

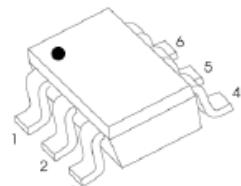
## Dual Bias Resistor Transistors

### 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 MMUN5211 DW series, two 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.

### MMUN5211DW Series



**SOT-363**

#### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

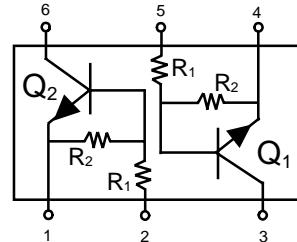
Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc

#### THERMAL CHARACTERISTICS

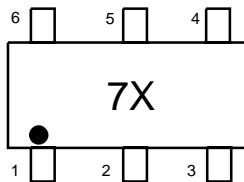
Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	187 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R <sub>θJA</sub>	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	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 <sub>θJA</sub>	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	R <sub>θJL</sub>	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

1. FR-4 @ Minimum Pad

2. FR-4 @ 1.0 x 1.0 inch Pad



#### MARKING DIAGRAM



7X = 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**

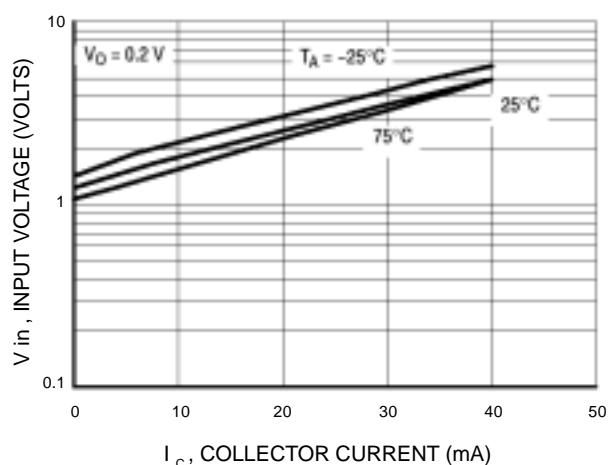
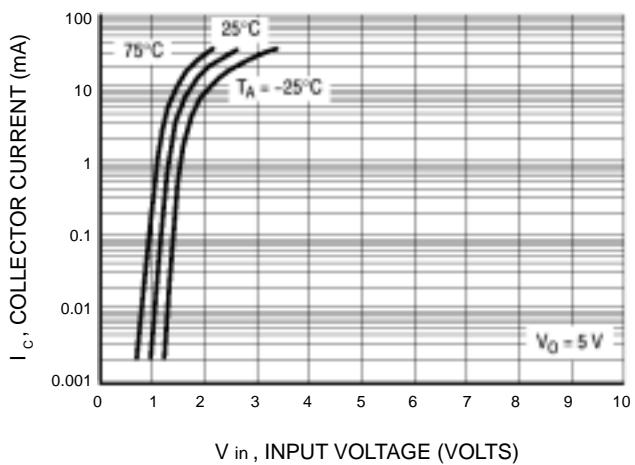
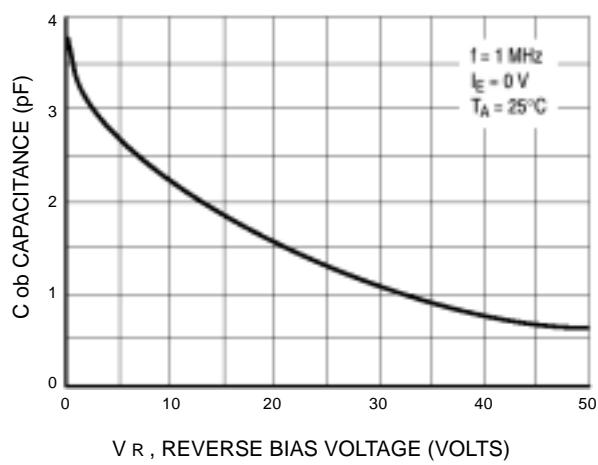
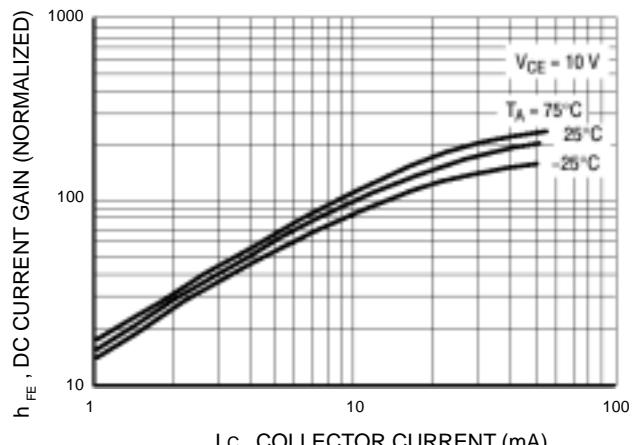
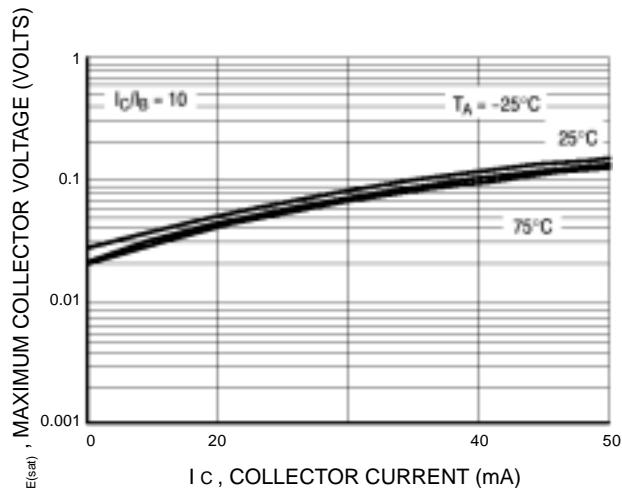
Device	Package	Marking	R1(K)	R2(K)	Shipping
MMUN5211DW	SOT-363	7A	10	10	3000/Tape&Reel
MMUN5212DW	SOT-363	7B	22	22	3000/Tape&Reel
MMUN5213DW	SOT-363	7C	47	47	3000/Tape&Reel
MMUN5214DW	SOT-363	7D	10	47	3000/Tape&Reel
MMUN5215DW	SOT-363	7E	10	$\infty$	3000/Tape&Reel
MMUN5216DW	SOT-363	7F	4.7	$\infty$	3000/Tape&Reel
MMUN5230DW	SOT-363	7G	1	1	3000/Tape&Reel
MMUN5231DW	SOT-363	7H	2.2	2.2	3000/Tape&Reel
MMUN5232DW	SOT-363	7J	4.7	4.7	3000/Tape&Reel
MMUN5233DW	SOT-363	7K	4.7	47	3000/Tape&Reel
MMUN5234DW	SOT-363	7L	22	47	3000/Tape&Reel
MMUN5235DW	SOT-363	7M	2.2	47	3000/Tape&Reel
MMUN5238DW	SOT-363	7Q	2.2	$\infty$	3000/Tape&Reel
MMUN5241DW	SOT-363	7T	100	$\infty$	3000/Tape&Reel

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ .) (Continued)

