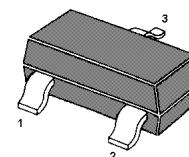


NPN Silicon Epitaxial Planar Transistor

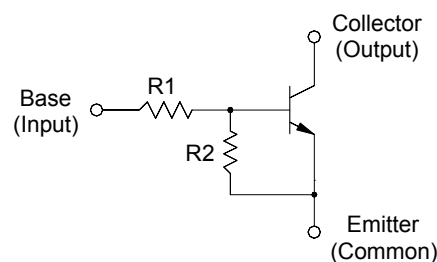
for switching and interface circuit and drive circuit applications

Resistor Values

Type	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	∞



1.Base 2.Emitter 3.Collector
SOT-23 Plastic Package



Absolute Maximum Ratings ($T_a = 25\text{ }^\circ\text{C}$)

Parameter	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	P_{tot}	200	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature Range	T_s	- 55 to + 150	$^\circ\text{C}$



Characteristics at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Min.	Max.	Unit	
DC Current Gain at $V_{CE} = 10\text{ V}$, $I_C = 5\text{ mA}$	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 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 $V_{EB} = 6\text{ V}$	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
	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 $I_C = 10\text{ }\mu\text{A}$	$V_{(BR)CBO}$	50	-	V	
Collector Emitter Breakdown Voltage at $I_C = 2\text{ mA}$	$V_{(BR)CEO}$	50	-	V	
Collector Emitter Saturation Voltage at $I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$ at $I_C = 10\text{ mA}$, $I_B = 5\text{ mA}$ at $I_C = 10\text{ mA}$, $I_B = 1\text{ mA}$	MMUN2230	V_{CEsat}	-	0.25	V
	MMUN2231	V_{CEsat}	-	0.25	V
	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
	MMUN2241	V_{CEsat}	-	0.25	V



Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Max.	Unit		
Output Voltage (on) at V _{CC} = 5 V, V _B = 2.5 V, R _L = 1 KΩ	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} = 5 V, V _B = 3.5 V, R _L = 1 KΩ	MMUN2213	V _{OL}	-	0.2	V
	at V _{CC} = 5 V, V _B = 5 V, R _L = 1 KΩ	MMUN2241	V _{OL}	-	0.2	V
Output Voltage (off) at V _{CC} = 5 V, V _B = 0.5 V, R _L = 1 KΩ	MMUN2230	V _{OH}	4.9	-	V	
	at V _{CC} = 5 V, V _B = 0.05 V, R _L = 1 KΩ	MMUN2215	V _{OH}	4.9	-	V
	at V _{CC} = 5 V, V _B = 0.25 V, R _L = 1 KΩ	MMUN2216	V _{OH}	4.9	-	V
	MMUN2233	V _{OH}	4.9	-	V	
	MMUN2238	V _{OH}	4.9	-	V	
	MMUN2238	V _{OH}	4.9	-	V	
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	-	



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SOT-23



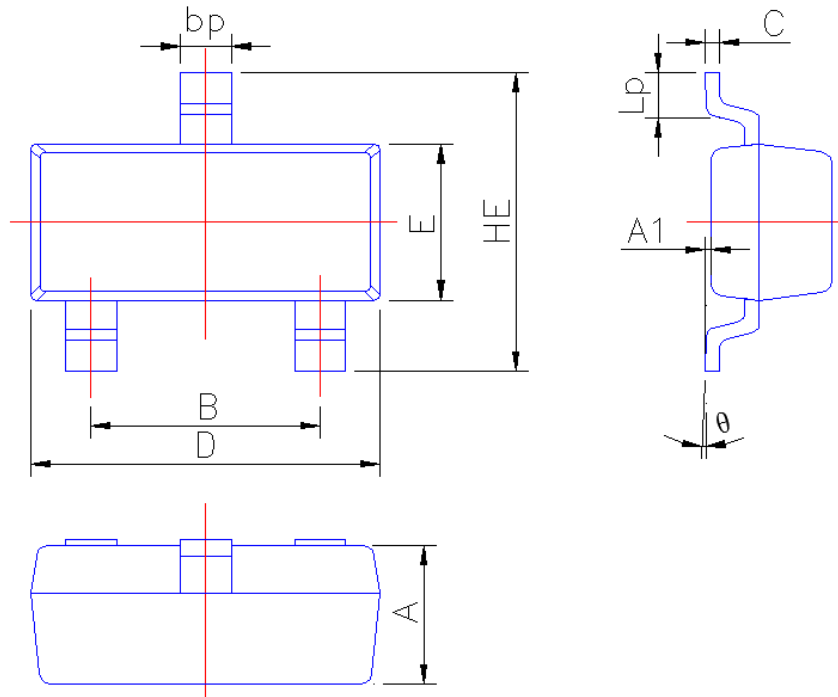
MMUN2211-MMUN2241

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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT-23



Symbol	Dimension in Millimeters	
	Min	Max
A	0.90	1.10
A1	0.013	0.100
B	1.80	2.00
bp	0.35	0.50
C	0.09	0.150
D	2.80	3.00
E	1.20	1.40
HE	2.20	2.80
Lp	0.20	0.50
θ	0°	5°