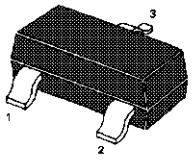
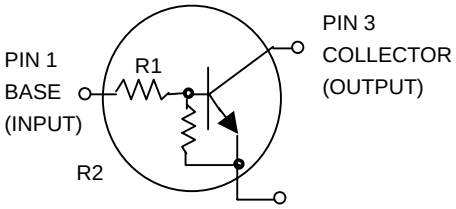
MMUN2211

NPN Silicon Surface Mount Transistor
with Monolithic Bias Resistor Network

This new series of digital transistors is designed to replace a single device and its external resistor bias 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. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space. The device is housed in the SOT-23 package which is designed for low power surface mount applications.



1. Base 2. Emitter 3. Collector



Absolute Maximum Ratings (T_a = 25 °C)

	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	50	V
Collector Emitter Voltage	V_{CEO}	50	V
Collector Current	I_C	100	mA
Total Power Dissipation [1)] Derate above 25°C	P_{tot}	200 1.6	mW mW/ °C

[1)] Device mounted on a FR-4 glass epoxy printed circuit board using the minimum recommended footprint.

Device Marking and Resistor Values

Device	Marking	R1(K)	R2(K)
MMUN2211	A8A	10	10
MMUN2212	A8B	22	22
MMUN2213	A8C	47	47
MMUN2214	A8D	10	47
MMUN2215	A8E	10	∞
MMUN2216	A8F	4.7	∞
MMUN2230	A8G	1	1
MMUN2231	A8H	2.2	2.2
MMUN2232	A8J	4.7	4.7
MMUN2233	A8K	4.7	47
MMUN2234	A8L	22	47
MMUN2235	A8M	2.2	47
MMUN2238	A8R	2.2	∞
MMUN2241	A8U	100	∞

Thermal Characteristics

Rating	Symbol	Value	Unit
Thermal Resistance-Junction-to Ambient (surface mounted)	$R_{\Theta JA}$	625	°C/W
Operating and Storage Temperature Range	T_J, T_s	-65 to+150	°C

MMUN2211

Characteristics at T_{amb}=25 °C

		Symbol	Min.	Max.	Unit
DC Current Gain					
at V_{CE}=10V, I_C=5mA	MMUN2211	h_{FE}	35	-	-
	MMUN2212	h_{FE}	60	-	-
	MMUN2213	h_{FE}	80	-	-
	MMUN2214	h_{FE}	80	-	-
	MMUN2215	h_{FE}	160	-	-
	MMUN2216	h_{FE}	160	-	-
	MMUN2230	h_{FE}	3	-	-
	MMUN2231	h_{FE}	8	-	-
	MMUN2232	h_{FE}	15	-	-
	MMUN2233	h_{FE}	80	-	-
	MMUN2234	h_{FE}	80	-	-
	MMUN2235	h_{FE}	80	-	-
	MMUN2238	h_{FE}	160	-	-
	MMUN2241	h_{FE}	160	-	-
Collector Emitter Saturation Voltage					
at I_C=10mA, I_B=0.3mA		V_{CEsat}	-	0.25	V
at I_C=10mA, I_B=5mA	MMUN2230	V_{CEsat}	-	0.25	V
	MMUN2231	V_{CEsat}	-	0.25	V
at I_C=10mA, I_B=1mA	MMUN2215	V_{CEsat}	-	0.25	V
	MMUN2216	V_{CEsat}	-	0.25	V
	MMUN2232	V_{CEsat}	-	0.25	V
	MMUN2233	V_{CEsat}	-	0.25	V
	MMUN2234	V_{CEsat}	-	0.25	V
	MMUN2235	V_{CEsat}	-	0.25	V
	MMUN2238	V_{CEsat}	-	0.25	V
Collector Base Cutoff Current					
at V_{CB}=50V		I_{CBO}	-	100	nA
Collector Emitter Cutoff Current					
at V_{CE}=50V		I_{CEO}	-	500	nA
Emitter Base Cutoff Current					
at V_{EB}=6V	MMUN2211	I_{EBO}	-	0.5	mA
	MMUN2212	I_{EBO}	-	0.2	mA
	MMUN2213	I_{EBO}	-	0.1	mA
	MMUN2214	I_{EBO}	-	0.2	mA
	MMUN2215	I_{EBO}	-	0.9	mA
	MMUN2216	I_{EBO}	-	1.9	mA

