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

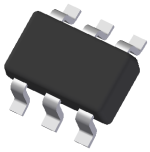
Features

- Epitaxial Planar Die Construction
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen, Antimony and Beryllium 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/**

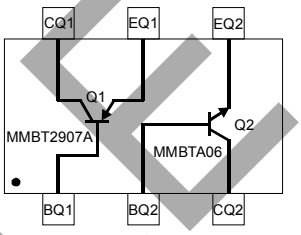
Sub-Component P/N	Reference	Device Type
MMBT2907A_DIE	Q1	PNP Transistor
MMBTA06_DIE	Q2	NPN Transistor

Mechanical Data

- Case: SOT-363
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminal Connections: See Schematic & Pin Configuration
- Terminals: Finish—Matte Tin Annealed over Alloy 42 Lead-Frame. Solderable per MIL-STD-202, Method 208 e3
- Marking Information: See Page 6
- Ordering Information: See Page 6
- Weight: 0.016 grams (Approximate)



Existing Product
Top View



Device Schematic

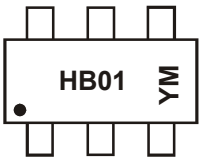
Please support the datasheet update to Discontinued status 4 datasheet such as background of the datasheet.

Ordering Information (Note 4)

Part Number	Compliance	Case	Packaging
HBDM60V600W-7	Standard	SOT-363	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, Antimony and Beryllium-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl), <1000ppm antimony compounds and <1000ppm Beryllium.
4. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

Marking Information



HB01 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: G = 2019)
M = Month (ex: 9 = September)

Date Code Key

Year	2006	2007	…	2019	2020	2021	2022	2023	2024	2025
Code	T	U	…	G	H	I	J	K	L	M

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 (MMBT2907A)	Q2-NPN Transistor (MMBTA06)	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

Note: 5. Device mounted on FR-4 substrate printed circuit board with 1 inch square 2oz copper pad area

Electrical Characteristics: PNP (MMBT2907A) 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
SMALL SIGNAL CHARACTERISTICS					
Current Gain-Bandwidth Product	f_T	100	—	MHz	V_{CE} = -2.0V, I_C = -10mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Turn-On Time	t_{on}	—	45	ns	V_{CE} = -30V, I_C = -150mA, I_{B1} = -15mA
Delay Time	t_d	—	10	ns	
Rise Time	t_r	—	40	ns	
Turn-Off Time	t_{off}	—	100	ns	V_{CC} = -6.0V, I_C = -150mA, I_{B1} = I_{B2} = -15mA
Storage Time	t_s	—	80	ns	
Fall Time	t_f	—	30	ns	

Electrical Characteristics: NPN (MMBTA06) 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
SMALL SIGNAL CHARACTERISTICS						
Current Gain-Bandwidth Product	f_T	100	—	—	MHz	V_{CE} = 20V, I_C = 10mA, f = 100MHz

