

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

- Epitaxial Planar Die Construction
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**

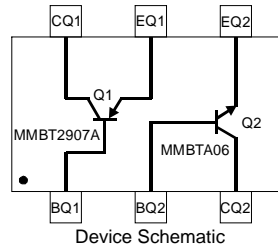
Sub-Component P/N	Reference	Device Type
MMBT2907A_DIE	Q1	PNP Transistor
MMBTA06_DIE	Q2	NPN Transistor



Top View

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 leadframe. Solderable per MIL-STD-202, Method 208
- Marking Information: See Page 6
- Ordering Information: See Page 6
- Weight: 0.016 grams (approximate)



Device Schematic

Maximum Ratings: Total Device @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Operating and Storage Junction Temperature Range	V_{EBO}	-55 to +150	$^\circ\text{C}$

Thermal Characteristics: Total Device

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 3)	P_D	200	mW
Thermal Resistance, Junction to Ambient Air (Note 3)	$R_{\theta JA}$	625	$^\circ\text{C/W}$

Maximum Ratings: Sub-Component Devices @ $T_A = 25^\circ\text{C}$ 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 3)	I_C	-600	500	mA

- Notes:
1. No purposefully added lead.
 2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
 3. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on page 7 or on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

Electrical Characteristics: PNP (MMBT2907A) Transistor (Q1) @_{T_A} = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 4)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60	—	V	$I_C = -10\mu A, I_E = 0$
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	$I_E = -10\mu A, I_C = 0$
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 4)					
DC Current Gain	h_{FE}	100	—	—	$I_C = -100\mu A, V_{CE} = -10V$
		100	—	—	$I_C = -1.0mA, V_{CE} = -10V$
		100	—	—	$I_C = -10mA, V_{CE} = -10V$
		100	300	—	$I_C = -150mA, V_{CE} = -10V$
		50	—	—	$I_C = -500mA, V_{CE} = -10V$
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 4)						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80	—	—	V	$I_C = 100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	65	—	—	V	$I_C = 1mA, I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	—	—	V	$I_E = 100\mu A, I_C = 0$
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 4)						
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: 4. Short duration pulse test used to minimize self-heating effect.

Typical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

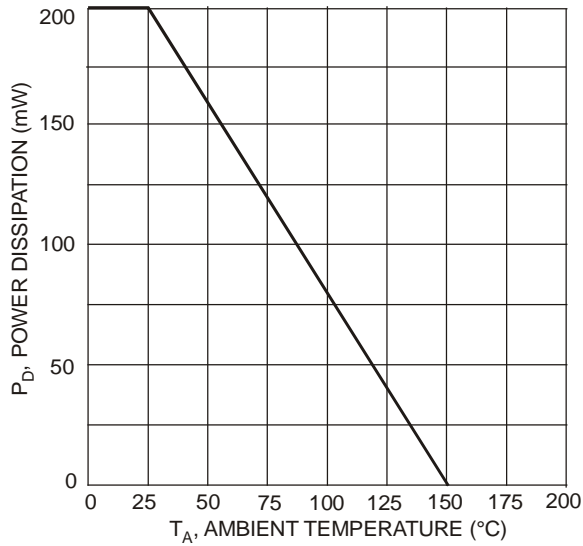


Fig. 1 Power Derating Curve

PNP (MMBT2907A) Transistor (Q1) Plots:

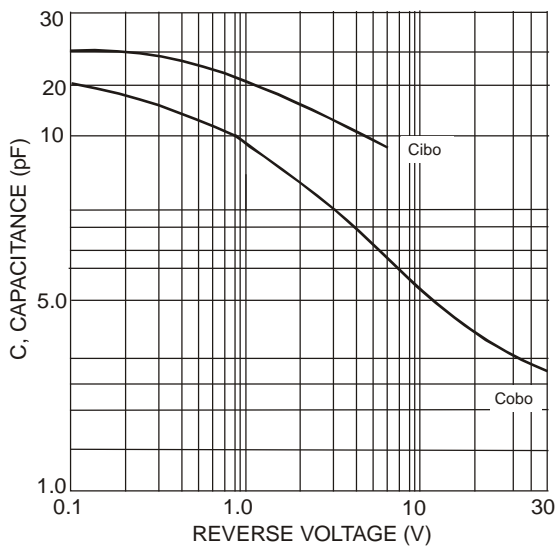


Fig. 2 Typical Capacitance

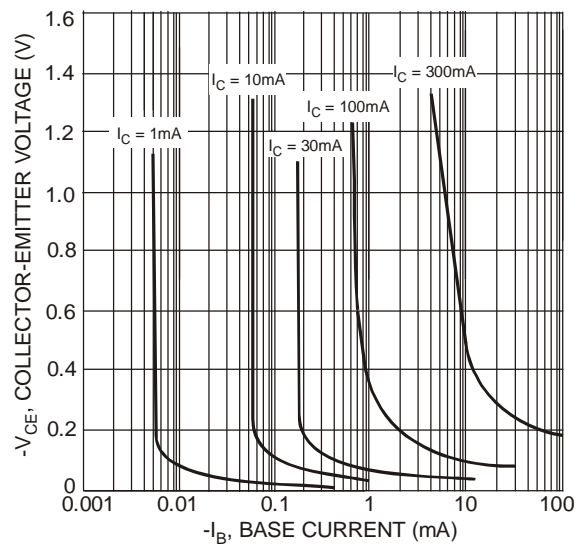


Fig. 3 Typical Collector Saturation Region

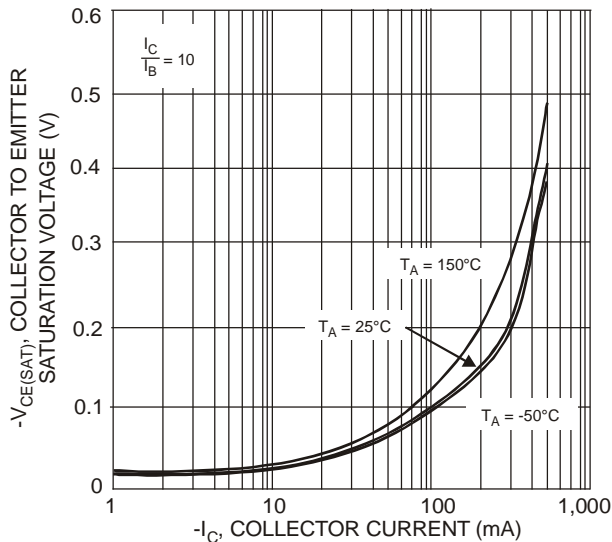


Fig. 4 Collector Emitter Saturation Voltage vs. Collector Current

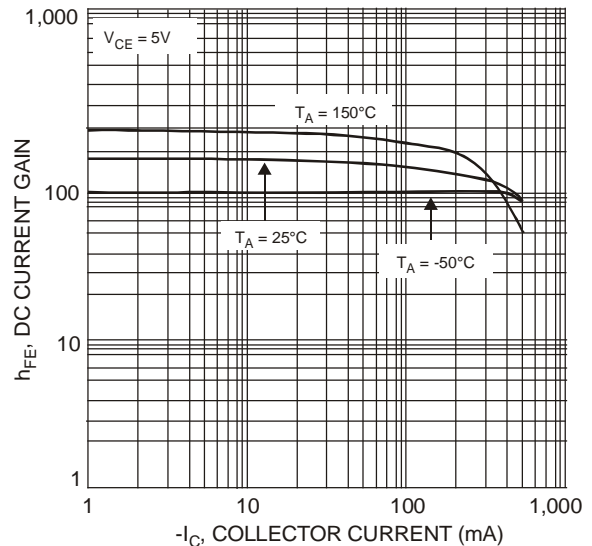


Fig. 5 Typical DC Current Gain vs. Collector Current

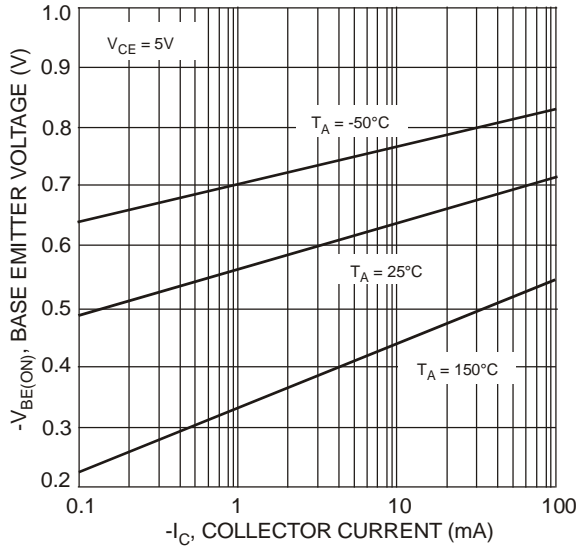


Fig. 6 Typical Base Emitter Voltage vs. Collector Current

