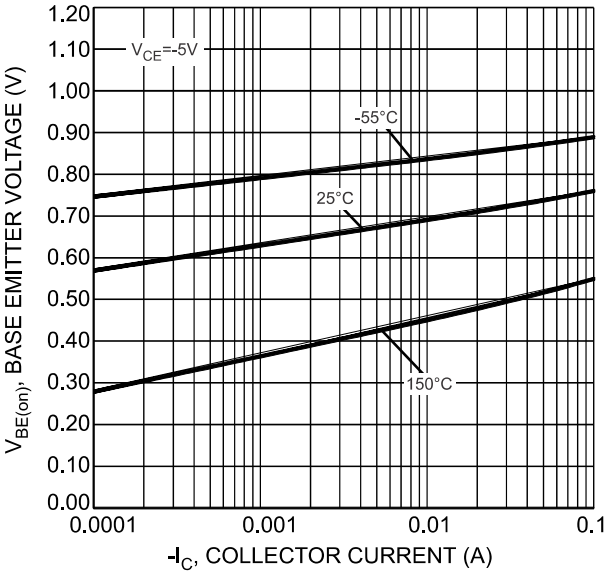


Fig. 4 Typical Base Emitter Voltage vs. Collector Current

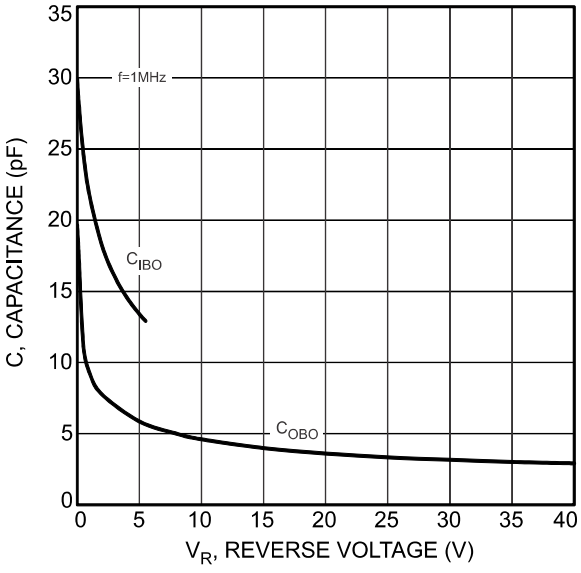


Fig. 5 Typical Capacitance

NPN Transistor (Q2) Plots