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

Typical Characteristics @T_A = 25°C unless otherwise specified

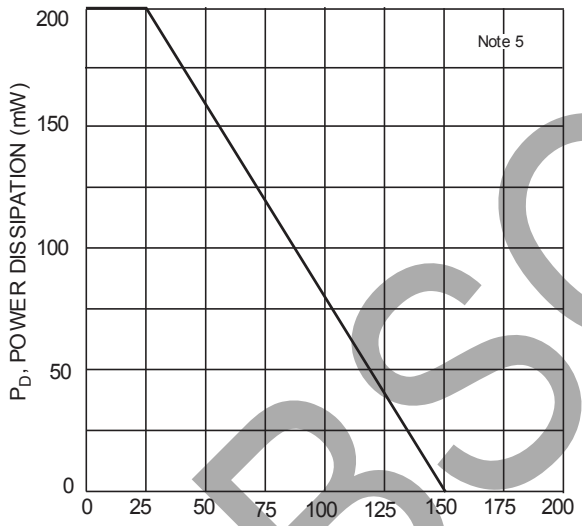


Fig. 1 Power Derating Curve

PNP (MMBT2907A) Transistor (Q1) Plots

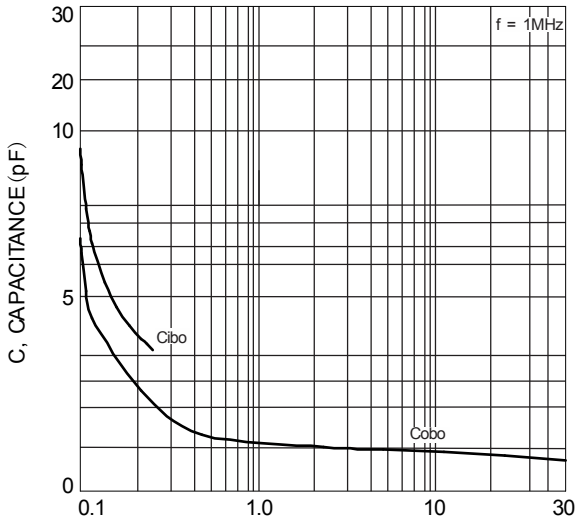


Fig. 2 Typical Capacitance

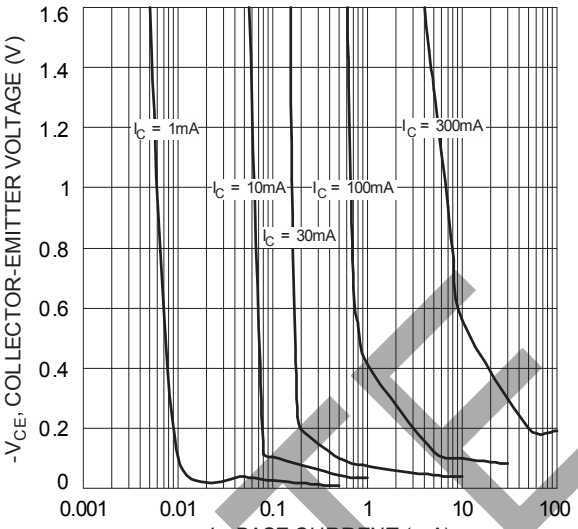


