

Dual Bias Resistor Transistors NPN and PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the MMUN5311DWseries, two complementary BRT devices are housed in the SOT-363 package which is ideal for low power surface mount applications where board space is at a premium.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- We declare that the material of product compliance with RoHS requirements.

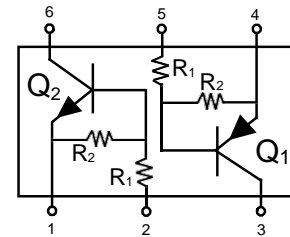
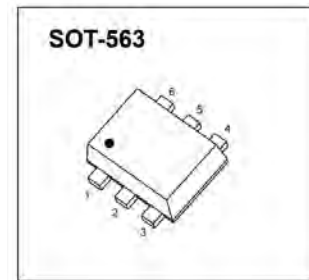
MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q 1 and Q 2, – minus sign for Q 1 (PNP) omitted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

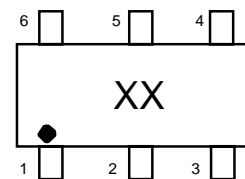
THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$	P_D	187 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	670 (Note 1.) 490 (Note 2.)	$^\circ\text{C}/\text{W}$
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$	P_D	250 (Note 1.) 385 (Note 2.)	mW
Derate above 25°C		2.0 (Note 1.) 3.0 (Note 2.)	mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	493 (Note 1.) 325 (Note 2.)	$^\circ\text{C}/\text{W}$
Thermal Resistance – Junction-to-Lead	$R_{\theta JL}$	188 (Note 1.) 208 (Note 2.)	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

1. FR-4 @ Minimum Pad 2. FR-4 @ 1.0 x 1.0 inch Pad



MARKING DIAGRAM



xx = Device Marking
(See Page 2)

DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 2 of this data sheet.



MM5311V ~ MM5335V

ORDERING, SHIPPING, DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1(K)	R2(K)	Shipping
MM5311V	SOT-563	11	10	10	3000/Tape&Reel
MM5312V	SOT-563	12	22	22	3000/Tape&Reel
MM5313V	SOT-563	13	47	47	3000/Tape&Reel
MM5314V	SOT-563	14	10	47	3000/Tape&Reel
MM5315V	SOT-563	15	10	Ġ	3000/Tape&Reel
MM5316V	SOT-563	16	4.7	Ġ	3000/Tape&Reel
MM5330V	SOT-563	30	1	1	3000/Tape&Reel
MM5331V	SOT-563	31	2.2	2.2	3000/Tape&Reel
MM5332V	SOT-563	32	4.7	4.7	3000/Tape&Reel
MM5333V	SOT-563	33	4.7	47	3000/Tape&Reel
MM5334V	SOT-563	34	22	47	3000/Tape&Reel
MM5335V	SOT-563	35	2.2	47	3000/Tape&Reel



MM5311V ~ MM5335V

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q₁ and Q₂, – minus sign for Q₁ (PNP) omitted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit	
ON CHARACTERISTICS (Note 4)						
DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	MM5311V MM5312V MM5313V MM5314V MM5315V MM5316V MM5330V MM5331V MM5332V MM5333V MM5334V MM5335V	h _{FE}	35 60 80 80 160 160 3.0 8.0 15 80 80 80	60 100 140 140 350 350 5.0 15 30 200 150 140	– – – – – – – – – – – –	
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA) (I _C = 10 mA, I _B = 5 mA) MM5330V /MM5331V (I _C = 10 mA, I _B = 1 mA) MM5315V /MM5316V /MM5332V /MM5333V /MM5334V		V _{CE(sat)}	–	–	0.25	Vdc
Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kfi)	MM5311V MM5312V MM5314V MM5315V MM5316V MM5330V MM5331V MM5332V MM5333V MM5334V MM5335V (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 kfi) MM5313V	V _{OL}	– – – – – – – – – – – –	– – – – – – – – – – – –	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kfi) (V _{CC} = 5.0 V, V _B = 0.050 V, R _L = 1.0 kfi) MM5330V (V _{CC} = 5.0 V, V _B = 0.25 V, R _L = 1.0 kfi) MM5315V MM5316V MM5333V		V _{OH}	4.9	–	–	Vdc
Input Resistor	MM5311V MM5312V MM5313V MM5314V MM5315V MM5316V MM5330V MM5331V MM5332V MM5333V MM5334V MM5335V	R1	7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4 1.54	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22 2.2	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 2.86	k fi
Resistor Ratio	MM5311V /MM5312V /MM5313V MM5314V MM5315V /MM5316V MM5330V /MM5331V /MM5332V MM5333V MM5334V MM5335V	R1/R2	0.8 0.17 – 0.8 0.055 0.38 0.038	1.0 0.21 – 1.0 0.1 0.47 0.047	1.2 0.25 – 1.2 0.185 0.56 0.056	