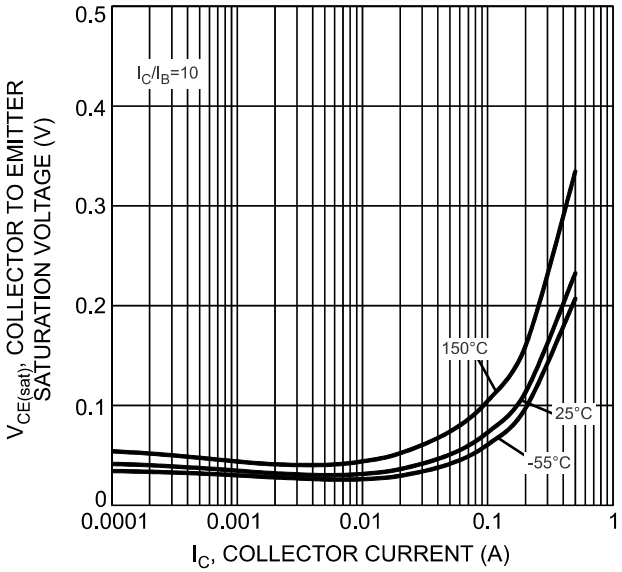


Fig. 6 Typical Collector Emitter Saturation Voltage vs. Collector Current

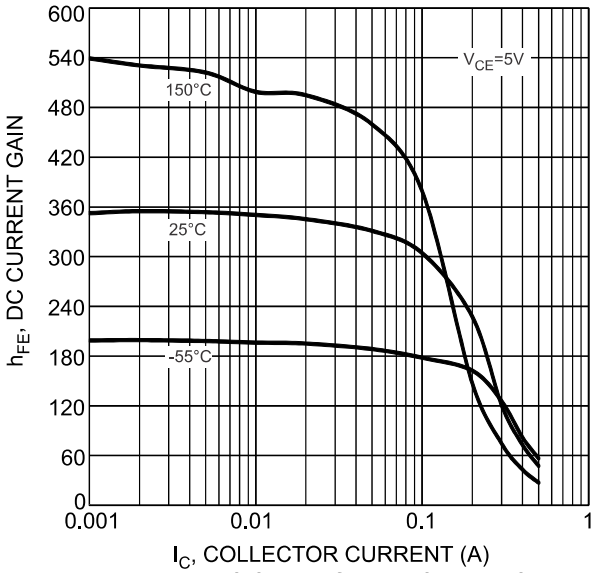


Fig. 7 Typical DC Current Gain vs. Collector Current