Fig. 3 Typical Collector Saturation Region

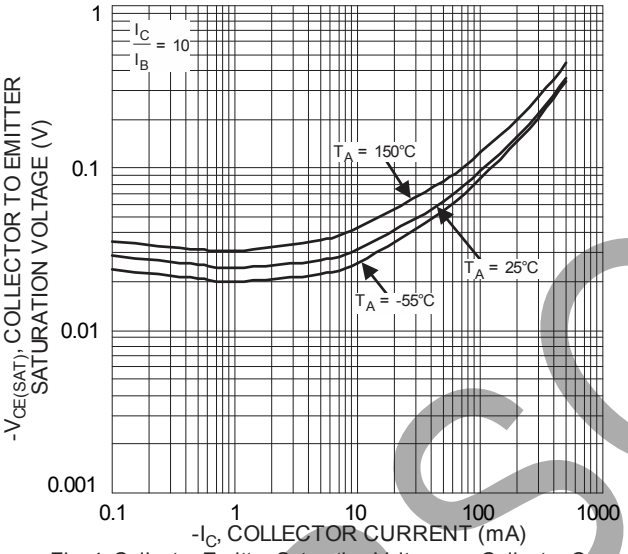


Fig. 4 Collector Emitter Saturation Voltage vs. Collector Current

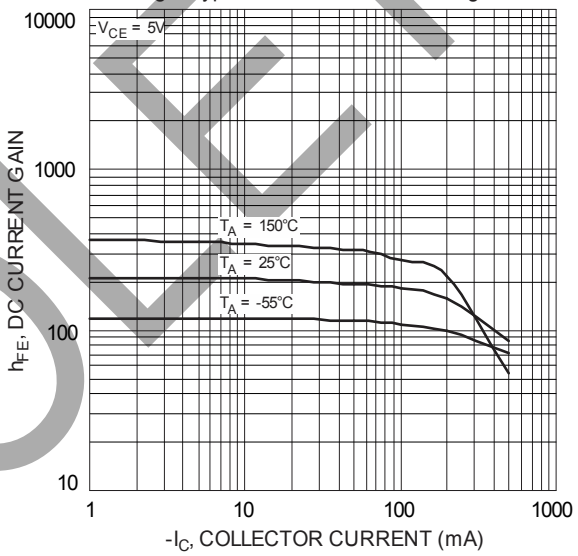


Fig. 5 Typical DC Current Gain vs. Collector Current

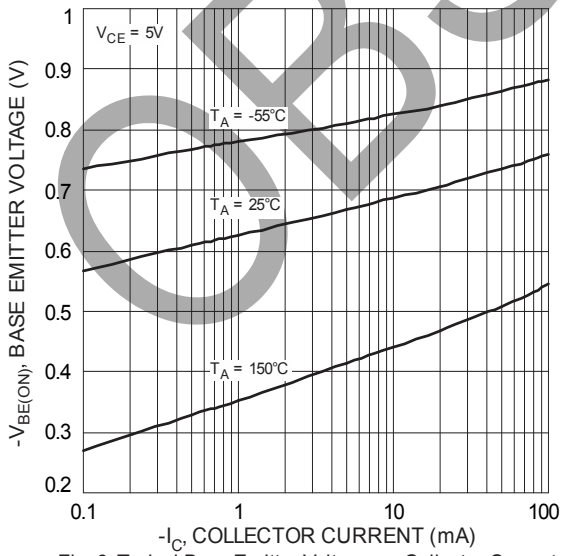


Fig. 6 Typical Base Emitter Voltage vs. Collector Current

