

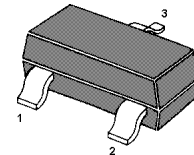


MMUN2211...MMUN2241 NPN Silicon Epitaxial Planar Transistor

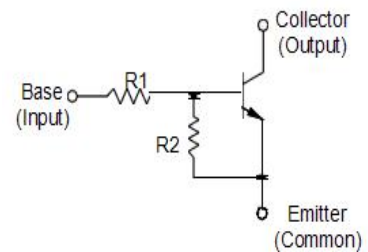
for switching and interface circuit and
drive circuit applications

Resistor Values

Type	R1 (K)	R2 (K)	Marking Code
MMUN2211	10	10	11
MMUN2212	22	22	12
MMUN2213	47	47	13
MMUN2214	10	47	14
MMUN2215	10	∞	15
MMUN2216	4.7	∞	16
MMUN2230	1	1	30
MMUN2231	2.2	2.2	31
MMUN2232	4.7	4.7	32
MMUN2233	4.7	47	33
MMUN2234	22	47	34
MMUN2235	2.2	47	35
MMUN2238	2.2	∞	38
MMUN2241	100	∞	41



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



on)

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	$^{\circ}C$
Storage Temperature Range	T_s	- 55 to + 150	$^{\circ}C$



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 $I_C = 10\text{ mA}$, $I_B = 1\text{ mA}$		V_{CEsat}	-	0.25	V
	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



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

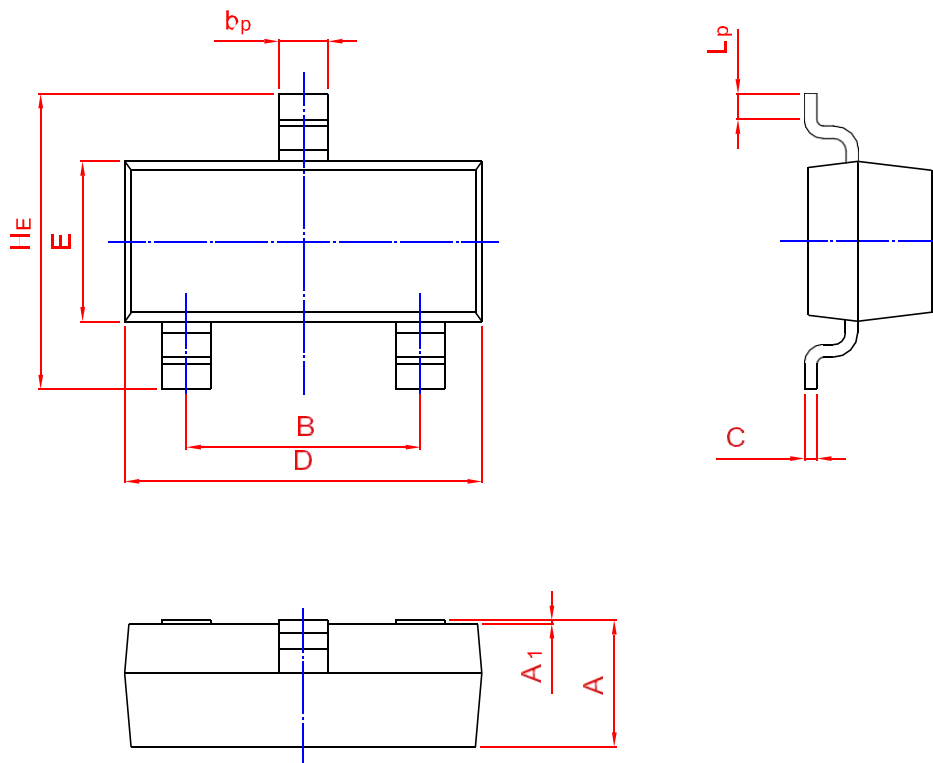
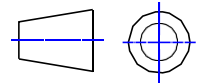
Parameter	Symbol	Min.	Max.	Unit
Output Voltage (on) at $V_{CC} = 5\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2211 V_{OL}	-	0.2	V
	MMUN2212 V_{OL}	-	0.2	V
	MMUN2214 V_{OL}	-	0.2	V
	MMUN2215 V_{OL}	-	0.2	V
	MMUN2216 V_{OL}	-	0.2	V
	MMUN2230 V_{OL}	-	0.2	V
	MMUN2231 V_{OL}	-	0.2	V
	MMUN2232 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 $V_{CC} = 5\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2213 V_{OL}	-	0.2	V
at $V_{CC} = 5\text{ V}$, $V_B = 5\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2241 V_{OL}	-	0.2	V
Output Voltage (off) at $V_{CC} = 5\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1\text{ K}\Omega$	V_{OH}	4.9	-	V
at $V_{CC} = 5\text{ V}$, $V_B = 0.05\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2230 V_{OH}	4.9	-	V
at $V_{CC} = 5\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2215 V_{OH}	4.9	-	V
	MMUN2216 V_{OH}	4.9	-	V
	MMUN2233 V_{OH}	4.9	-	V
	MMUN2238 V_{OH}	4.9	-	V
Input Resistor	MMUN2211 R1	7	13	K Ω
	MMUN2212 R1	15.4	28.6	K Ω
	MMUN2213 R1	32.9	61.1	K Ω
	MMUN2214 R1	7	13	K Ω
	MMUN2215 R1	7	13	K Ω
	MMUN2216 R1	3.3	6.1	K Ω
	MMUN2230 R1	0.7	1.3	K Ω
	MMUN2231 R1	1.5	2.9	K Ω
	MMUN2232 R1	3.3	6.1	K Ω
	MMUN2233 R1	3.3	6.1	K Ω
	MMUN2234 R1	15.4	28.6	K Ω
	MMUN2235 R1	1.54	2.86	K Ω
	MMUN2238 R1	1.54	2.88	K Ω
	MMUN2241 R1	70	130	K Ω
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



UNIT	A	B	bp	C	D	E	HE	A1	Lp
mm	1.40 0.95	2.04 1.78	0.50 0.35	0.19 0.08	3.10 2.70	1.65 1.20	3.00 2.20	0.100 0.013	0.50 0.20