MM5311V ~ MM5335V

ELECTRICAL CHARACTERISTICS

($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q_1 and Q_2 , - minus sign for Q_1 (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$)	I_{CBO}	-	-	100	nAdc
Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$)	I_{CEO}	-	-	500	nAdc
Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$)	MM5311V	-	-	0.5	mAdc
	MM5312V	-	-	0.2	
	MM5313V	-	-	0.1	
	MM5314V	-	-	0.2	
	MM5315V	-	-	0.9	
	MM5316V	-	-	1.9	
	MM5330V	-	-	4.3	
	MM5331V	-	-	2.3	
	MM5332V	-	-	1.5	
	MM5333V	-	-	0.18	
	MM5334V	-	-	0.13	
MM5335V	-	-	0.2		
Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ($I_C = 2.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	50	-	-	Vdc

3. Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%

ALL MMUN5311V SERIES DEVICES

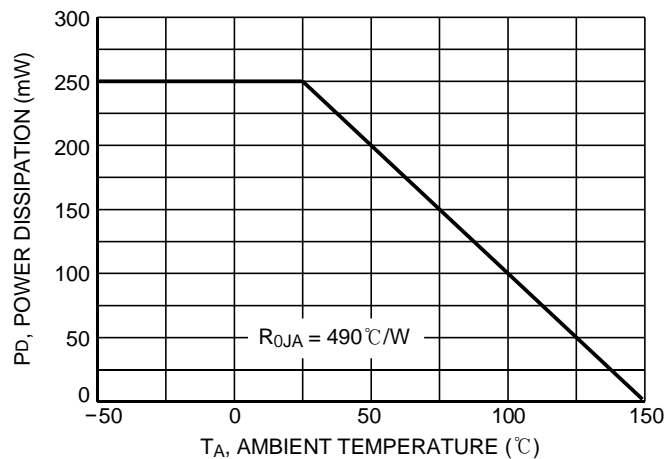


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – MMUN5311DW NPN TRANSISTOR

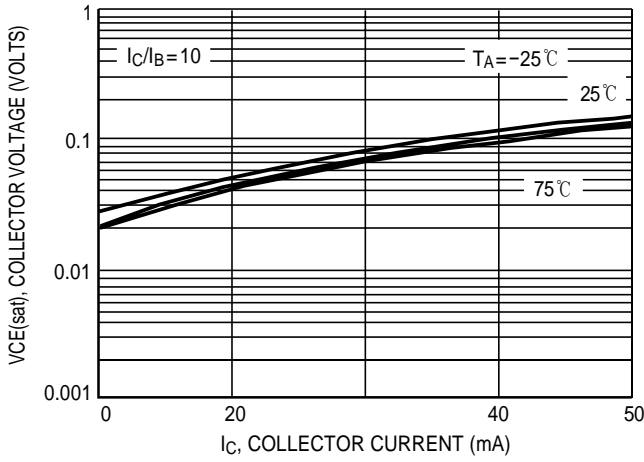


Figure 2. $V_{CE(sat)}$ versus I_C

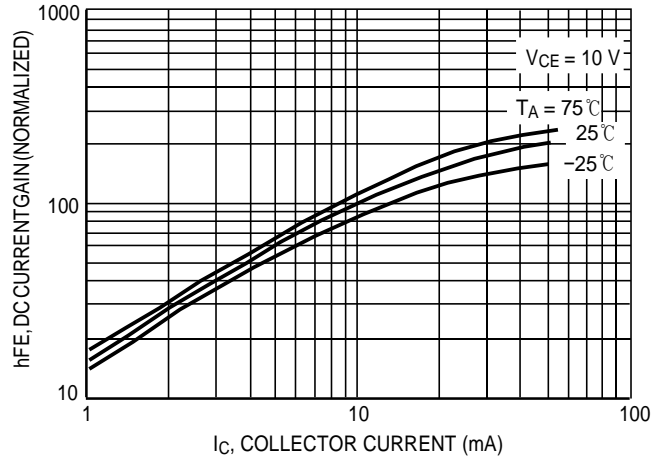


