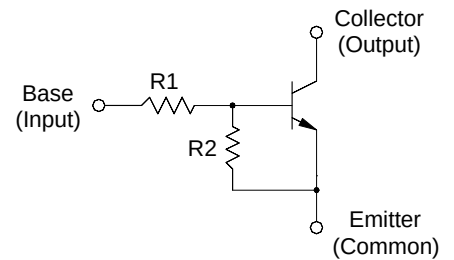




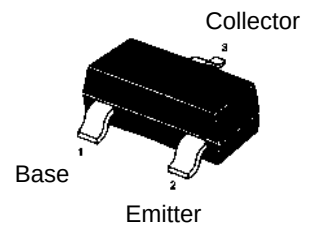
NPN Silicon Epitaxial Planar Transistor

for switching and interface circuit and
drive circuit applications



Resistor Values

Type	R1 (K)	R2 (K)	Mraking
MMUN2211	10	10	A8A
MMUN2212	22	22	A8B
MMUN2213	47	47	A8C
MMUN2214	10	47	A8D
MMUN2215	10	∞	A8E
MMUN2216	4.7	∞	A8F
MMUN2230	1	1	A8G
MMUN2231	2.2	2.2	A8H
MMUN2232	4.7	4.7	A8J
MMUN2233	4.7	47	A8K
MMUN2234	22	47	A8L
MMUN2235	2.2	47	A8M
MMUN2238	2.2	∞	A8R
MMUN2241	100	∞	A8U



SOT-23

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

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

Parameter	Symbol	Min.	Max.	Unit
DC Current Gain at $V_{CE} = 10\text{ V}$, $I_C = 5\text{ mA}$				
MMUN2211	h_{FE}	35	-	-
MMUN2212		60	-	-
MMUN2213		80	-	-
MMUN2214		80	-	-
MMUN2215		160	-	-
MMUN2216		160	-	-
MMUN2230		3	-	-
MMUN2231		8	-	-
MMUN2232		15	-	-
MMUN2233		80	-	-
MMUN2234		80	-	-
MMUN2235		80	-	-
MMUN2238		160	-	-
MMUN2241		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		-	0.2	
MMUN2213		-	0.1	
MMUN2214		-	0.2	
MMUN2215		-	0.9	
MMUN2216		-	1.9	
MMUN2230		-	4.3	
MMUN2231		-	2.3	
MMUN2232		-	1.5	
MMUN2233		-	0.18	
MMUN2234		-	0.13	
MMUN2235		-	0.2	
MMUN2238		-	4	
MMUN2241		-	0.1	
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		-	0.25	
MMUN2215		-	0.25	
MMUN2216		-	0.25	
MMUN2232		-	0.25	
MMUN2233		-	0.25	
MMUN2234		-	0.25	
MMUN2235		-	0.25	
MMUN2238		-	0.25	

