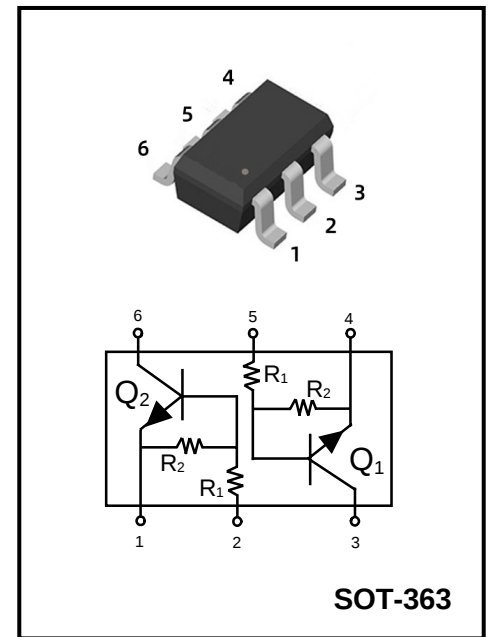


Dual Bias Resistor Transistors

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 MMUN52 11 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.



MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q 1 and Q 2)

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

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q 1 and Q 2)

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C	P _D	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 _{θJA}	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	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

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	H2	47	47	3000/Tape&Reel
MMUN5214DW	SOT-363	7D	10	47	3000/Tape&Reel
MMUN5215DW	SOT-363	7E	10	Ġ	3000/Tape&Reel
MMUN5216DW	SOT-363	7F	4.7	Ġ	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	Ġ	3000/Tape&Reel
MMUN5241DW	SOT-363	7T	100	Ġ	3000/Tape&Reel

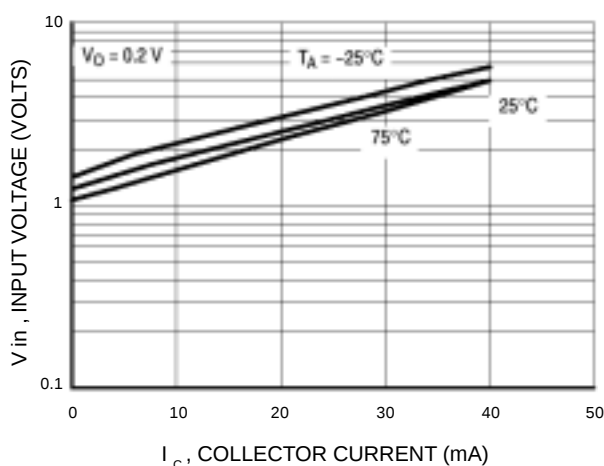
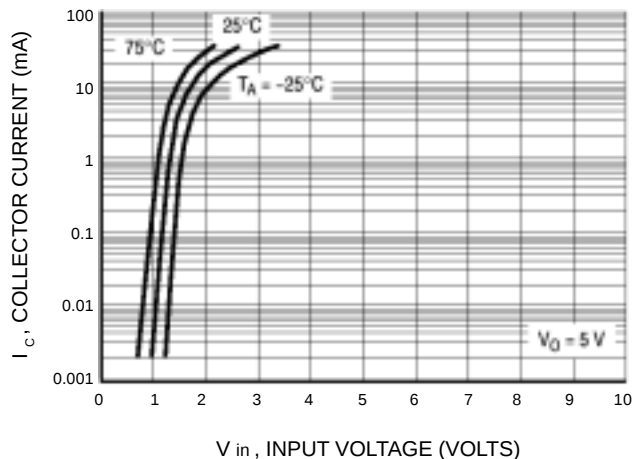
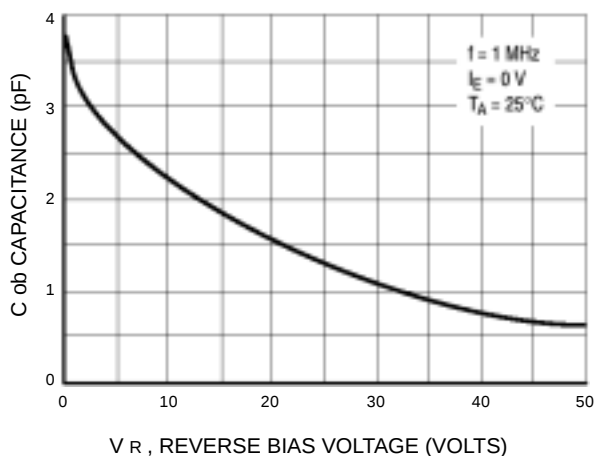
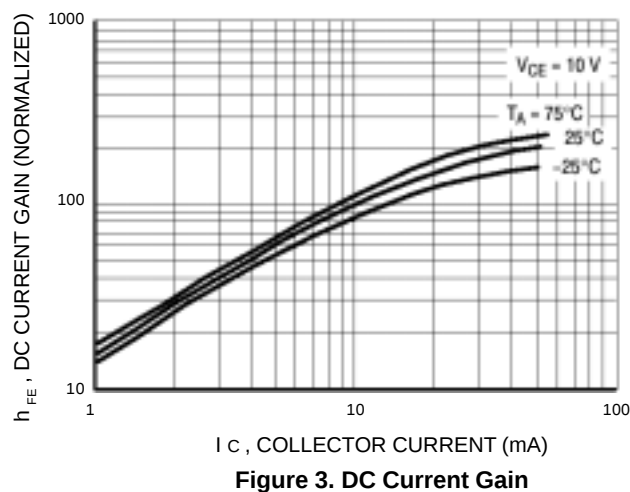
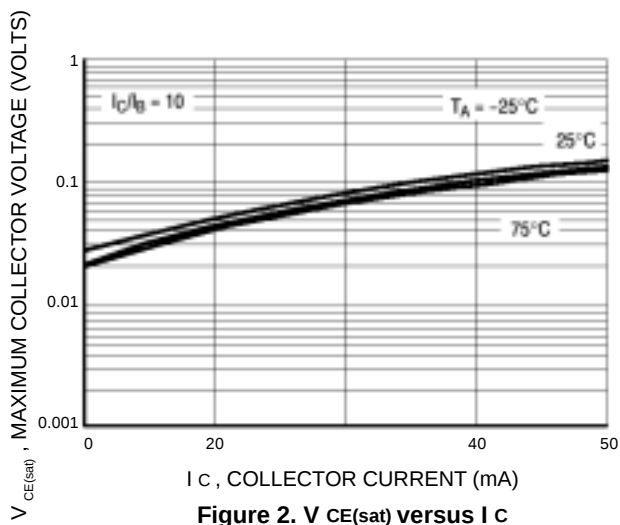
ELECTRICAL CHARACTERISTICS (T A = 25°C unless otherwise noted, common for Q 1 and Q 2 ,)(Continued)