Figure 3. DC Current Gain

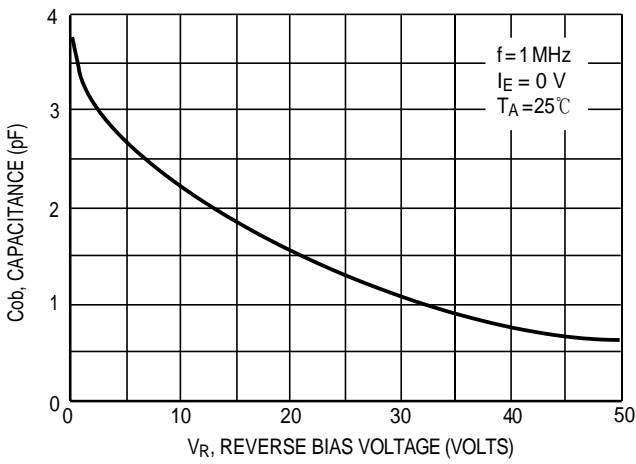


Figure 4. Output Capacitance

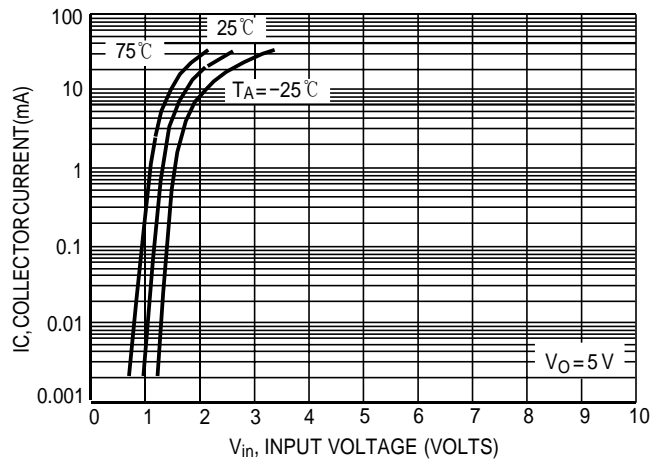


Figure 5. Output Current versus Input Voltage

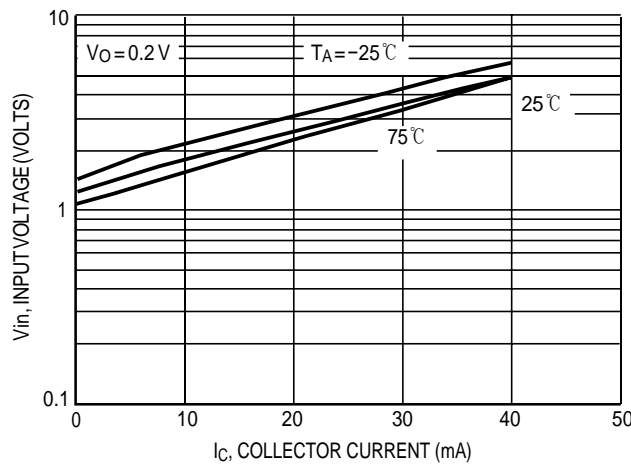


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MMUN5311DW PNP TRANSISTOR

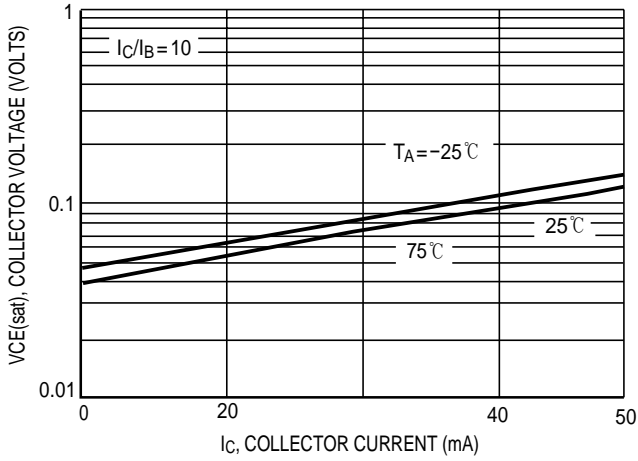


Figure 7. $V_{CE(sat)}$ versus I_C

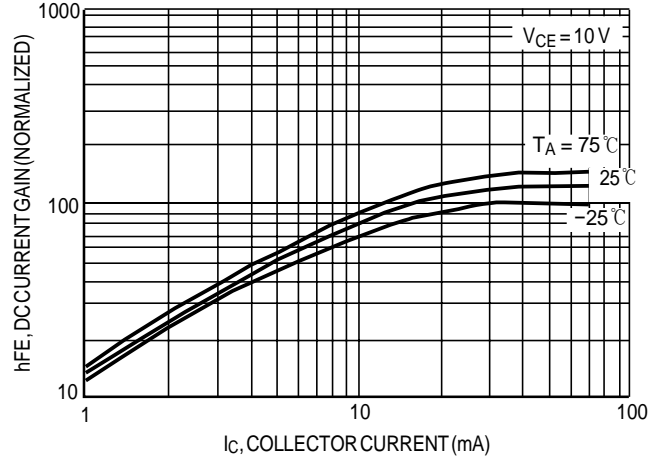


Figure 8. DC Current Gain

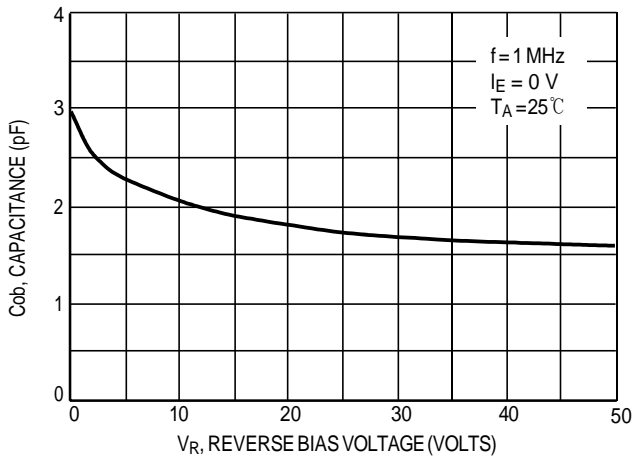