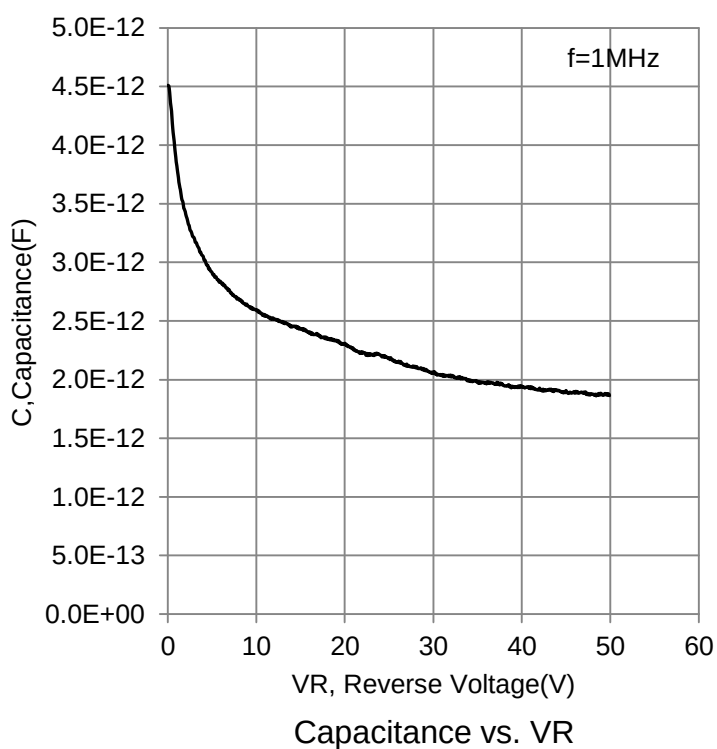
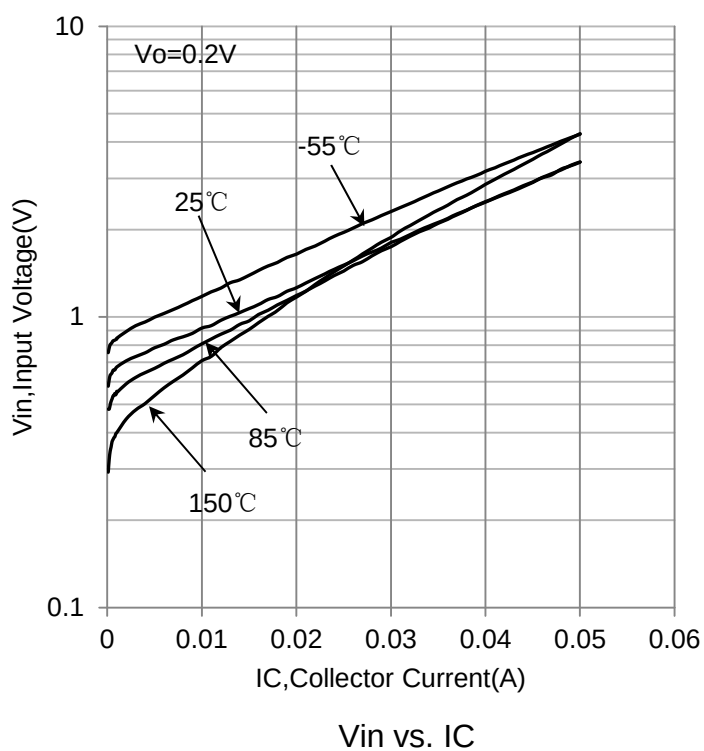
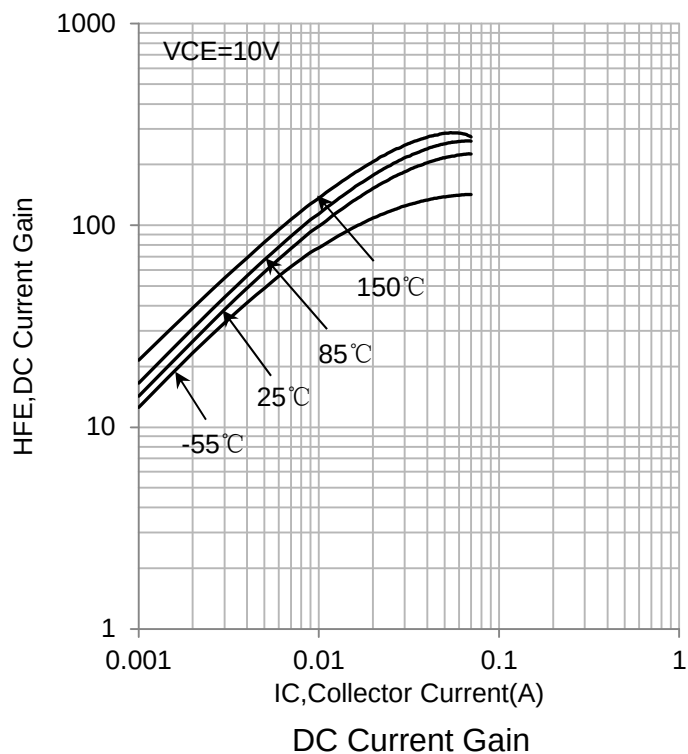
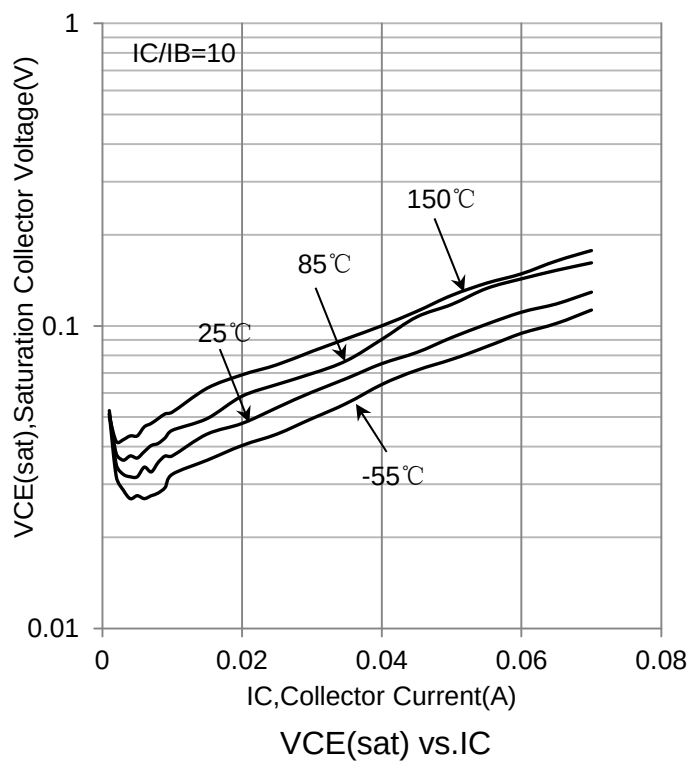