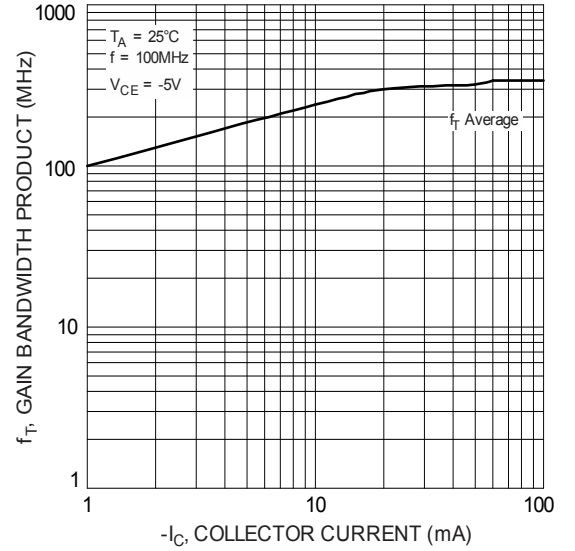


Fig. 7 Typical Gain Bandwidth Product vs. Collector Current

NPN (MMBTA06) Transistor (Q2) Plots

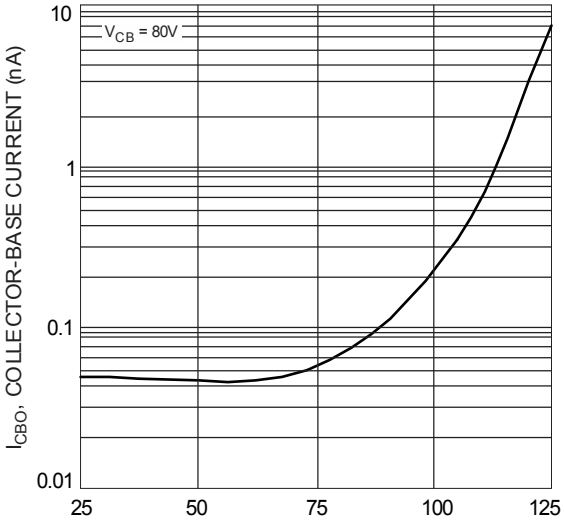


Fig. 8 Typical Collector-Cutoff Current vs. Ambient Temperature

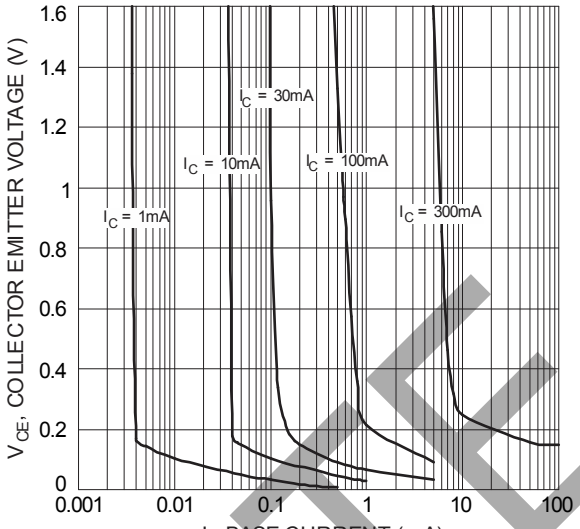


Fig. 9 Typical Collector Saturation Region

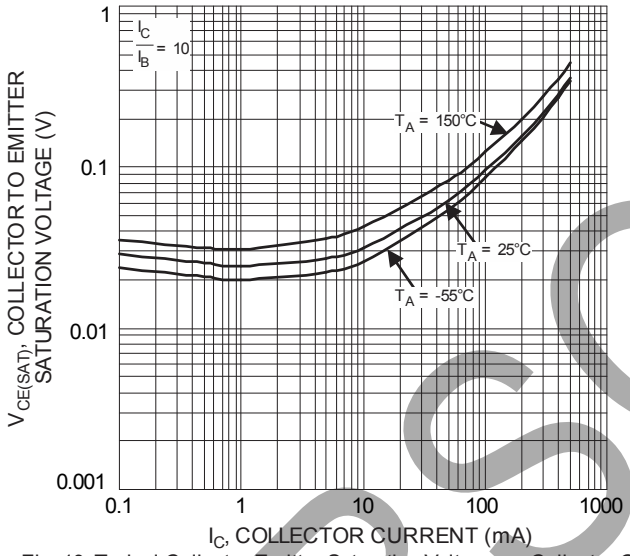