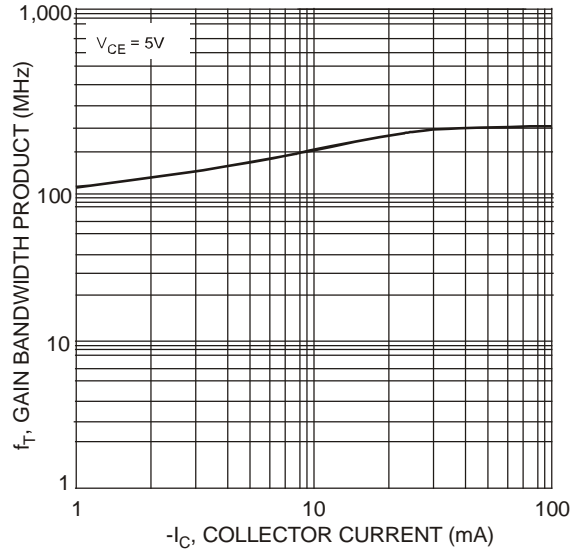


Fig. 7 Typical Gain Bandwidth Product vs. Collector Current

NPN (MMBTA06) Transistor (Q2) Plots

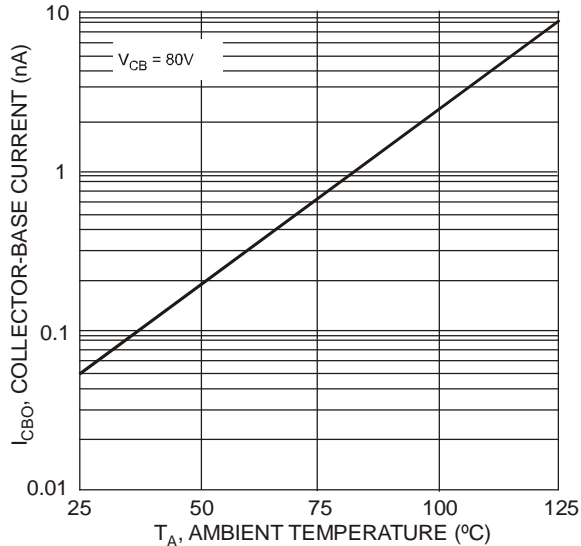


Fig. 8 Typical Collector-Cutoff Current vs. Ambient Temperature

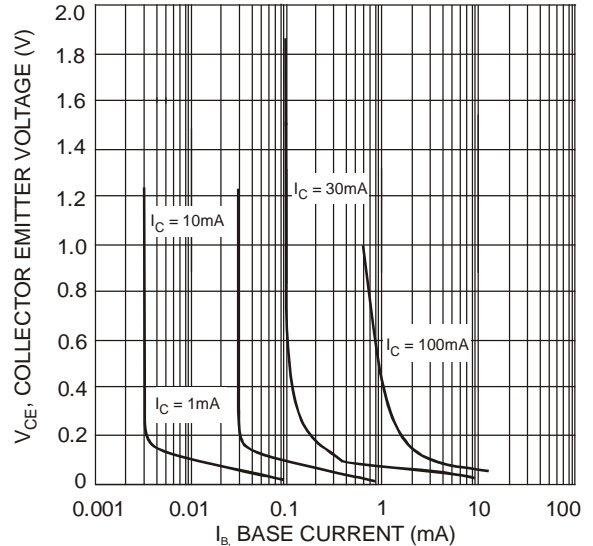


Fig. 9 Typical Collector Saturation Region

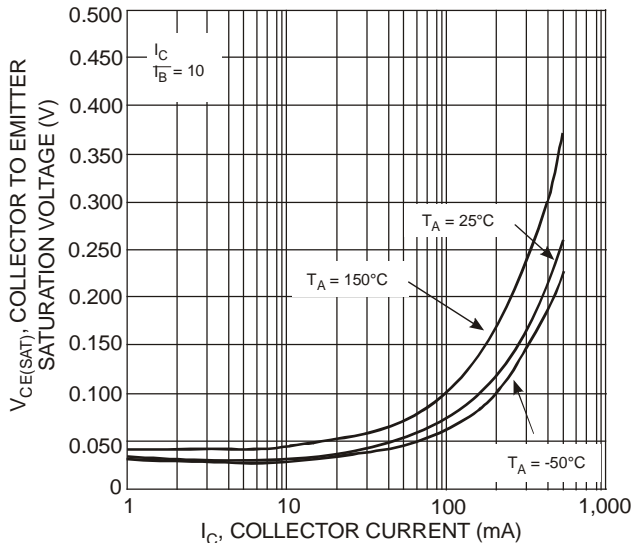


Fig. 10 Typical Collector Emitter Saturation Voltage vs. Collector Current

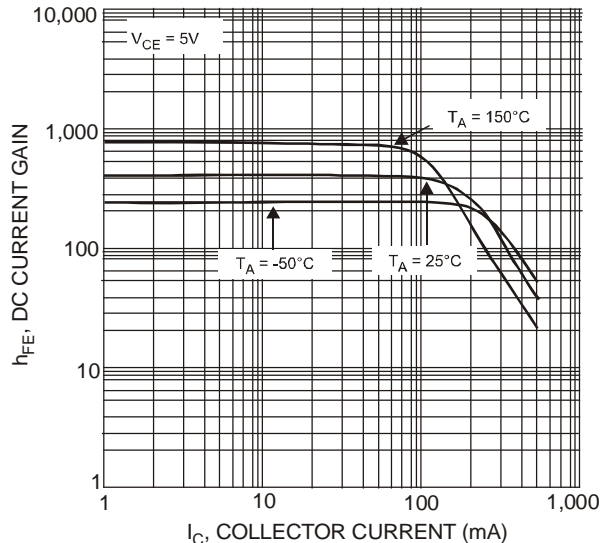
