

Dual Bias Resistor Transistors

NPN 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 MMUN52xxV series, two BRT devices are housed in the SOT-563 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.

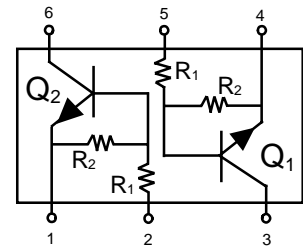
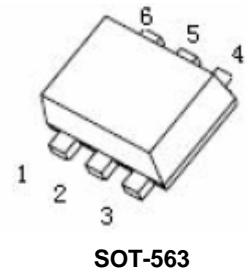
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q₁ and Q₂)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current	I _C	100	mAdc

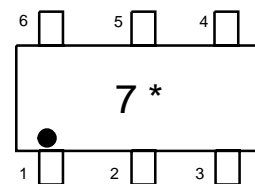
THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)			
Characteristic	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C	P _D	150 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R _{θJA}	833 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)			
Characteristic	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C	P _D	250 (Note 1.) 385 (Note 2.)	mW
Derate above 25°C		2.0 (Note 1.) 3.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R _{θJA}	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	R _{θJL}	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T _J , T _{stg}	-55 to +150	°C

MMUN52xxV Series



MARKING DIAGRAM



7* = Device Marking
(See Page 2)

DEVICE MARKING INFORMATION

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

DEVICE MARKING , RESISTOR VALUES AND ORDERING INFORMATION

Device	Package	Marking	R1(K)	R2(K)	Shipping
MMUN5211V	SOT-563	7A	10	10	3000/Tape&Reel
MMUN5212V	SOT-563	7B	22	22	3000/Tape&Reel
MMUN5213V	SOT-563	7C	47	47	3000/Tape&Reel
MMUN5214V	SOT-563	7D	10	47	3000/Tape&Reel
MMUN5215V	SOT-563	7E	10	∞	3000/Tape&Reel
MMUN5216V	SOT-563	7F	4.7	∞	3000/Tape&Reel
MMUN5230V	SOT-563	7G	1	1	3000/Tape&Reel
MMUN5231V	SOT-563	7H	2.2	2.2	3000/Tape&Reel
MMUN5232V	SOT-563	7J	4.7	4.7	3000/Tape&Reel
MMUN5233V	SOT-563	7K	4.7	47	3000/Tape&Reel
MMUN5234V	SOT-563	7L	22	47	3000/Tape&Reel
MMUN5235V	SOT-563	7M	2.2	47	3000/Tape&Reel
MMUN5238V	SOT-563	7Q	2.2	∞	3000/Tape&Reel
MMUN5241V	SOT-563	7T	100	∞	3000/Tape&Reel



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q₁ and Q₂),(Continued)

Parameter	Symbol	Min.	Max.	Unit	
DC Current Gain at $V_{CE} = 10\text{ V}$, $I_C = 5\text{ mA}$	MMUN5211V	h_{FE}	35	-	-
	MMUN5212V	h_{FE}	60	-	-
	MMUN5213V	h_{FE}	80	-	-
	MMUN5214V	h_{FE}	80	-	-
	MMUN5215V	h_{FE}	160	-	-
	MMUN5216V	h_{FE}	160	-	-
	MMUN5230V	h_{FE}	3	-	-
	MMUN5231V	h_{FE}	8	-	-
	MMUN5232V	h_{FE}	15	-	-
	MMUN5233V	h_{FE}	80	-	-
	MMUN5234V	h_{FE}	80	-	-
	MMUN5235V	h_{FE}	80	-	-
	MMUN5238V	h_{FE}	160	-	-
MMUN5241V	h_{FE}	160	-	-	
Collector Base Cutoff Current at $V_{CB} = 50\text{ V}$	I_{CBO}	-	100	nA	
Collector Emitter Cutoff Current at $V_{CE} = 50\text{ V}$	I_{CEO}	-	500	nA	
Emitter Base Cutoff Current at $V_{EB} = 6\text{ V}$	MMUN5211V	I_{EBO}	-	0.5	mA
	MMUN5212V	I_{EBO}	-	0.2	mA
	MMUN5213V	I_{EBO}	-	0.1	mA
	MMUN5214V	I_{EBO}	-	0.2	mA
	MMUN5215V	I_{EBO}	-	0.9	mA
	MMUN5216V	I_{EBO}	-	1.9	mA
	MMUN5230V	I_{EBO}	-	4.3	mA
	MMUN5231V	I_{EBO}	-	2.3	mA
	MMUN5232V	I_{EBO}	-	1.5	mA
	MMUN5233V	I_{EBO}	-	0.18	mA
	MMUN5234V	I_{EBO}	-	0.13	mA
	MMUN5235V	I_{EBO}	-	0.2	mA
	MMUN5238V	I_{EBO}	-	4	mA
MMUN5241V	I_{EBO}	-	0.1	mA	
Collector Base Breakdown Voltage at $I_C = 10\ \mu\text{A}$	$V_{(BR)CBO}$	50	-	V	
Collector Emitter Breakdown Voltage at $I_C = 2\text{ mA}$	$V_{(BR)CEO}$	50	-	V	
Collector Emitter Saturation Voltage at $I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$ at $I_C = 10\text{ mA}$, $I_B = 5\text{ mA}$ at $I_C = 10\text{ mA}$, $I_B = 1\text{ mA}$		V_{CEsat}	-	0.25	V
	MMUN5230V	V_{CEsat}	-	0.25	V
	MMUN5231V	V_{CEsat}	-	0.25	V
	MMUN5215V	V_{CEsat}	-	0.25	V
	MMUN5216V	V_{CEsat}	-	0.25	V
	MMUN5232V	V_{CEsat}	-	0.25	V
	MMUN5233V	V_{CEsat}	-	0.25	V
	MMUN5234V	V_{CEsat}	-	0.25	V
	MMUN5235V	V_{CEsat}	-	0.25	V
	MMUN5238V	V_{CEsat}	-	0.25	V
	MMUN5238V	V_{CEsat}	-	0.25	V



