HBDM60V600W

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

NEW PRODUCT

Features

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

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-020C
- Terminal Connections: See Fig. 2
- Terminals: Finish Matte Tin Finish annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208
- Marking & Type Code Information: See Page 7
- Ordering Information: See Page 7
- Weight: 0.016 grams (approximate)

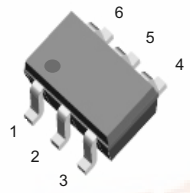

Fig. 1: SOT-363

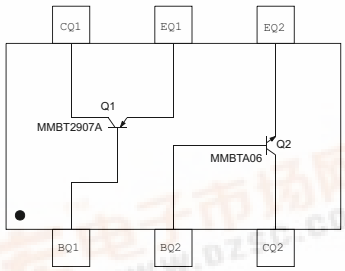

Fig. 2: Schematic & Pin Configuration

Sub-Component P/N	Reference	Device Type	Figure
MMBT2907A_DIE	Q1	PNP Transistor	2
MMBTA06_DIE	Q2	NPN Transistor	2

Maximum Ratings: Total Device @ T_A = 25 C unless otherwise specified

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 3)	P_d	200	mW
Thermal Resistance, Junction to Ambient Air (Note 3)	R_{JA}	625	°C/W
Operating and Storage Junction Temperature Range	V_{EBO}	-55 to +150	°C

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 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 8 or on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.

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Electrical Characteristics @ $T_A = 25$ C unless otherwise specified
PNP (MMBT2907A) Transistor (Q1):

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 4)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60		V	I_C = -10 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 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}	100 100 100 100 50	300		I_C = -100 A, 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 -01.3	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	
Delay Time	t_d		10	ns	V_{CE} = -30V, I_C = -150mA, $I_{B1} = I_{B2}$ = -15mA
Rise Time	t_r		40	ns	
Turn-Off Time	t_{off}		100	ns	
Storage Time	t_s		80	ns	V_{CC} = -6.0V, I_C = -150mA, $I_{B1} = I_{B2}$ = -15mA
Fall Time	t_r		30	ns	

Electrical Characteristics @ $T_A = 25$ C unless otherwise specified
NPN (MMBTA06) Transistor (Q2):

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 4)						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	80			V	I_C = 100 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 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
Collector-Emitter Cutoff Current, $I_{O(OFF)}$	I_{CEO}			100	nA	V_{CE} = 30V, I_B = 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.

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Typical Characteristics

@ T_{amb} = 25°C unless otherwise specified

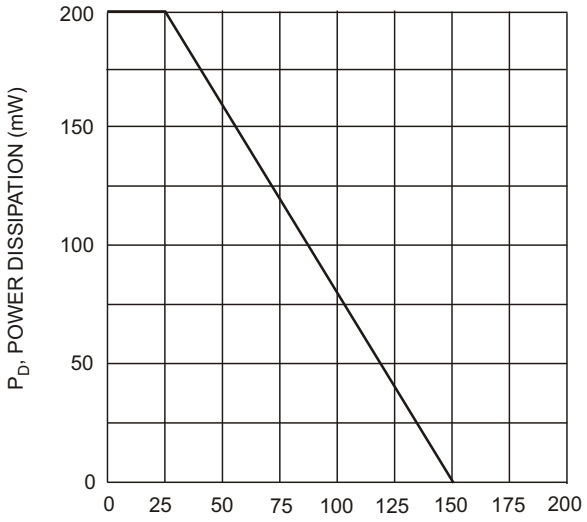

Fig. 3 Power Derating Curve

PNP (MMBT2907A) Transistor (Q1) Plots:

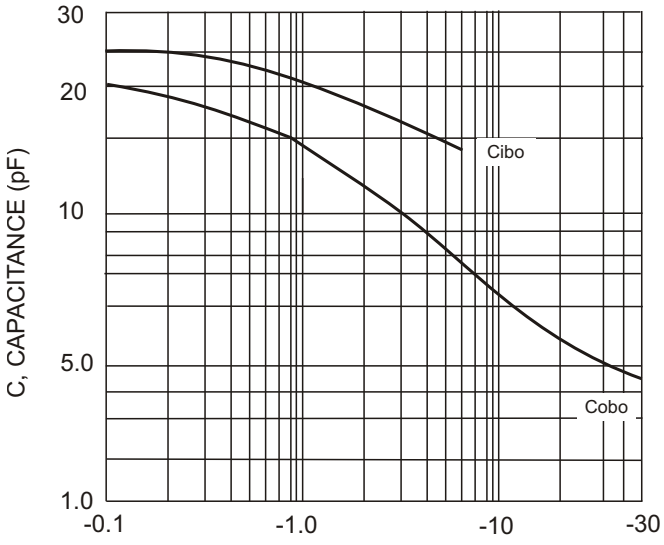

Fig. 4 Typical Capacitance

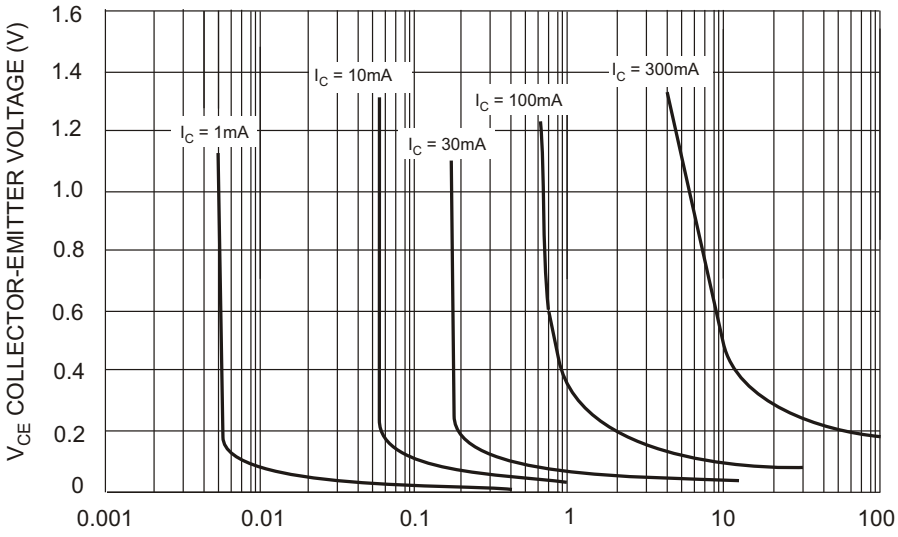

Fig. 5 Typical Collector Saturation Region

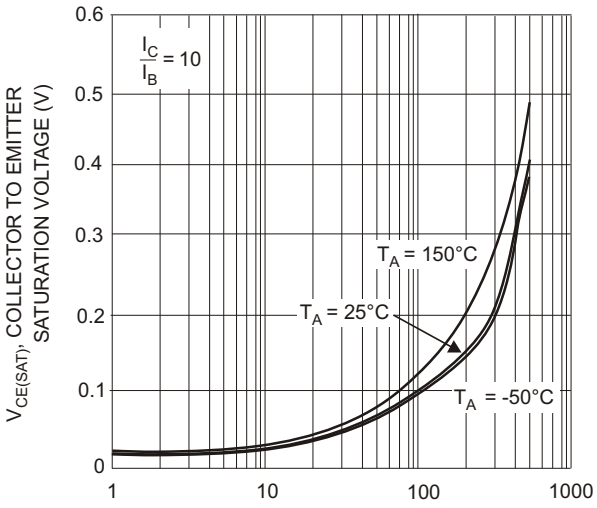

Fig. 6 Collector Emitter Saturation Voltage vs. Collector Current

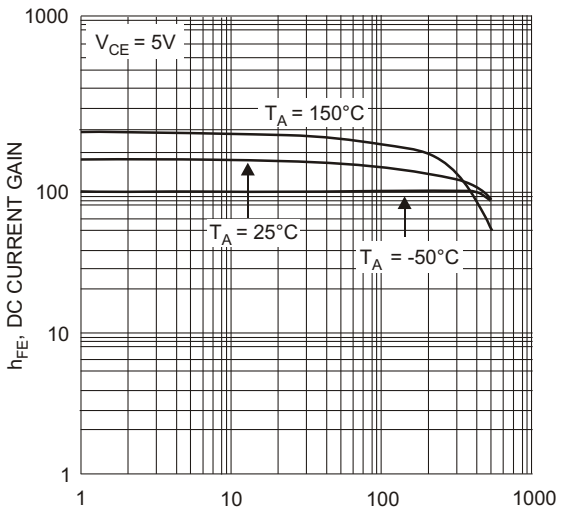