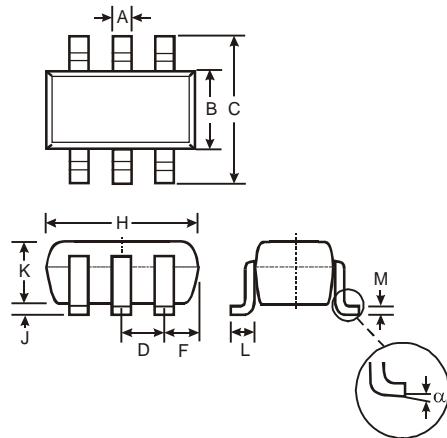


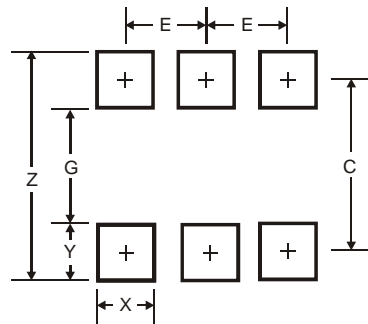
Fig. 11 Typical DC Current Gain vs. Collector Current

Package Outline Dimensions



SOT-363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Typ	
F	0.40	0.45
H	1.80	2.20
J	0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.22
α	0°	8°
All Dimensions in mm		

Suggested Pad Layout



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C	1.9
E	0.65

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