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q₁ and Q₂),(Continued)

Parameter	Symbol	Min.	Max.	Unit		
Output Voltage (on) at $V_{CC} = 5\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN5211V	V_{OL}	-	0.2	V	
	MMUN5212V	V_{OL}	-	0.2	V	
	MMUN5214V	V_{OL}	-	0.2	V	
	MMUN5215V	V_{OL}	-	0.2	V	
	MMUN5216V	V_{OL}	-	0.2	V	
	MMUN5230V	V_{OL}	-	0.2	V	
	MMUN5231V	V_{OL}	-	0.2	V	
	MMUN5232V	V_{OL}	-	0.2	V	
	MMUN5233V	V_{OL}	-	0.2	V	
	MMUN5234V	V_{OL}	-	0.2	V	
	MMUN5235V	V_{OL}	-	0.2	V	
	MMUN5238V	V_{OL}	-	0.2	V	
	at $V_{CC} = 5\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN5213V	V_{OL}	-	0.2	V
	at $V_{CC} = 5\text{ V}$, $V_B = 5\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN5241V	V_{OL}	-	0.2	V
	Output Voltage (off) at $V_{CC} = 5\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1\text{ K}\Omega$ at $V_{CC} = 5\text{ V}$, $V_B = 0.05\text{ V}$, $R_L = 1\text{ K}\Omega$ at $V_{CC} = 5\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN5230V	V_{OH}	4.9	-	V
MMUN5215V		V_{OH}	4.9	-	V	
MMUN5216V		V_{OH}	4.9	-	V	
MMUN5233V		V_{OH}	4.9	-	V	
MMUN5238V		V_{OH}	4.9	-	V	
MMUN5211V		R_1	7	13	K Ω	
Input Resistor	MMUN5212V	R_1	15.4	28.6	K Ω	
	MMUN5213V	R_1	32.9	61.1	K Ω	
	MMUN5214V	R_1	7	13	K Ω	
	MMUN5215V	R_1	7	13	K Ω	
	MMUN5216V	R_1	3.3	6.1	K Ω	
	MMUN5230V	R_1	0.7	1.3	K Ω	
	MMUN5231V	R_1	1.5	2.9	K Ω	
	MMUN5232V	R_1	3.3	6.1	K Ω	
	MMUN5233V	R_1	3.3	6.1	K Ω	
	MMUN5234V	R_1	15.4	28.6	K Ω	
	MMUN5235V	R_1	1.54	2.86	K Ω	
	MMUN5238V	R_1	1.54	2.88	K Ω	
	MMUN5241V	R_1	70	130	K Ω	
	Resistor Ratio	MMUN5211V/MMUN5212V/MMUN5213V	R1/R2	0.8	1.2	-
MMUN5214V		R1/R2	0.17	0.25	-	
MMUN5215V/MMUN5216V/MMUN5238V		R1/R2	-	-	-	
MMUN5241V		R1/R2	-	-	-	
MMUN5230V/MMUN5231V/MMUN5232V		R1/R2	0.8	1.2	-	
MMUN5233V		R1/R2	0.055	0.185	-	
MMUN5234V		R1/R2	0.38	0.56	-	
MMUN5235V		R1/R2	0.038	0.056	-	