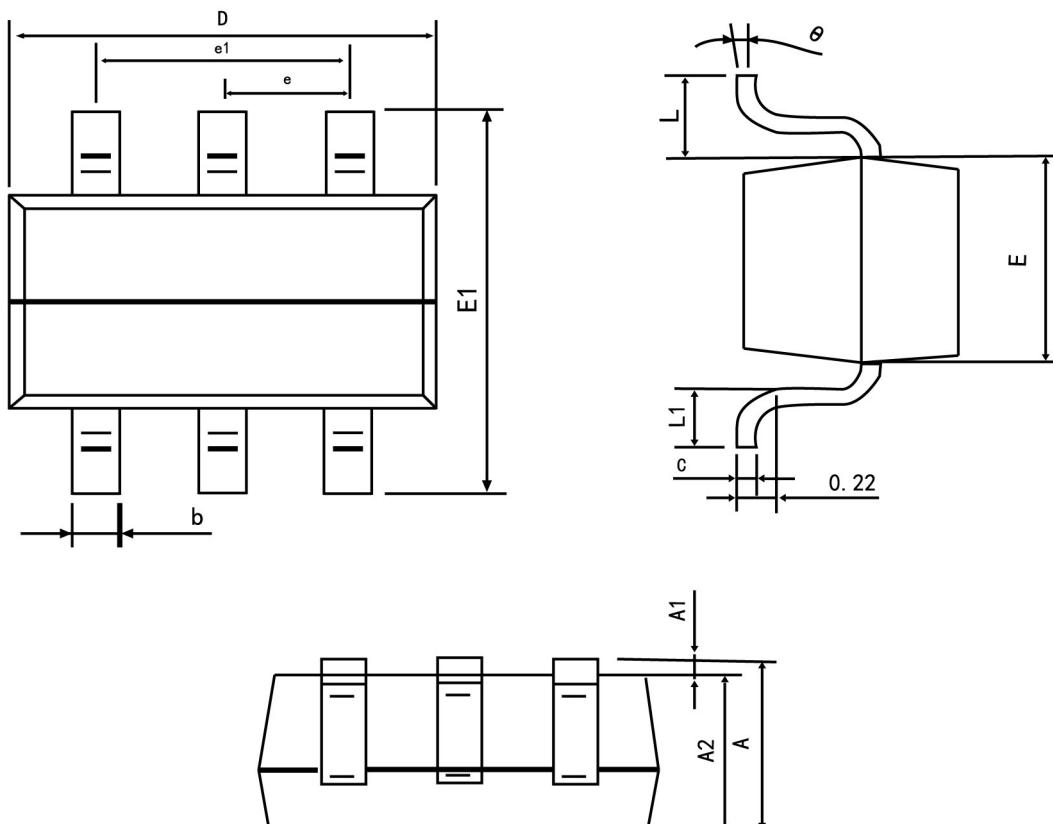
Parameter		Symbol	Min.	Max.	Unit
DC Current Gain at $V_{CE} = 10 \text{ V}$ , $I_C = 5 \text{ mA}$	MMUN5211DW MMUN5212DW MMUN5213DW MMUN5214DW MMUN5215DW MMUN5216DW MMUN5230DW MMUN5231DW MMUN5232DW MMUN5233DW MMUN5234DW MMUN5235DW MMUN5238DW MMUN5241DW	$h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$ $h_{FE}$	35 60 80 80 160 160 3 8 15 80 80 80 160 160	- - - - - - - - - - - - - - -	- - - - - - - - - - - - - - -
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 $V_{EB} = 6 \text{ V}$	MMUN5211DW MMUN5212DW MMUN5213DW MMUN5214DW MMUN5215DW MMUN5216DW MMUN5230DW MMUN5231DW MMUN5232DW MMUN5233DW MMUN5234DW MMUN5235DW MMUN5238DW MMUN5241DW	$I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$ $I_{EBO}$	- - - - - - - - - - - - - - -	0.5 0.2 0.1 0.2 0.9 1.9 4.3 2.3 1.5 0.18 0.13 0.2 4 0.1	mA mA mA mA mA mA mA mA mA mA mA mA mA mA 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 $I_C = 10 \text{ mA}$ , $I_B = 1 \text{ mA}$	MMUN5230DW MMUN5231DW MMUN5215DW MMUN5216DW MMUN5232DW MMUN5233DW MMUN5234DW MMUN5235DW MMUN5238DW	$V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$ $V_{CEsat}$	- - - - - - - - -	0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25 0.25	V V V V V V V V V

