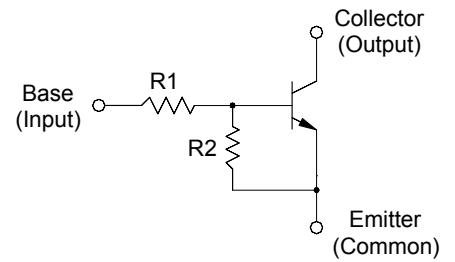




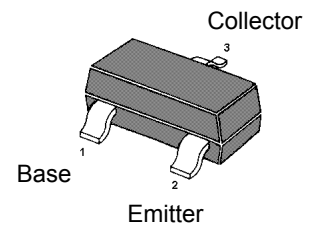
NPN Silicon Epitaxial Planar Transistor

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



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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	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	-	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	-	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	

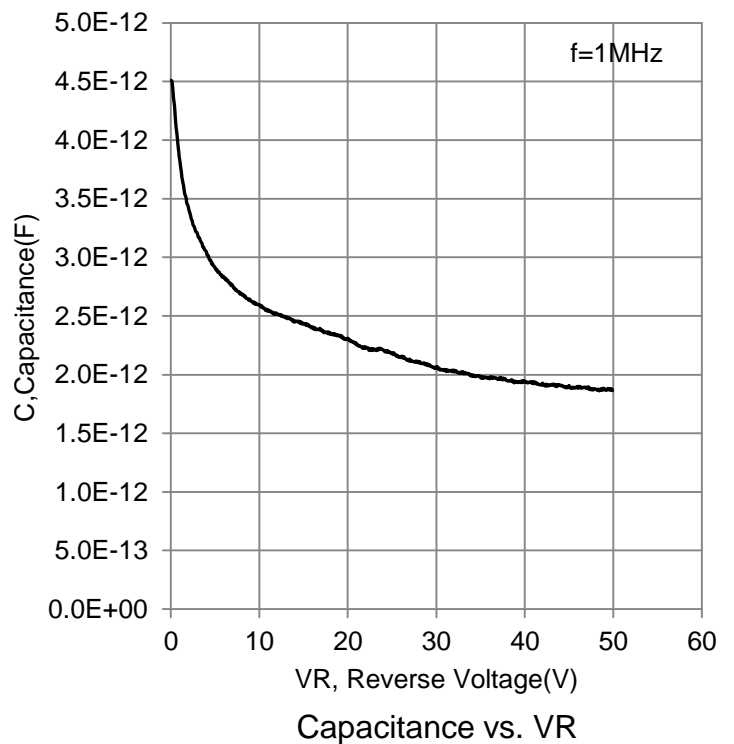
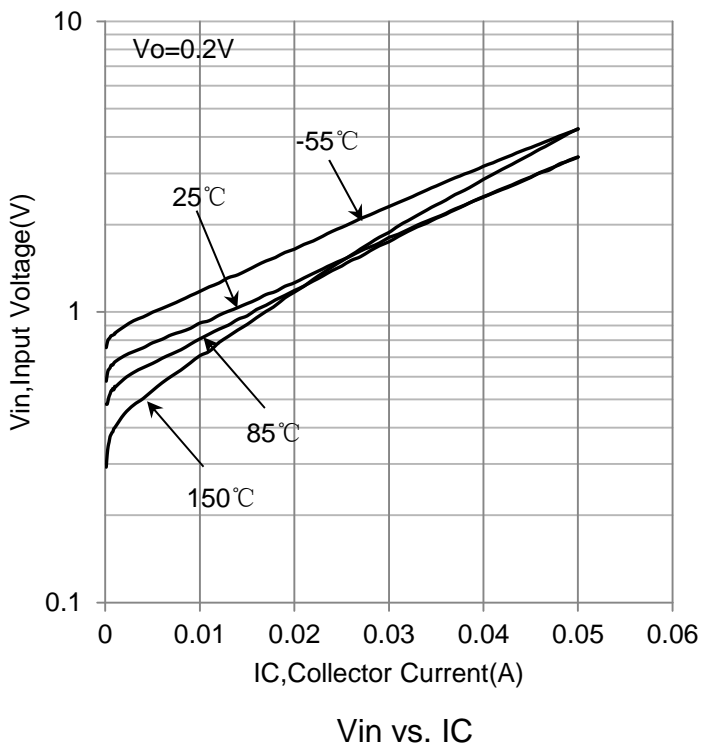
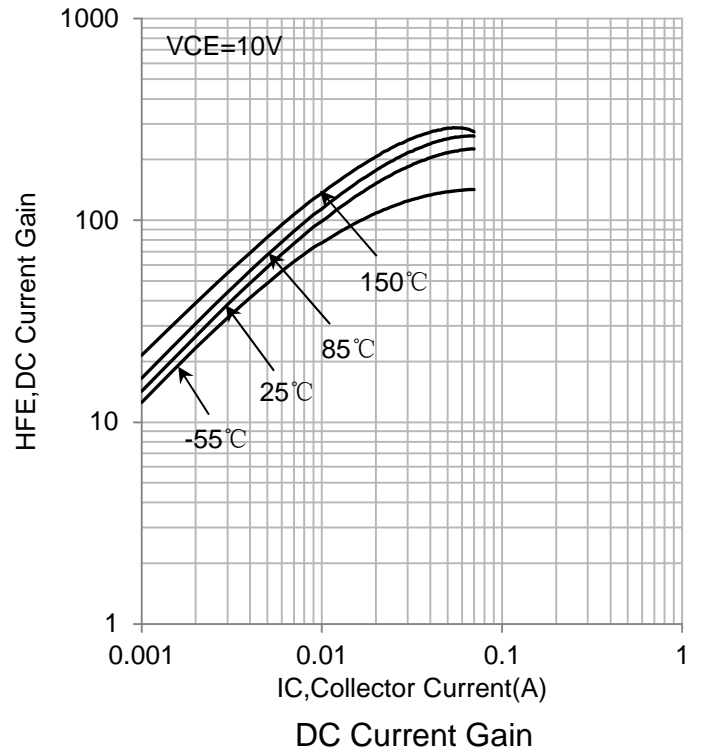
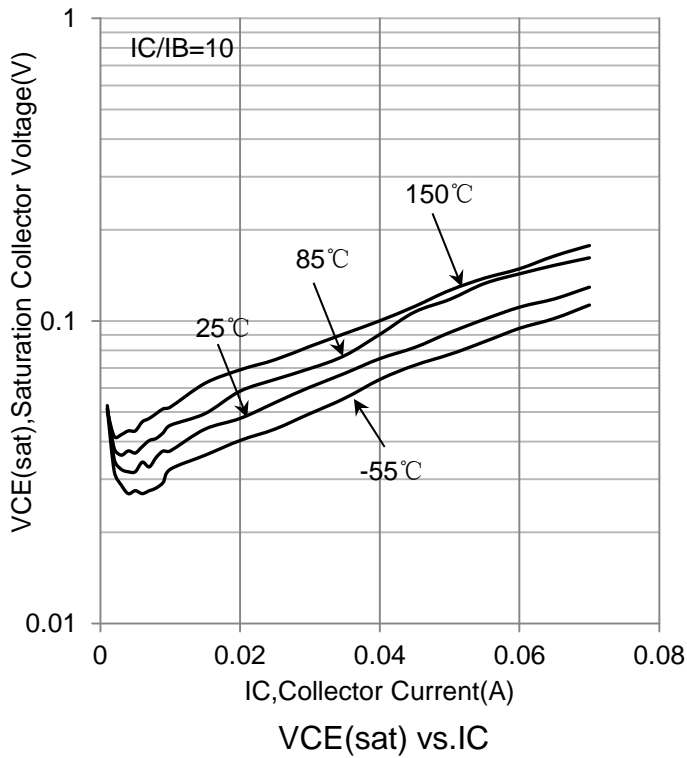


