

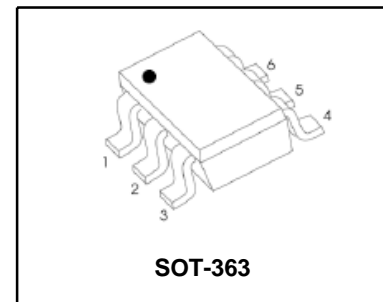
# Dual Bias Resistor Transistors

## 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.

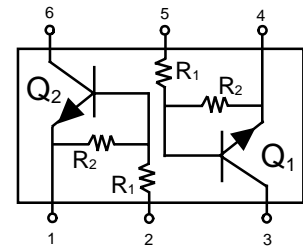
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- We declare that the material of product compliance with RoHS requirements.

**MMUN5211DW  
Series**



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

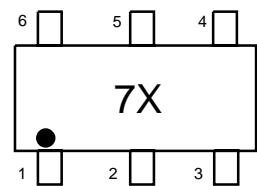
Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc



### 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

### 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.

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

## 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	∞	3000/Tape&Reel
MMUN5216DW	SOT-363	7F	4.7	∞	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	∞	3000/Tape&Reel
MMUN5241DW	SOT-363	7T	100	∞	3000/Tape&Reel

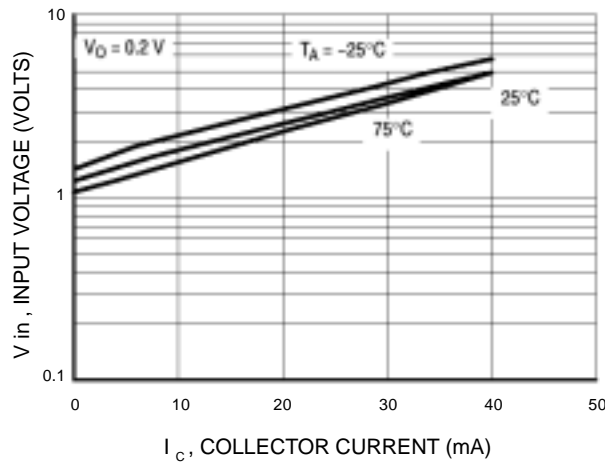
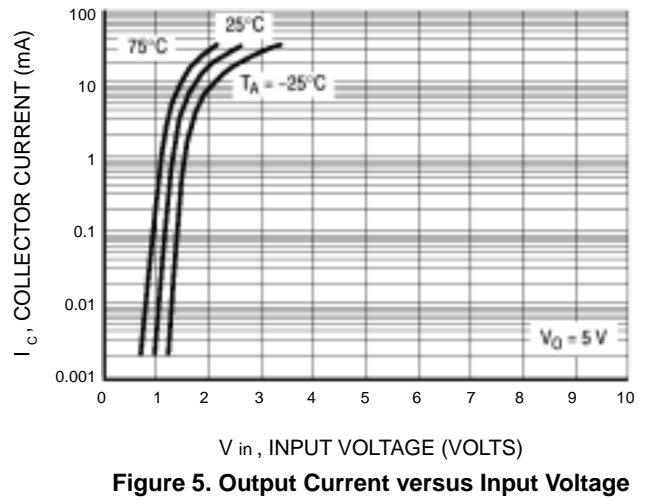
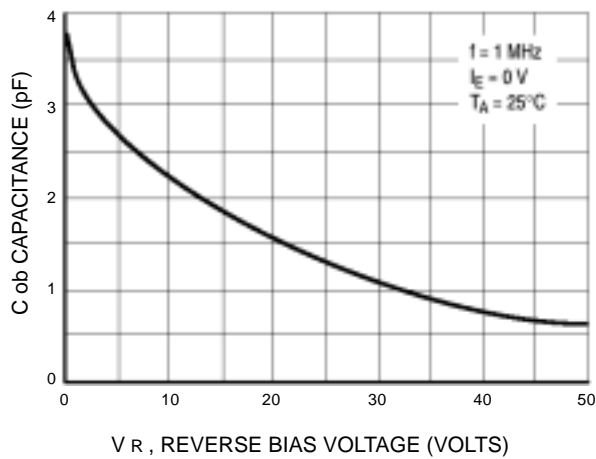
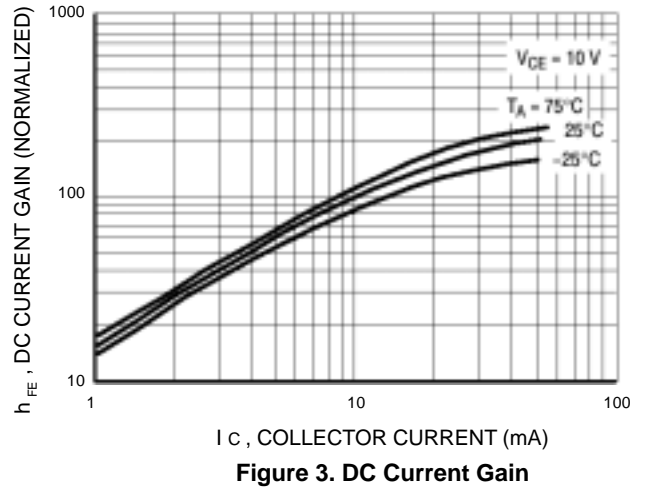
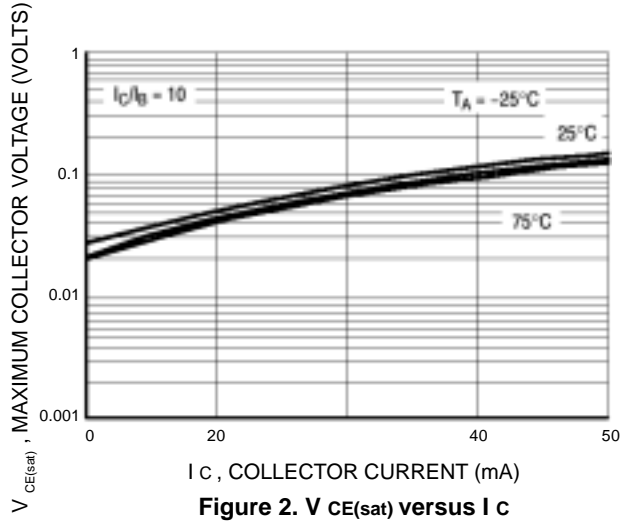
**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ ),(Continued)