TYPICAL ELECTRICAL CHARACTERISTICS — MUN52xxV

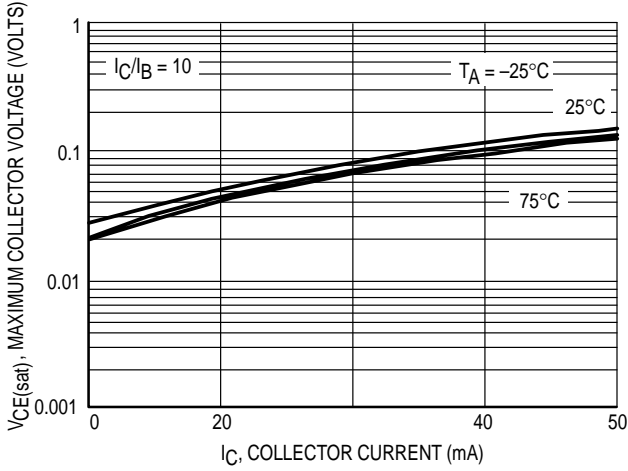


Figure 2. $V_{CE(sat)}$ versus I_C

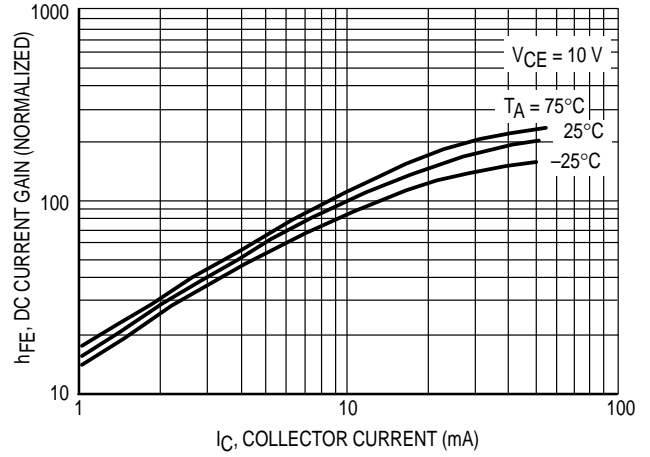


Figure 3. DC Current Gain

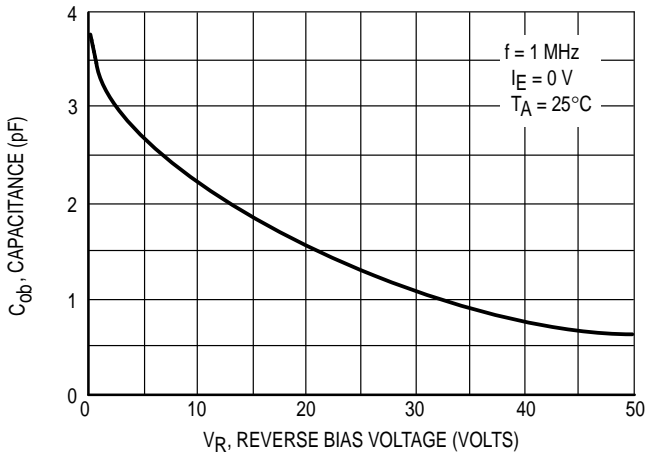


Figure 4. Output Capacitance

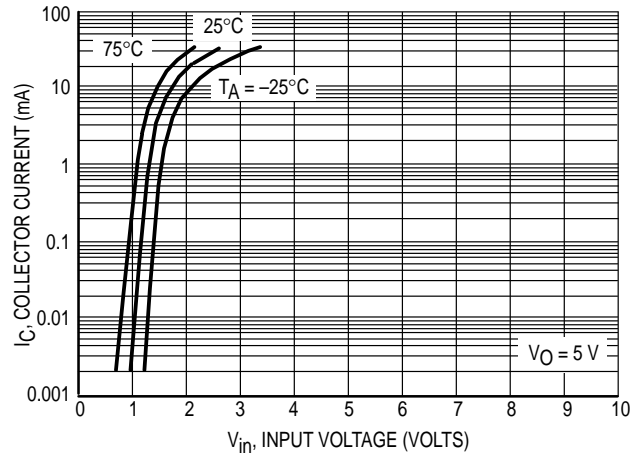


Figure 5. Output Current versus Input Voltage