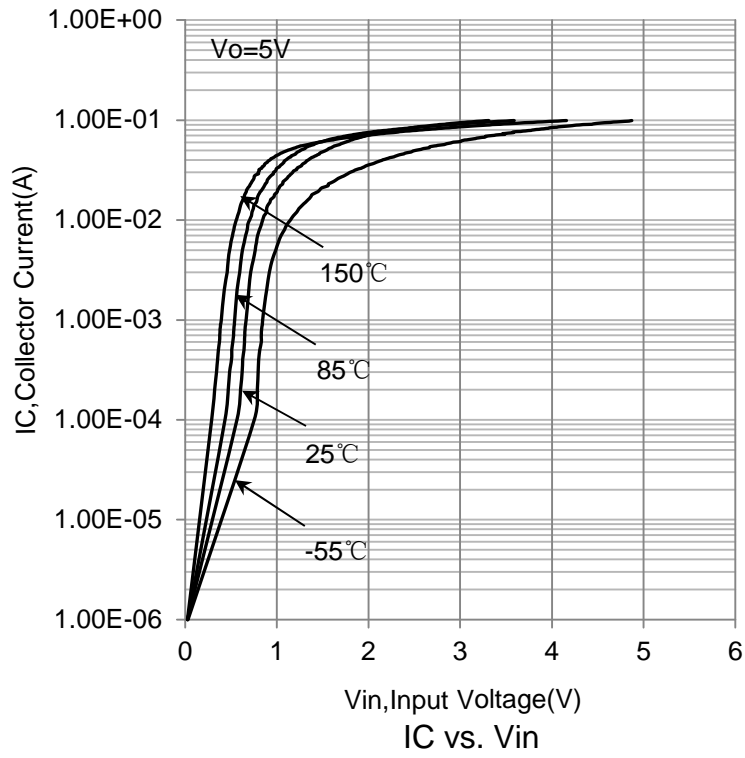
Characteristics at $T_a = 25\text{ }^\circ\text{C}$