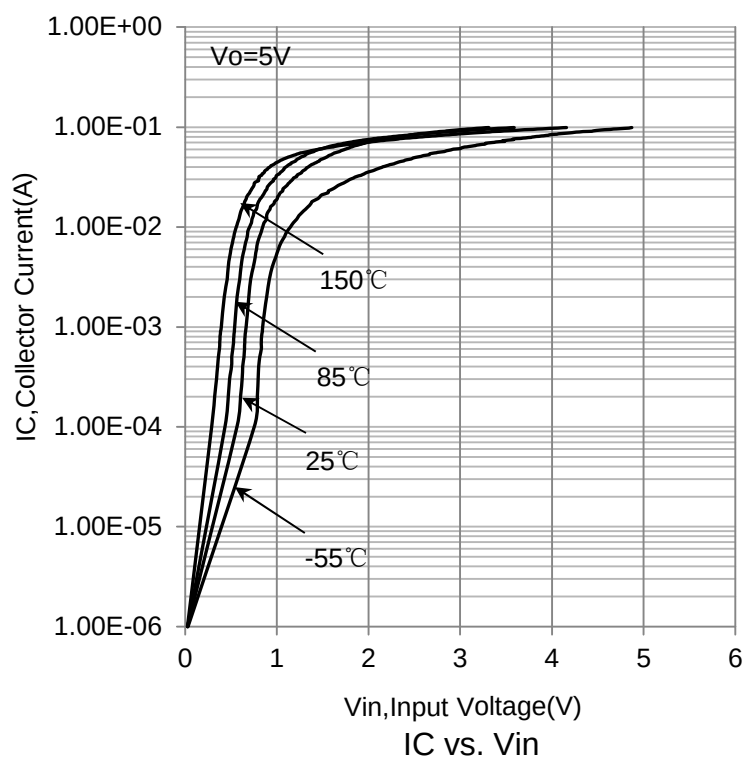
Characteristics at $T_a = 25\text{ }^{\circ}\text{C}$