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 $I_C = 10\text{ }\mu\text{A}$	$V_{(BR)CBO}$	50	-	V
Collector Emitter Breakdown Voltage at $I_C = 2\text{ mA}$	$V_{(BR)CEO}$	50	-	V
Collector Emitter Saturation Voltage at $I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$	V_{CEsat}	-	0.25	V
at $I_C = 10\text{ mA}$, $I_B = 5\text{ mA}$	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°C unless otherwise noted, common for Q 1 and Q 2.)(Continued)

Parameter		Symbol	Min.	Max.	Unit
Output Voltage (on) at V _{CC} = 5 V, V _B = 2.5 V, R _L = 1 KΩ					
	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 V, V _B = 3.5 V, R _L = 1 KΩ	MMUN5213DW	V _{OL}	-	0.2	V
at V _{CC} = 5 V, V _B = 5 V, R _L = 1 KΩ	MMUN5241DW	V _{OL}	-	0.2	V
Output Voltage (off) at V _{CC} = 5 V, V _B = 0.5 V, R _L = 1 KΩ		V _{OH}	4.9	-	V
at V _{CC} = 5 V, V _B = 0.05 V, R _L = 1 KΩ	MMUN5230DW	V _{OH}	4.9	-	V
at V _{CC} = 5 V, V _B = 0.25 V, R _L = 1 KΩ	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	13	KΩ
	MMUN5212DW	R1	15.4	28.6	KΩ
	MMUN5213DW	R1	32.9	61.1	KΩ
	MMUN5214DW	R1	7	13	KΩ
	MMUN5215DW	R1	7	13	KΩ
	MMUN5216DW	R1	3.3	6.1	KΩ
	MMUN5230DW	R1	0.7	1.3	KΩ
	MMUN5231DW	R1	1.5	2.9	KΩ
	MMUN5232DW	R1	3.3	6.1	KΩ
	MMUN5233DW	R1	3.3	6.1	KΩ
	MMUN5234DW	R1	15.4	28.6	KΩ
	MMUN5235DW	R1	1.54	2.86	KΩ
	MMUN5238DW	R1	1.54	2.88	KΩ
	MMUN5241DW	R1	70	130	KΩ
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



Ordering information

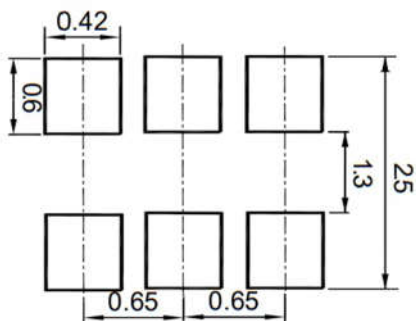
Package	Packing Description	Packing Quantity
SOT-363	Tape/Reel, 7" reel	3000PCS/Reel 120000PCS/Carton

Package Dimensions

SOT-363

Dim.	Millimeter(mm)		mil	
	Min.	Max.	Min.	Max.
A	0.8	1.1	32	43
A1	-	0.1	-	3.94
bp	0.20	0.30	7.87	11.81
c	0.10	0.25	3.94	9.84
D	1.8	2.2	70.87	86.61
E	1.15	1.35	45.28	53.15
e	1.3		51.18	
e1	0.65		25.6	
HE	2.0	2.2	78.74	86.6
Lp	0.15	0.45	5.90	17.71
Q	0.15	0.25	5.90	9.84
v	0.2		7.78	
w	0.2		7.78	
y	0.1		3.94	

The recommended mounting pad size



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