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 $V_{CC} = 5\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1\text{ K}\Omega$		MMUN2213	-		0.2
at $V_{CC} = 5\text{ V}$, $V_B = 5\text{ V}$, $R_L = 1\text{ K}\Omega$		MMUN2241	-		0.2
Output Voltage (off) at $V_{CC} = 5\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1\text{ K}\Omega$		4.9	-		
at $V_{CC} = 5\text{ V}$, $V_B = 0.05\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2230	4.9	-	V	
at $V_{CC} = 5\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1\text{ K}\Omega$	MMUN2215	4.9	-		
	MMUN2216	4.9	-		
	MMUN2233	4.9	-		
	MMUN2238	4.9	-		
Input Resistor					
	MMUN2211	7	13	K Ω	
	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	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



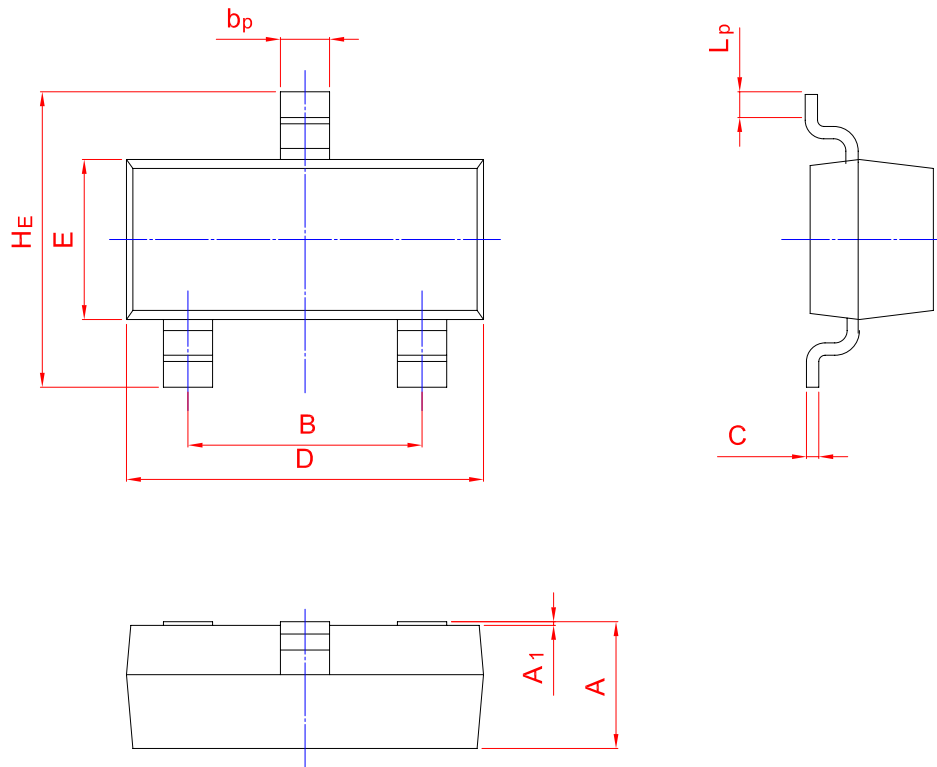
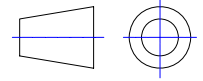




PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT-23



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