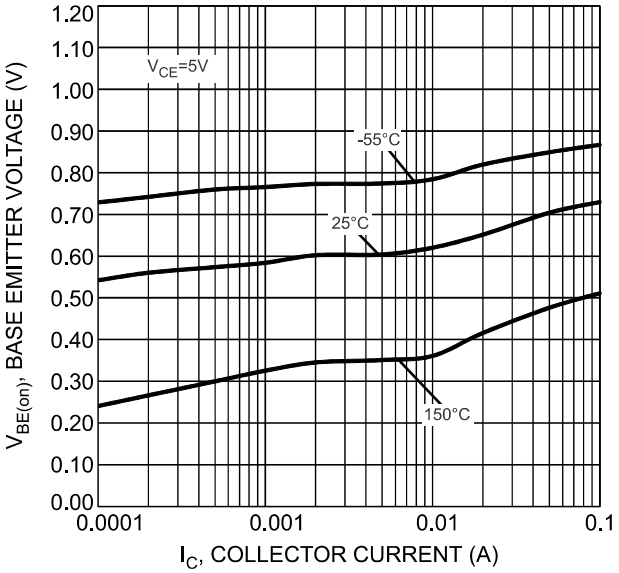


Fig 8. Typical Base Emitter Voltage vs Collector Current

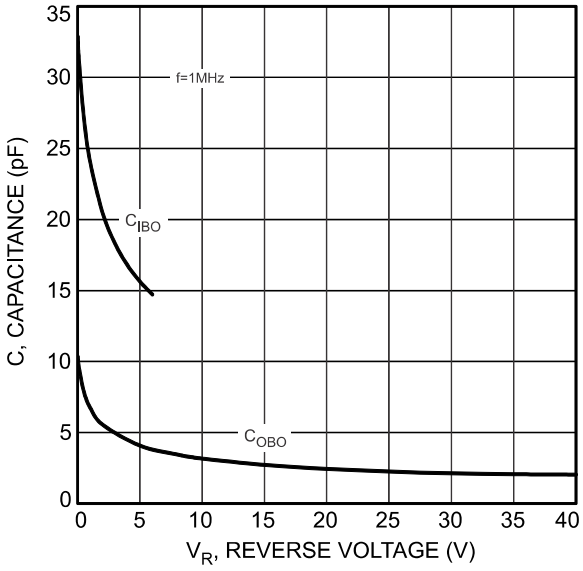
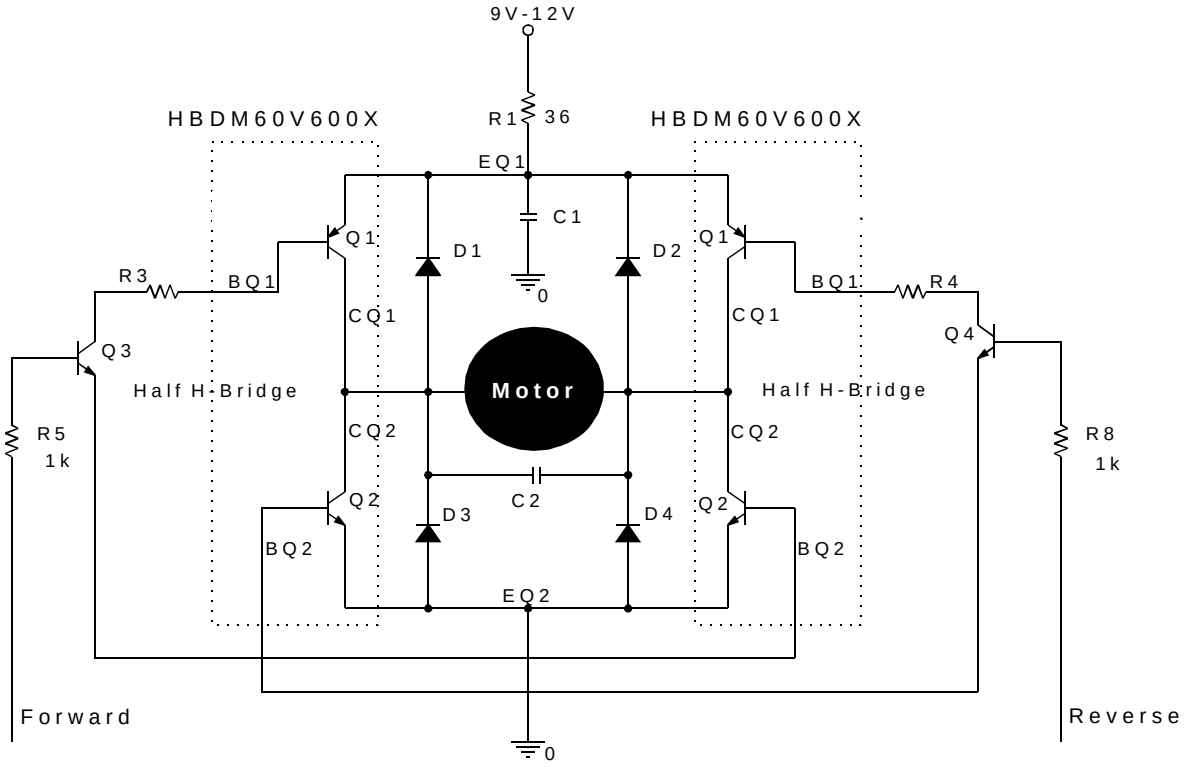


