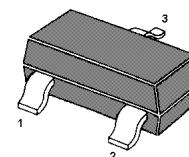


NPN Silicon Epitaxial Planar Transistor

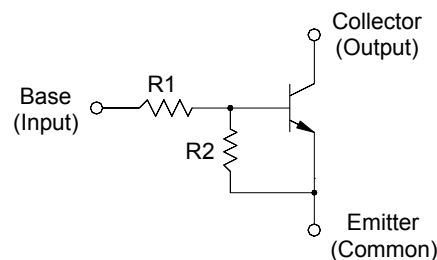
for switching and interface circuit and drive circuit applications

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 °C

Parameter	Symbol	Min.	Max.	Unit	
DC Current Gain at V _{CE} = 10 V, I _C = 5 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 V	I _{CBO}	-	100	nA
Collector Emitter Cutoff Current at V _{CE} = 50 V	I _{CEO}	-	500	nA	
Emitter Base Cutoff Current at V _{EB} = 6 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 μA	V _{(BR)CBO}	50	-	V	
Collector Emitter Breakdown Voltage at I _C = 2 mA	V _{(BR)CEO}	50	-	V	
Collector Emitter Saturation Voltage at I _C = 10 mA, I _B = 0.3 mA at I _C = 10 mA, I _B = 5 mA at I _C = 10 mA, I _B = 1 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

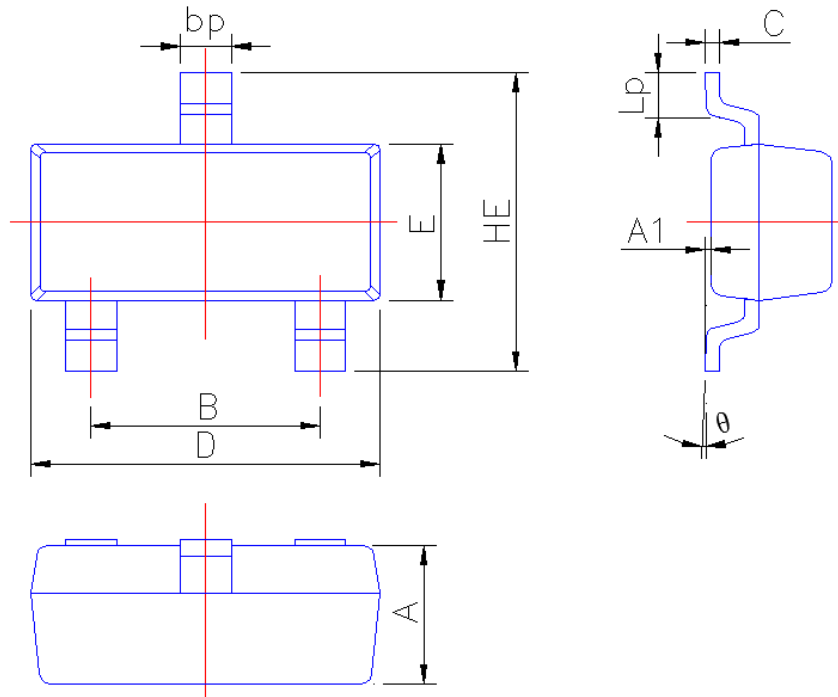
Parameter	Symbol	Min.	Max.	Unit		
Output Voltage (on) at V _{CC} = 5 V, V _B = 2.5 V, R _L = 1 KΩ	MMUN2211	V _{OL}	-	0.2	V	
	MMUN2212	V _{OL}	-	0.2	V	
	MMUN2214	V _{OL}	-	0.2	V	
	MMUN2215	V _{OL}	-	0.2	V	
	MMUN2216	V _{OL}	-	0.2	V	
	MMUN2230	V _{OL}	-	0.2	V	
	MMUN2231	V _{OL}	-	0.2	V	
	MMUN2232	V _{OL}	-	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	-	



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°