Fig. 7 DC Current Gain vs Collector Current

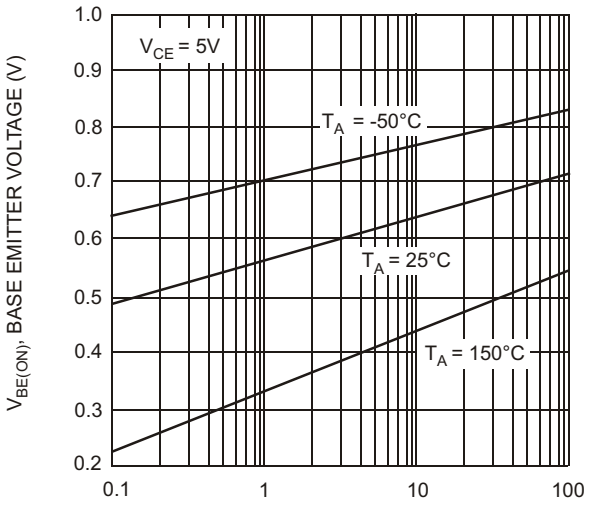

Fig. 8 Base Emitter Voltage vs. Collector Current

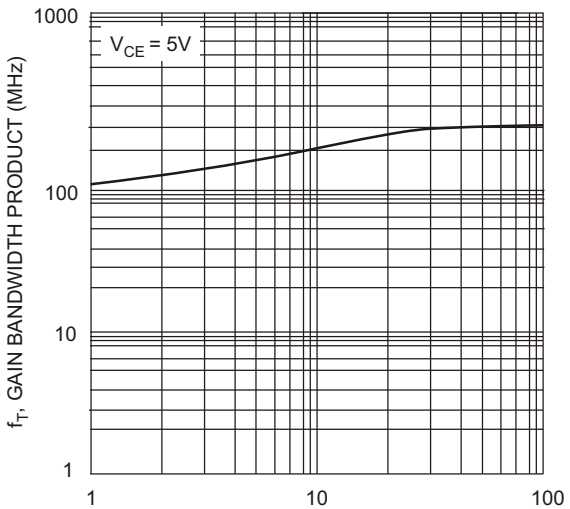

Fig. 9 Gain Bandwidth Product vs. Collector Current

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NPN (MMBTA06) Transistor (Q2) Plots:

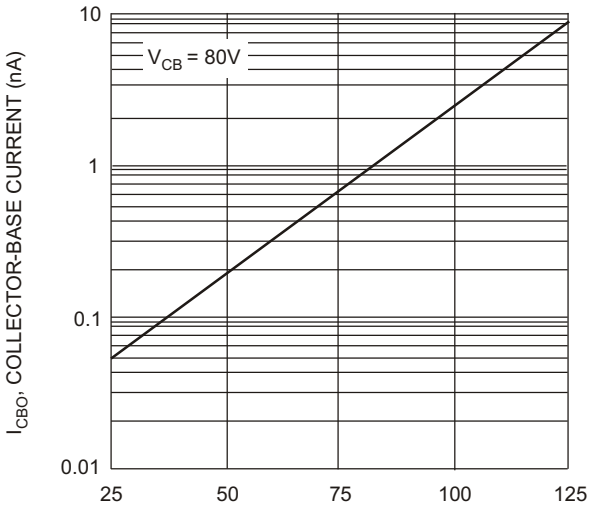

Fig. 10 Typical Collector-Cutoff Current vs. Ambient Temperature

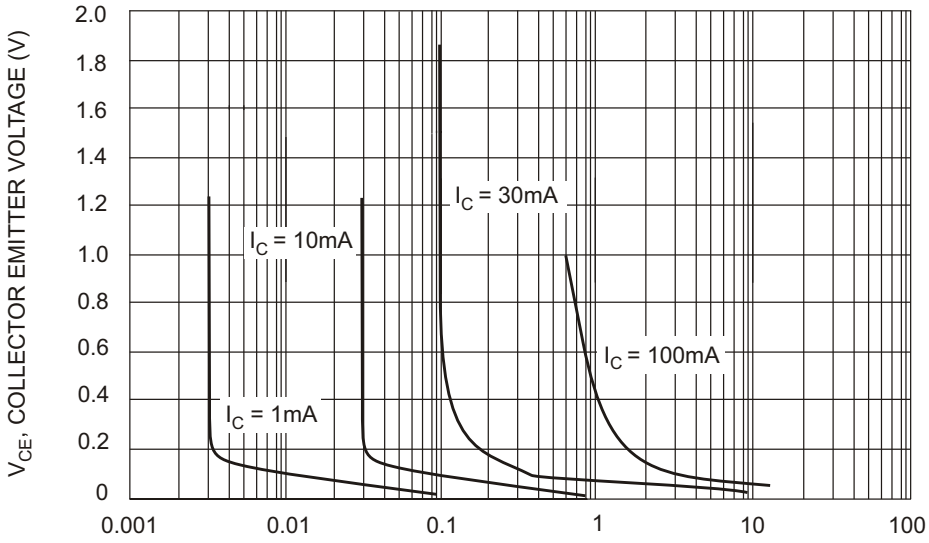

Fig. 11 Typical Collector Saturation Region

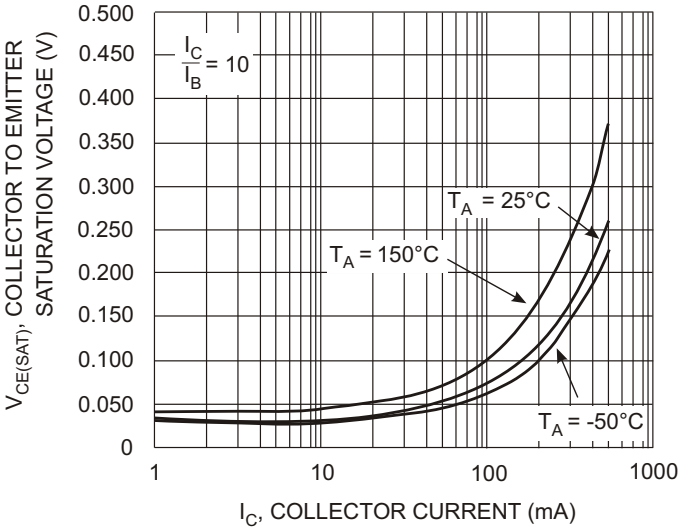

Fig. 12 Collector Emitter Saturation Voltage vs. Collector Current

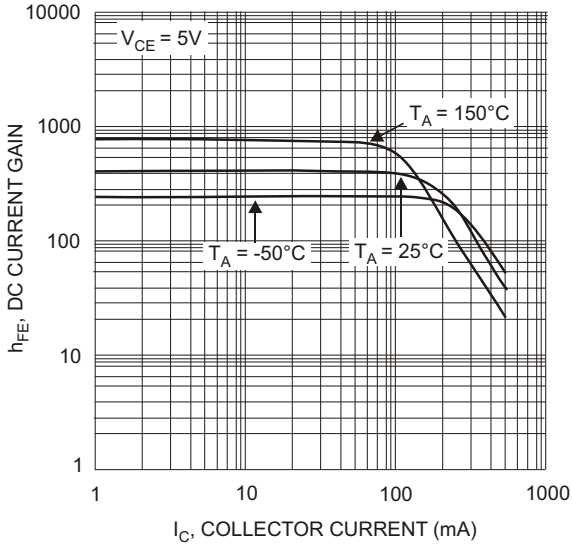

Fig. 13 DC Current Gain vs Collector Current

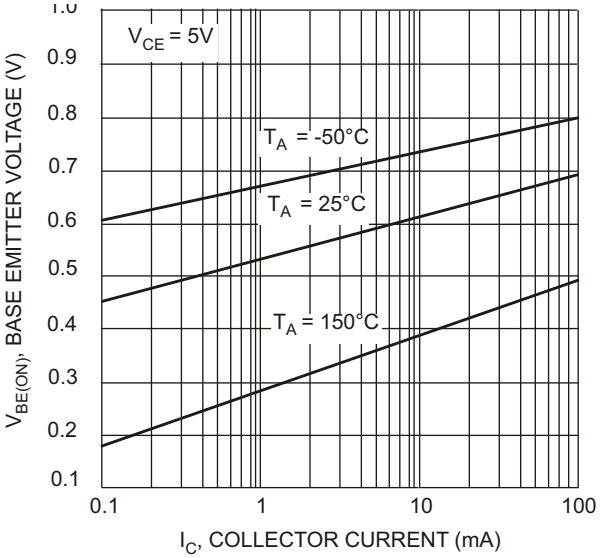