Figure 9. Output Capacitance

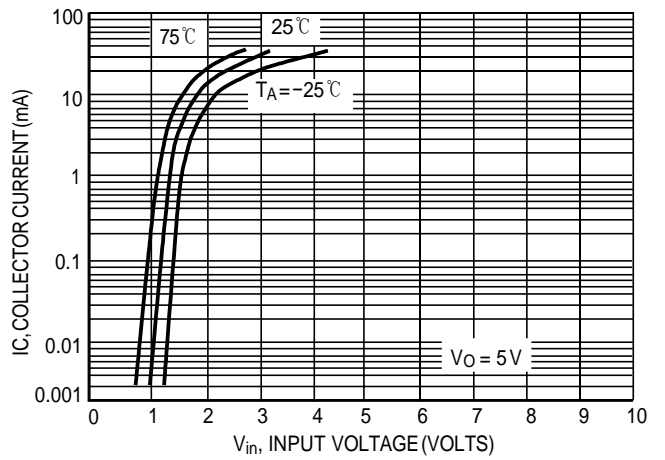


Figure 10. Output Current versus Input Voltage

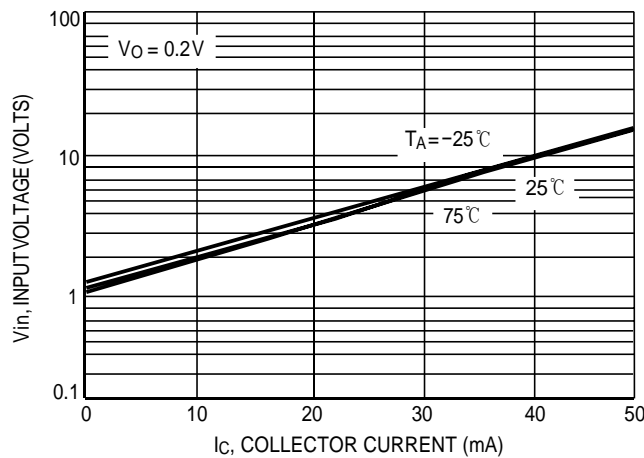
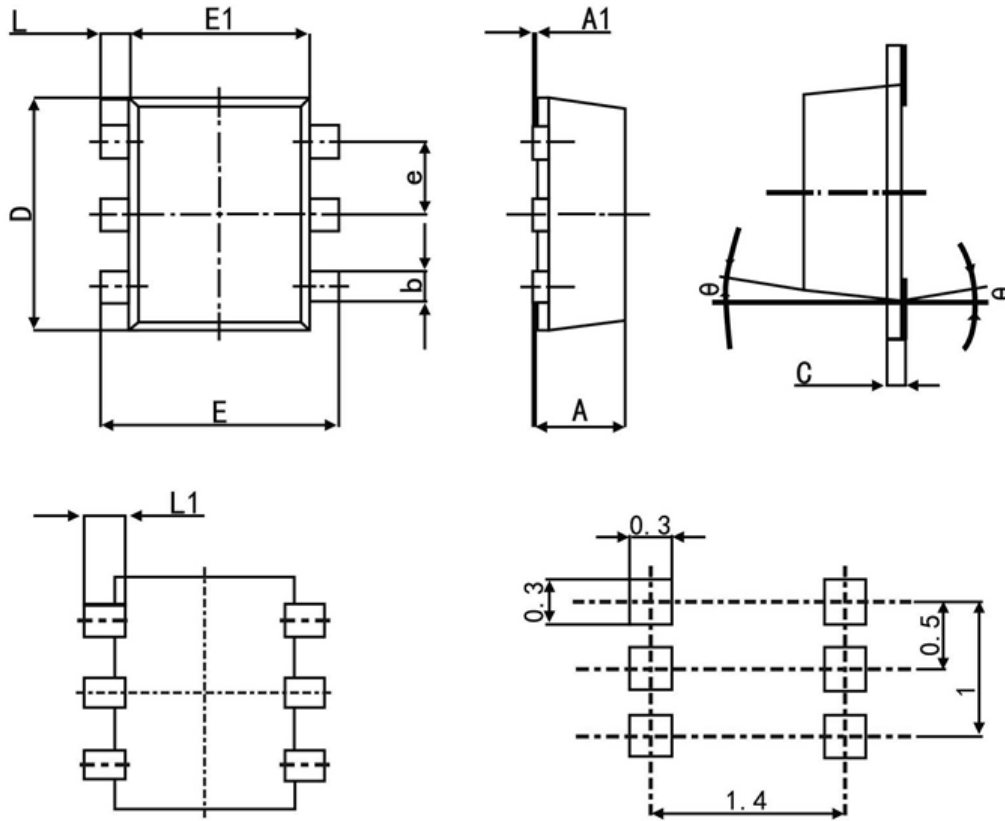


Figure 11. Input Voltage versus Output Current

SOT-563-Package Outline Dimensions



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.525	0.600
A1	0.000	0.050
e	0.450	0.550
c	0.090	0.160
D	1.500	1.700
b	0.170	0.270
E1	1.100	1.300
E	1.500	1.700
L	0.100	0.300
L1	0.200	0.400
θ	7 °REF.	