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ )(Continued)

Parameter	Symbol	Min.	Max.	Unit
Output Voltage (on) at $V_{CC} = 5 \text{ V}$ , $V_B = 2.5 \text{ V}$ , $R_L = 1 \text{ k}\Omega$	$V_{OL}$	-	0.2	V
MMUN5211DW	$V_{OL}$	-	0.2	V
MMUN5212DW	$V_{OL}$	-	0.2	V
MMUN5214DW	$V_{OL}$	-	0.2	V
MMUN5215DW	$V_{OL}$	-	0.2	V
MMUN5216DW	$V_{OL}$	-	0.2	V
MMUN5230DW	$V_{OL}$	-	0.2	V
MMUN5231DW	$V_{OL}$	-	0.2	V
MMUN5232DW	$V_{OL}$	-	0.2	V
MMUN5233DW	$V_{OL}$	-	0.2	V
MMUN5234DW	$V_{OL}$	-	0.2	V
MMUN5235DW	$V_{OL}$	-	0.2	V
MMUN5238DW	$V_{OL}$	-	0.2	V
MMUN5213DW	$V_{OL}$	-	0.2	V
MMUN5241DW	$V_{OL}$	-	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 $V_{CC} = 5 \text{ V}$ , $V_B = 0.25 \text{ V}$ , $R_L = 1 \text{ k}\Omega$	$V_{OH}$	4.9	-	V
MMUN5230DW	$V_{OH}$	4.9	-	V
MMUN5215DW	$V_{OH}$	4.9	-	V
MMUN5216DW	$V_{OH}$	4.9	-	V
MMUN5233DW	$V_{OH}$	4.9	-	V
MMUN5238DW	$V_{OH}$	4.9	-	V
Input Resistor	MMUN5211DW	R1	7	$\text{k}\Omega$
	MMUN5212DW	R1	15.4	$\text{k}\Omega$
	MMUN5213DW	R1	32.9	$\text{k}\Omega$
	MMUN5214DW	R1	7	$\text{k}\Omega$
	MMUN5215DW	R1	7	$\text{k}\Omega$
	MMUN5216DW	R1	3.3	$\text{k}\Omega$
	MMUN5230DW	R1	0.7	$\text{k}\Omega$
	MMUN5231DW	R1	1.5	$\text{k}\Omega$
	MMUN5232DW	R1	3.3	$\text{k}\Omega$
	MMUN5233DW	R1	3.3	$\text{k}\Omega$
	MMUN5234DW	R1	15.4	$\text{k}\Omega$
	MMUN5235DW	R1	1.54	$\text{k}\Omega$
	MMUN5238DW	R1	1.54	$\text{k}\Omega$
	MMUN5241DW	R1	70	$\text{k}\Omega$
Resistor Ratio	MMUN5211DW/MMUN5212DW/MMUN5213DW	R1/R2	0.8	1.2
	MMUN5214DW	R1/R2	0.17	0.25
	MMUN5215DW/MMUN5216DW/MMUN5238DW	R1/R2	-	-
	MMUN5241DW	R1/R2	-	-
	MMUN5230DW/MMUN5231DW/MMUN5232DW	R1/R2	0.8	1.2
	MMUN5233DW	R1/R2	0.055	0.185
	MMUN5234DW	R1/R2	0.38	0.56
	MMUN5235DW	R1/R2	0.038	0.056

**TYPICAL ELECTRICAL CHARACTERISTICS – MMUN5211DW**


### SOT-363 Package Outline Dimensions



Symbol	Dimension in Millimeters	
	Min	Max
A	0.900	1.100
A1	0.000	0.100
A2	0.900	1.000
b	0.150	0.350
c	0.080	0.150
D	2.000	2.200
E	1.150	1.350
E1	2.150	2.450
e	0.650 TYP	
e1	1.200	1.400
L	0.525 REF	
L1	0.260	0.460
θ	0°	8°