Fig. 14 Base Emitter Voltage vs Collector Current

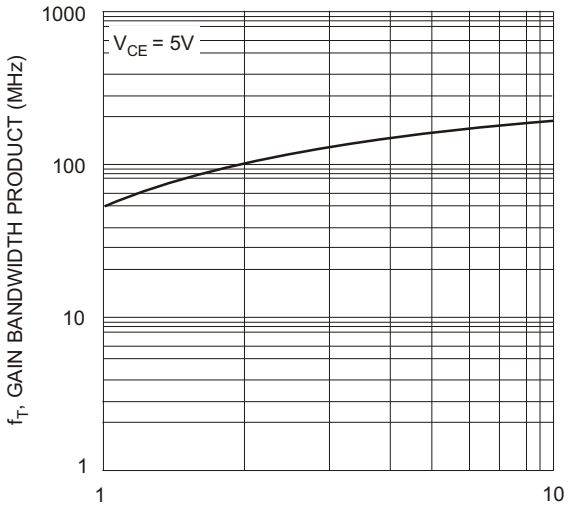

Fig. 15 Gain Bandwidth Product vs Collector Current

Circuit Schematic along with Application Example:

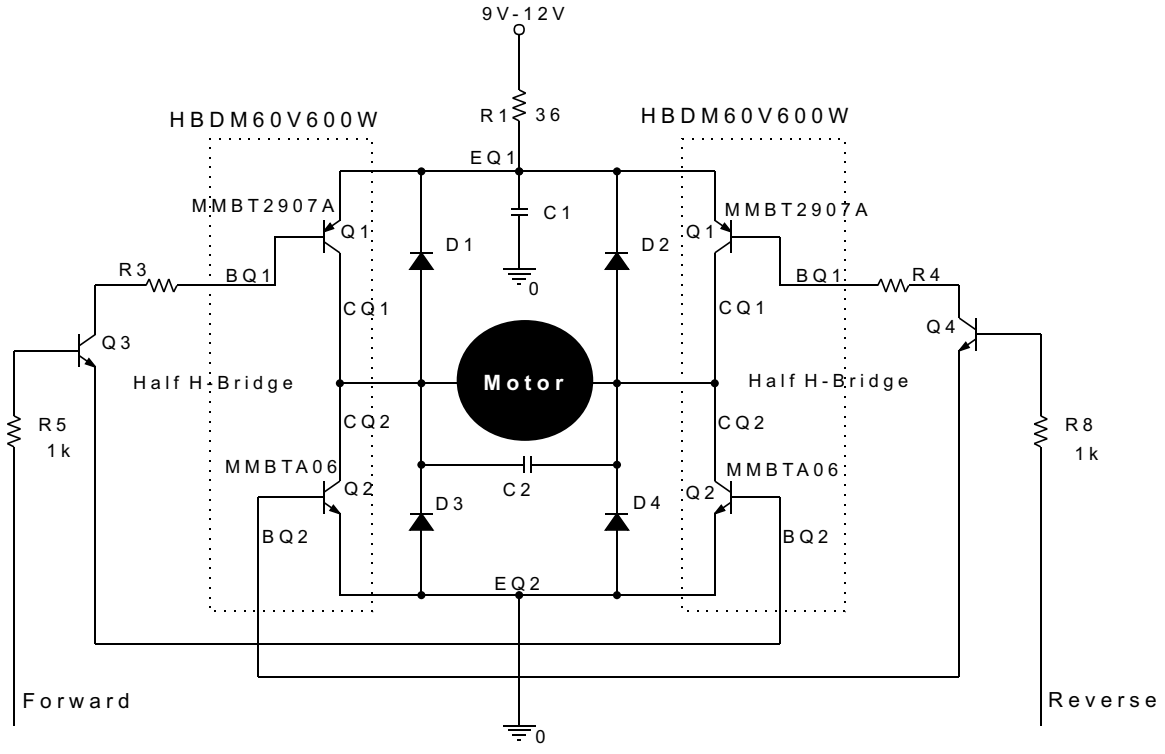

Fig. 16

Note: D_1, D_2, D_3, D_4: Switching Diodes (MMBD4448)
Q_3, Q_4: NPN Transistors (MMBTA06)

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Application Example Schematic: (with Package Pinouts)