Characteristics at T_{amb}=25 °C

		Symbol	Min.	Max.	Unit
Emitter-Base Cutoff Current					
at V_{EB}=6V	MMUN2230	I_{EBO}	-	4.3	mA
	MMUN2231	I_{EBO}	-	2.3	mA
	MMUN2232	I_{EBO}	-	1.5	mA
	MMUN2233	I_{EBO}	-	0.18	mA
	MMUN2234	I_{EBO}	-	0.13	mA
	MMUN2235	I_{EBO}	-	0.2	mA
	MMUN2238	I_{EBO}	-	4	mA
	MMUN2241	I_{EBO}	-	0.1	mA
Collector Base Breakdown Voltage					
at I_C=10μA		$V_{(BR)CBO}$	50	-	V
Collector Emitter Breakdown Voltage					
at I_C=2mA		$V_{(BR)CEO}$	50	-	V
Output Voltage(on)					
at V_{CC}=5V, V_B=2.5V, R_L=1KΩ	MMUN2211	V_{OL}	-	0.2	V
	MMUN2212	V_{OL}	-	0.2	V
	MMUN2214	V_{OL}	-	0.2	V
	MMUN2215	V_{OL}	-	0.2	V
	MMUN2216	V_{OL}	-	0.2	V
	MMUN2230	V_{OL}	-	0.2	V
	MMUN2231	V_{OL}	-	0.2	V
	MMUN2232	V_{OL}	-	0.2	V
	MMUN2233	V_{OL}	-	0.2	V
	MMUN2234	V_{OL}	-	0.2	V
	MMUN2235	V_{OL}	-	0.2	V
	MMUN2238	V_{OL}	-	0.2	V
at V_{CC}=5V, V_B=3.5V, R_L=1KΩ	MMUN2213	V_{OL}	-	0.2	V
at V_{CC}=5V, V_B=5V, R_L=1KΩ	MMUN2241	V_{OL}	-	0.2	V
Output Voltage(off)					
at V_{CC}=5V, V_B=0.5V, R_L=1KΩ		V_{OH}	4.9	-	V
at V_{CC}=5V, V_B=0.05V, R_L=1KΩ	MMUN2230	V_{OH}	4.9	-	V
at V_{CC}=5V, V_B=0.25V, R_L=1KΩ	MMUN2215	V_{OH}	4.9	-	V
	MMUN2216	V_{OH}	4.9	-	V
	MMUN2233	V_{OH}	4.9	-	V
	MMUN2238	V_{OH}	4.9	-	V

Characteristics at T_{amb}=25 °C

		Symbol	Min.	Max.	Unit
Input Resistor	MMUN2211	R1	7	13	KΩ
	MMUN2212	R1	15.4	28.6	KΩ
	MMUN2213	R1	32.9	61.1	KΩ
	MMUN2214	R1	7	13	KΩ
	MMUN2215	R1	7	13	KΩ
	MMUN2216	R1	3.3	6.1	KΩ
	MMUN2230	R1	0.7	1.3	KΩ
	MMUN2231	R1	1.5	2.9	KΩ
	MMUN2232	R1	3.3	6.1	KΩ
	MMUN2233	R1	3.3	6.1	KΩ
	MMUN2234	R1	15.4	28.6	KΩ
	MMUN2235	R1	1.54	2.86	KΩ
	MMUN2238	R1	1.54	2.88	KΩ
	MMUN2241	R1	70	130	KΩ
Resistor Ratio	MMUN2211/MMUN2212/MMUN2213	R1/R2	0.8	1.2	
	MMUN2214	R1/R2	0.17	0.25	
	MMUN2215/MMUN2216/MMUN2238	R1/R2	-	-	
	MMUN2241	R1/R2	-	-	
	MMUN2230/MMUN2231/MMUN2232	R1/R2	0.8	1.2	
	MMUN2233	R1/R2	0.055	0.185	
	MMUN2234	R1/R2	0.38	0.56	
	MMUN2235	R1/R2	0.038	0.056	