Fig. 10 Typical Collector Emitter Saturation Voltage vs. Collector Curren

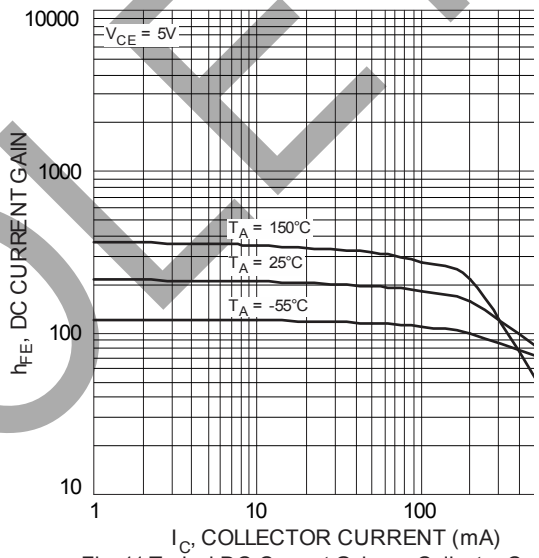


Fig. 11 Typical DC Current Gain vs. Collector Cu

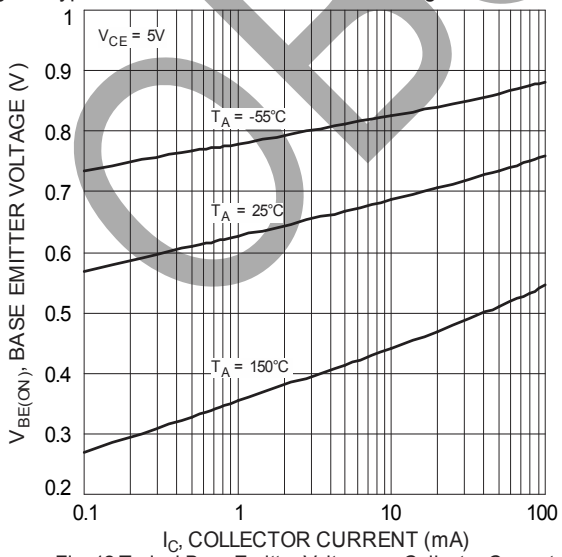


Fig. 12 Typical Base Emitter Voltage vs. Collector Current

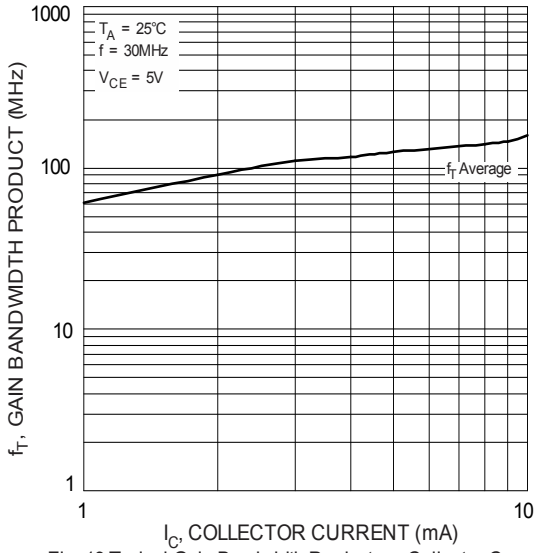
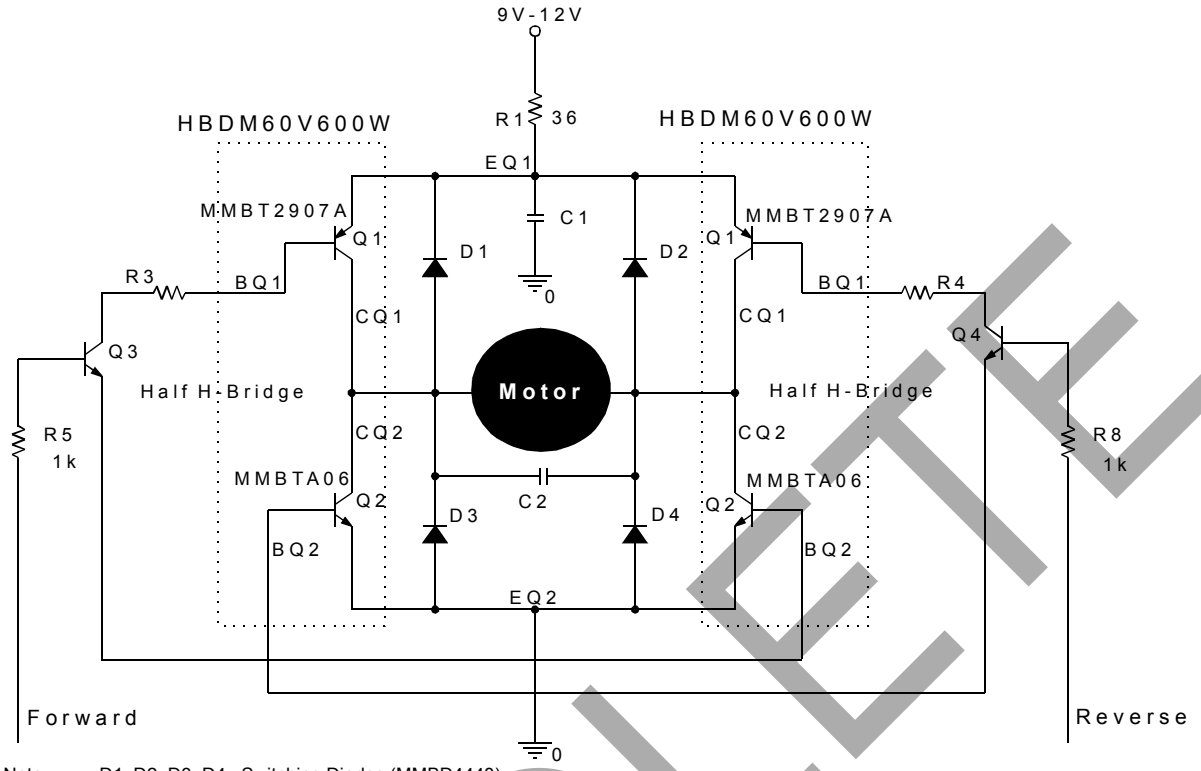