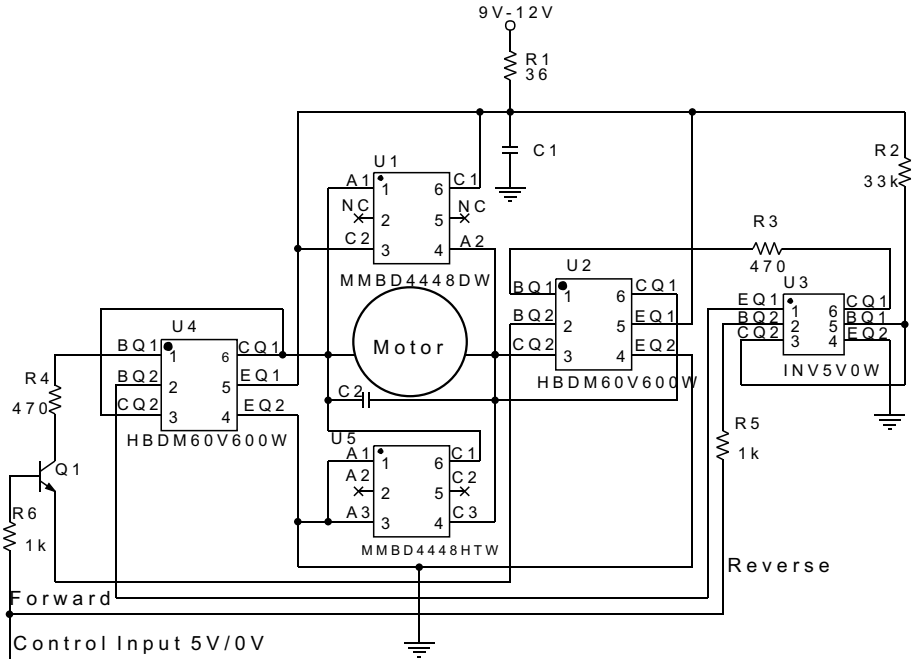

Fig. 17

Ordering Information (Note 5)

Device	Packaging	Shipping
HBDM60V600W-7	HB01	3000/Tape & Reel

Notes: 5. For Packaging Details, please go to page 8 or our website at http://www.diodes.com/datasheets/ap02007.pdf.

Marking Information

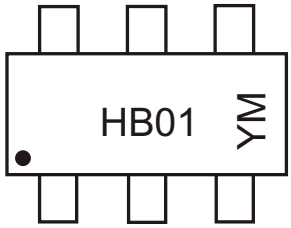

Fig. 18

HB01 = Product Type Marking Code
YM = Date Code Marking
Y = Year ex: T = 2006
M = Month ex: 9 = September

Date Code Key

Year	2006	2007	2008	2009	2010	2011	2012
Code	T	U	V	W	X	Y	Z

Month	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

NEW PRODUCT

Mechanical Details

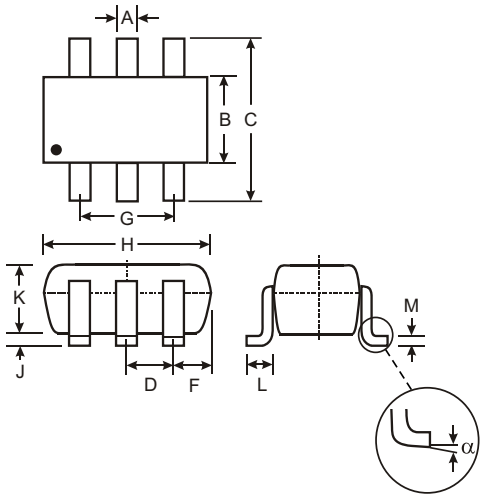

Fig. 19

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

Suggested Pad Layout: (Based on IPC-SM-782)

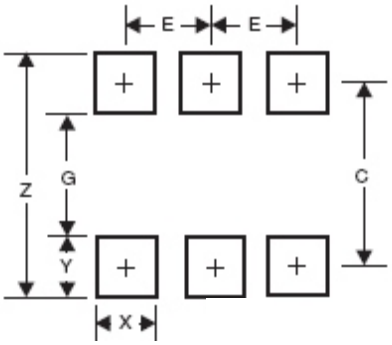

Fig. 20

Figure 20 Dimensions	SOT-363*
Z	2.5
G	1.3
X	0.42
Y	0.6
C	1.9
E	0.65

* Typical dimensions in mm