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

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>.) (Continued)

Parameter	Symbol	Min.	Max.	Unit		
Output Voltage (on) at $V_{CC} = 5\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1\text{ K}\Omega$	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	
	at $V_{CC} = 5\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1\text{ K}\Omega$	MMUN5213DW	$V_{OL}$	-	0.2	V
	at $V_{CC} = 5\text{ V}$ , $V_B = 5\text{ V}$ , $R_L = 1\text{ K}\Omega$	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 $V_{CC} = 5\text{ V}$ , $V_B = 0.25\text{ V}$ , $R_L = 1\text{ K}\Omega$	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	
	MMUN5238DW	$V_{OH}$	4.9	-	V	
Input Resistor	MMUN5211DW	R1	7	13	K $\Omega$	
	MMUN5212DW	R1	15.4	28.6	K $\Omega$	
	MMUN5213DW	R1	32.9	61.1	K $\Omega$	
	MMUN5214DW	R1	7	13	K $\Omega$	
	MMUN5215DW	R1	7	13	K $\Omega$	
	MMUN5216DW	R1	3.3	6.1	K $\Omega$	
	MMUN5230DW	R1	0.7	1.3	K $\Omega$	
	MMUN5231DW	R1	1.5	2.9	K $\Omega$	
	MMUN5232DW	R1	3.3	6.1	K $\Omega$	
	MMUN5233DW	R1	3.3	6.1	K $\Omega$	
	MMUN5234DW	R1	15.4	28.6	K $\Omega$	
	MMUN5235DW	R1	1.54	2.86	K $\Omega$	
	MMUN5238DW	R1	1.54	2.88	K $\Omega$	
	MMUN5241DW	R1	70	130	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

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