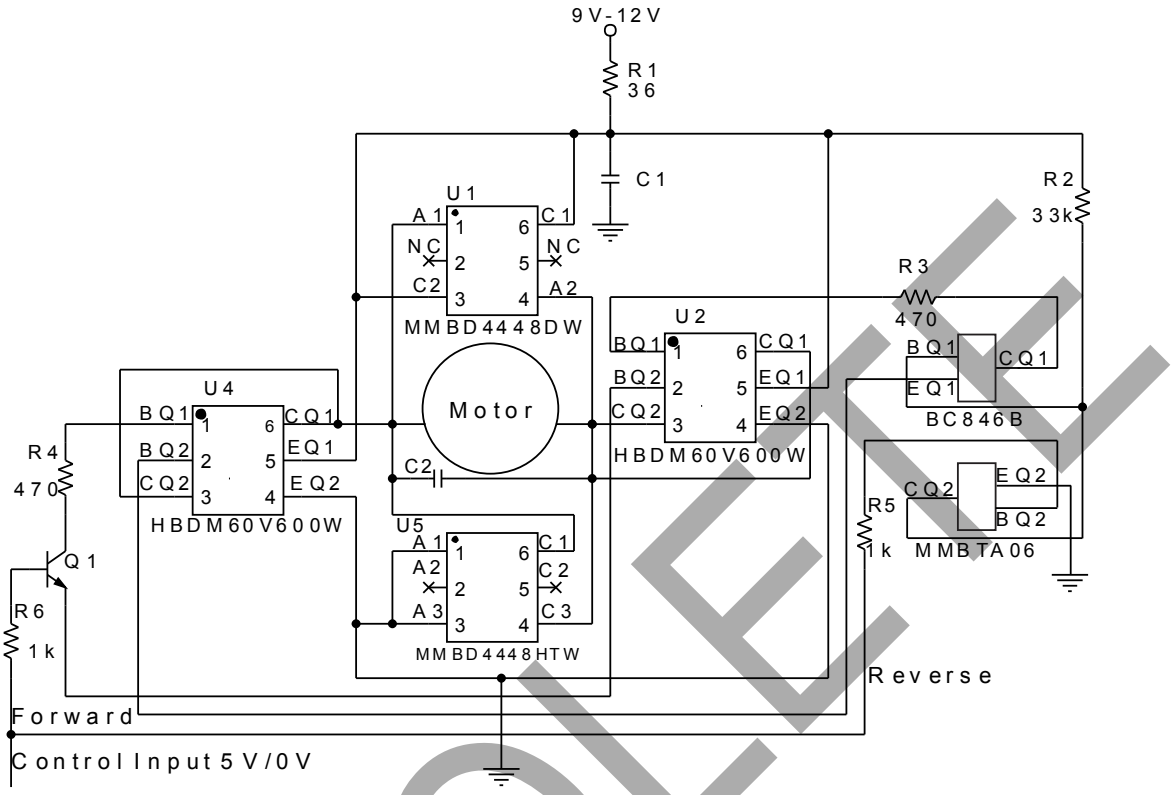
Fig. 13 Typical Gain Bandwidth Product vs. Collector Current

Current Schematic with Application Example



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

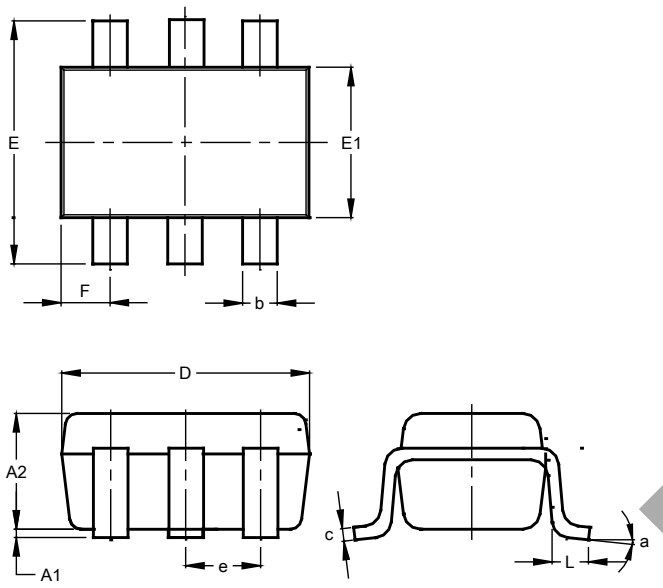
Application Example Schematic (with Package Pinouts)



Package Outline Dimensions

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

SOT363

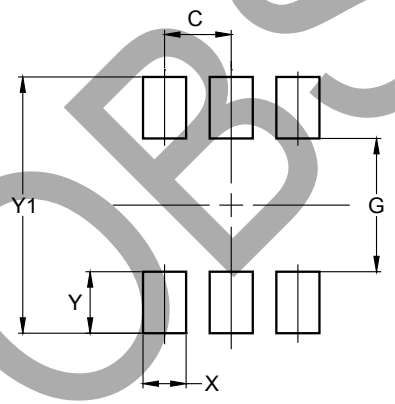


SOT363			
Dim	**Min**	**Max**	**Typ**
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

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

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