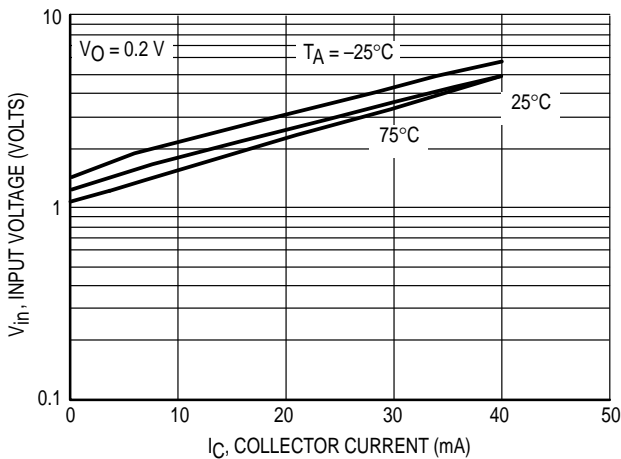


Figure 6. Input Voltage versus Output Current

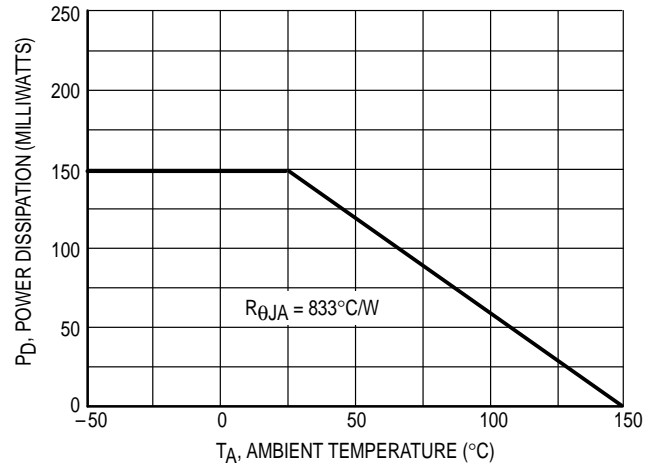
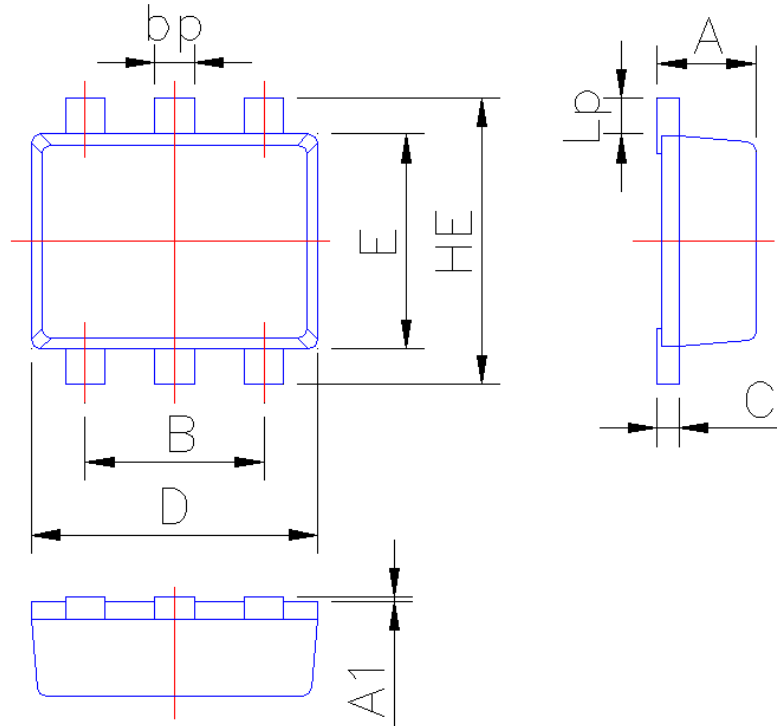


Figure 1. Derating Curve

SOT-563-Package Outline Dimensions



Symbol	Dimension in Millimeters	
	Min	Max
A	0.50	0.60
A1	0	0.05
B	0.95	1.05
bp	0.13	0.30
C	0.09	0.150
D	1.50	1.70
E	1.15	1.35
HE	1.40	1.80
Lp	0.13	0.30