Fig. 9 Typical Capacitance

Current Schematic with Application Example

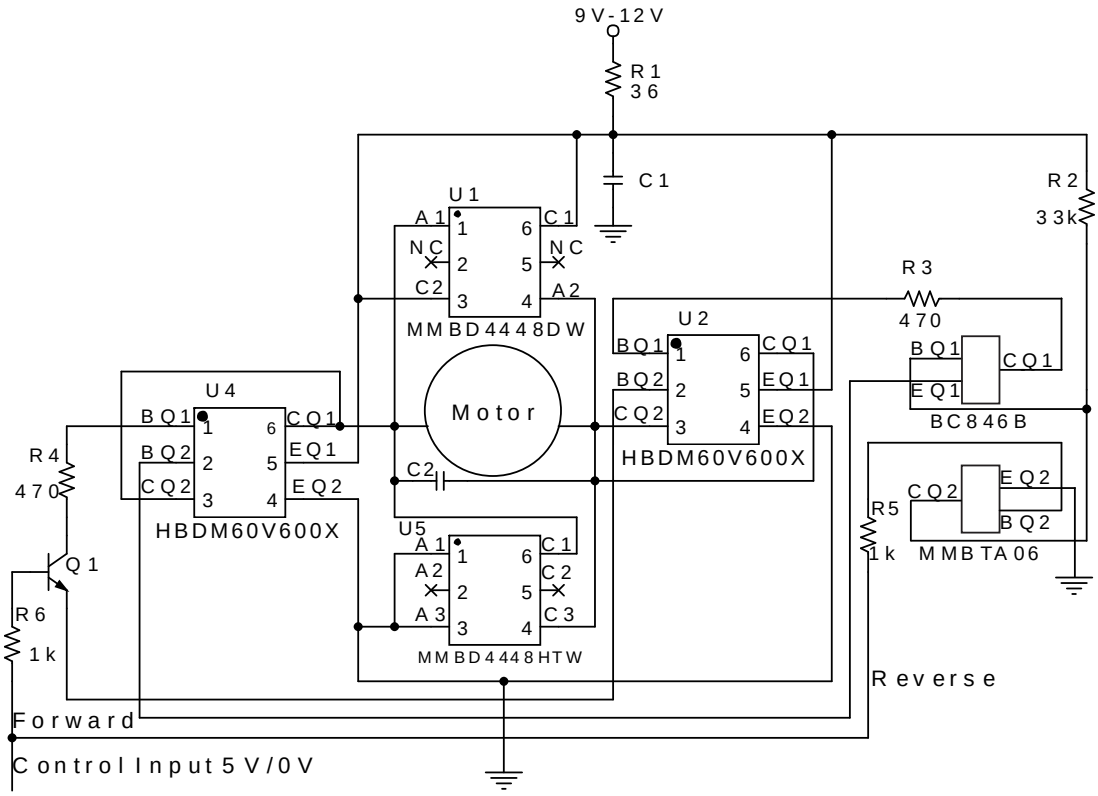
SOT363



Notes: D1, D2, D3, D4: Switching Diodes (MMBD4448)
Q3, Q4: NPN Transistors (MMBTA06)

Application Example Schematic (with Package Pinouts)

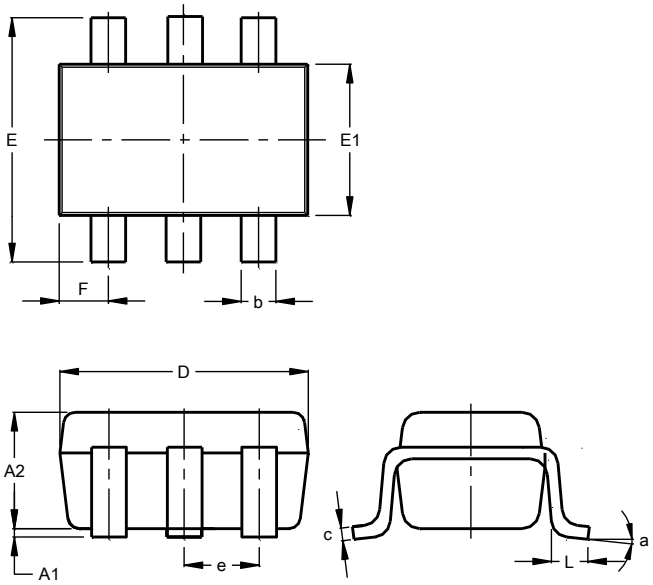
SOT363



Package Outline Dimensions

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

SOT363

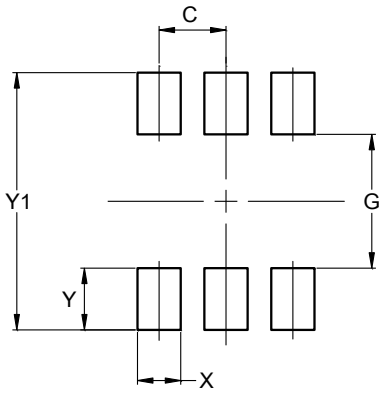


SOT363			
Dim	**Min**	**Max**	**Typ**
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

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

SOT363



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500

IMPORTANT NOTICE

1. DIODES INCORPORATED AND ITS SUBSIDIARIES (“DIODES”) MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes products. Diodes products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of the Diodes products for their intended applications, (c) ensuring their applications, which incorporate Diodes products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.

3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes’ websites, harmless against all damages and liabilities.

4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes’ website) under this document.

5. Diodes products are provided subject to Diodes’ Standard Terms and Conditions of Sale (https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

6. Diodes products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.

7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.

8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.

www.diodes.com