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		-	0.2	
	MMUN2214		-	0.2	
	MMUN2215		-	0.2	
	MMUN2216		-	0.2	
	MMUN2230		-	0.2	
	MMUN2231		-	0.2	
	MMUN2232		-	0.2	
	MMUN2233		-	0.2	
	MMUN2234		-	0.2	
	MMUN2235		-	0.2	
	MMUN2238		-	0.2	
	at $V_{CC} = 5\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1\text{ K}\Omega$		-	0.2	
	at $V_{CC} = 5\text{ V}$, $V_B = 5\text{ V}$, $R_L = 1\text{ K}\Omega$		-	0.2	
	MMUN2241		-	0.2	
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 $V_{CC} = 5\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2230	V_{OH}	4.9	-	V
	MMUN2215		4.9	-	
	MMUN2216		4.9	-	
	MMUN2233		4.9	-	
	MMUN2238		4.9	-	
Input Resistor	MMUN2211	R1	7	13	$\text{K}\Omega$
	MMUN2212		15.4	28.6	
	MMUN2213		32.9	61.1	
	MMUN2214		7	13	
	MMUN2215		7	13	
	MMUN2216		3.3	6.1	
	MMUN2230		0.7	1.3	
	MMUN2231		1.5	2.9	
	MMUN2232		3.3	6.1	
	MMUN2233		3.3	6.1	
	MMUN2234		15.4	28.6	
	MMUN2235		1.54	2.86	
	MMUN2238		1.54	2.88	
	MMUN2241		70	130	
Resistor Ratio	MMUN2211/MMUN2212/MMUN2213	R1/R2	0.8	1.2	-
	MMUN2214		0.17	0.25	-
	MMUN2215/MMUN2216/MMUN2238		-	-	-
	MMUN2241		-	-	-
	MMUN2230/MMUN2231/MMUN2232		0.8	1.2	-
	MMUN2233		0.055	0.185	-
	MMUN2234		0.38	0.56	-
	MMUN2235		0.038	0.056	-



ELECTRICAL CHARACTERISTICS CURVES



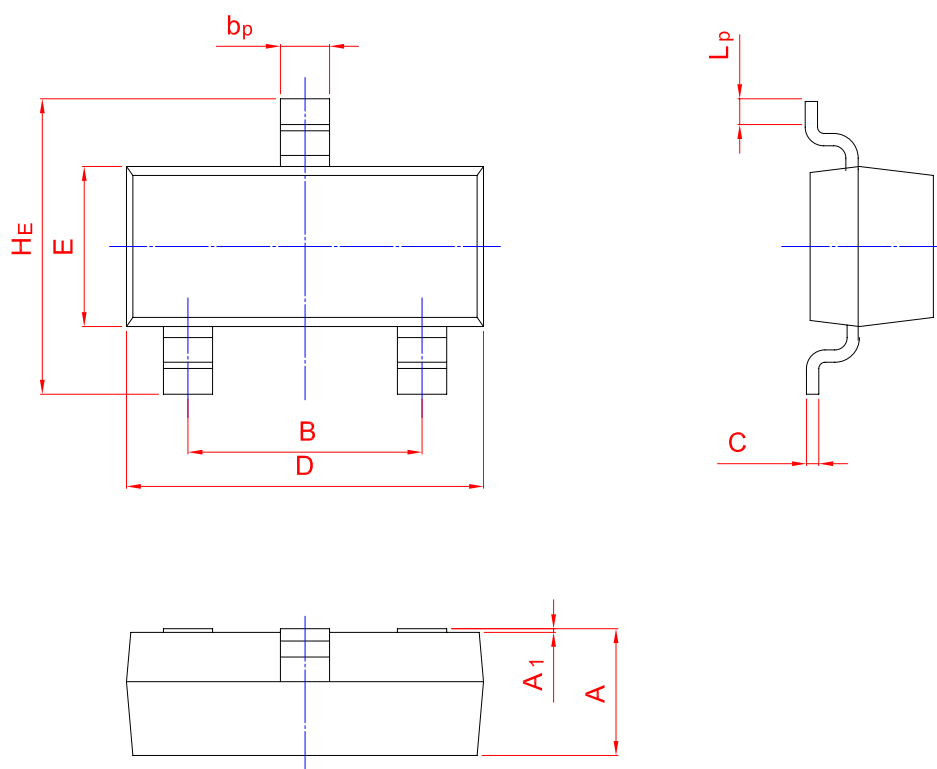
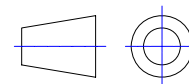




PACKAGE OUTLINE

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