HIGH DIODE

MMUN2211 THRU MMUN 2241

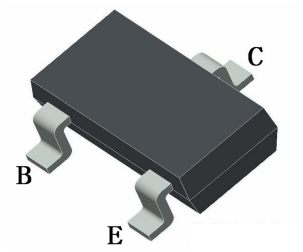
SOT-23 Plastic-Encapsulate Bias Resistor Transistor

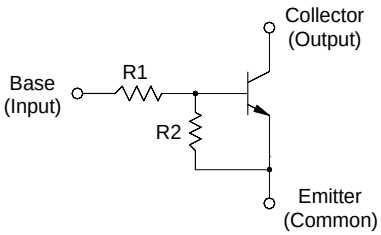
NPN Silicon

Markingand Resistor Values

Device	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	1.0	1.0
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	∞

SOT- 23





Maximum Ratings

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Rating	Symbol	Value	Unit
Collector-Emitter Voltage	VCEO	50	Vdc
Collector-Base Voltage	VCBO	50	Vdc
Collector Current-Continuous	Ic	100	mAdc

Thermal Characteristics

Characteristics	Symbol	Value	Unit
Total Device Dissipation FR-5 Board (1) T_A = 25℃ Derate above 25℃	PD	 246 1.6	 mW mW / ℃
Thermal Resistance, Junction to Ambient (1)	$R_{\theta JA}$	625	℃/W
Junction and Storage, Temperature	TJ,Tstg	-65 to +150	℃

1. FR-4 @ minimun pad

Electrical Characteristics (T_A=25℃ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Base Cutoff Current (V_{CB}= 50 V, I_E = 0)		I_{CBO}	-	-	100	nAdc
Collector-Emitter Cutoff Current (V_{CE}= 50 V, I_B = 0)		I_{CEO}	-	-	500	nAdc
Emitter-Base Cutoff Current (V_{EB}= 6.0 V, I_C = 0)	MMUN2211	I_{EBO}	-	-	0.5	mAdc
	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		-	-	4.0	
	MMUN2241		-	-	0.1	
Collector-Base Breakdown Voltage (I_C = 10 mA, I_E = 0)		$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 2.) (I_C = 2.0 mA, I_B = 0)		$V_{(BR)CEO}$	50	-	-	Vdc
ON CHARACTERISTICS (Note 2.)						
DC Current Gain (V_{CE}= 10 V, I_C = 5.0 mA)	MMUN2211	h_{FE}	35	60	-	
	MMUN2212		60	100	-	
	MMUN2213		80	140	-	
	MMUN2214		80	140	-	
	MMUN2215		160	350	-	
	MMUN2216		160	350	-	
	MMUN2230		3.0	5.0	-	
	MMUN2231		8.0	15	-	
	MMUN2232		15	30	-	
	MMUN2233		80	200	-	
	MMUN2234		80	150	-	
	MMUN2235		80	140	-	
	MMUN2238		160	350	-	
	MMUN2241		160	350	-	
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA) (I_C = 10 mA, I_B = 5 mA) MMUN2230/MMUN2231 (I_C = 10 mA, I_B = 1 mA) MMUN2215/MMUN2216/MMUN2232 MMUN2233/MMUN2234/MMUN2235/MMUN2238		$V_{CE(sat)}$	-	-	0.25	Vdc
Output Voltage (on) (V_{CC}= 5.0 V, V_B= 2.5 V, R_L= 1.0 kΩ)	MMUN2211	V_{OL}	-	-	0.2	Vdc
	MMUN2212		-	-	0.2	
	MMUN2213		-	-	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	
(V_{CC}= 5.0 V, V_B= 3.5 V, R_L= 1.0 kΩ)	MMUN2238		-	-	0.2	
(V_{CC}= 5.0 V, V_B= 5.0 V, R_L= 1.0 kΩ)	MMUN2241		-	-	0.2	

2. Pulse Test: Pulse Width < 300 ms, Duty Cycle < 2.0 %.

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Electrical Characteristics (T_A=25℃ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 2) (Continued)					
Output Voltage (off) (V_{CC}= 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ) (V_{CC}= 5.0 V, V_B = 0.050 V, R_L = 1.0 kΩ) MMUN2230 (V_{CC}= 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ) MMUN2215 MMUN2216 MMUN2233 MMUN2238	V_{OH}	4.9	-	-	Vdc
Input Resistor	R_1				kΩ
MMUN2211		7.0	10	13	
MMUN2212		15.4	22	28.6	
MMUN2213		32.9	47	61.1	
MMUN2214		7.0	10	13	
MMUN2215		7.0	10	13	
MMUN2216		3.3	4.7	6.1	
MMUN2230		0.7	1.0	1.3	
MMUN2231		1.5	2.2	2.9	
MMUN2232		3.3	4.7	6.1	
MMUN2233		3.3	4.7	6.1	
MMUN2234		15.4	22	28.6	
MMUN2235		1.54	2.2	2.86	
MMUN2238		1.54	2.2	2.86	
MMUN2241		70	100	100	
Resistor Ratio	R_1/R_2				
MMUN2211/MMUN2212/MMUN2213		0.8	1.0	1.2	
MMUN2214		0.17	0.21	0.25	
MMUN2215/MMUN2216/MMUN2238		-	-	-	
MMUN2241		-	-	-	
MMUN2230/MMUN2231/MMUN2232		0.8	1.0	1.2	
MMUN2233		0.055	0.1	0.185	
MMUN2234		0.38	0.47	0.56	
MMUN2235		0.038	0.047	0.056	

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

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Typical Characteristics

MMUN2211

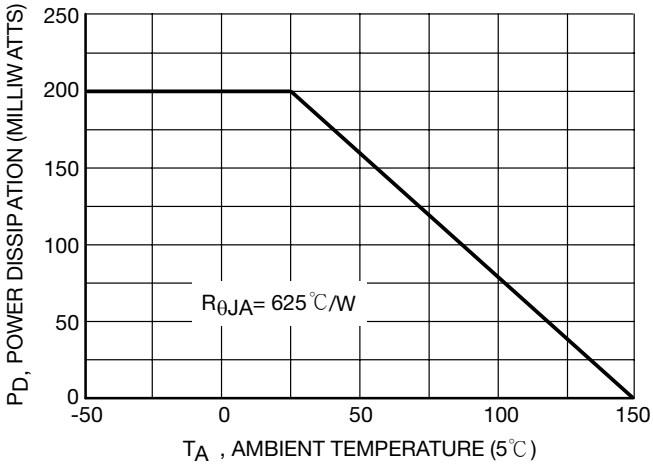


Figure 1. Derating Curve

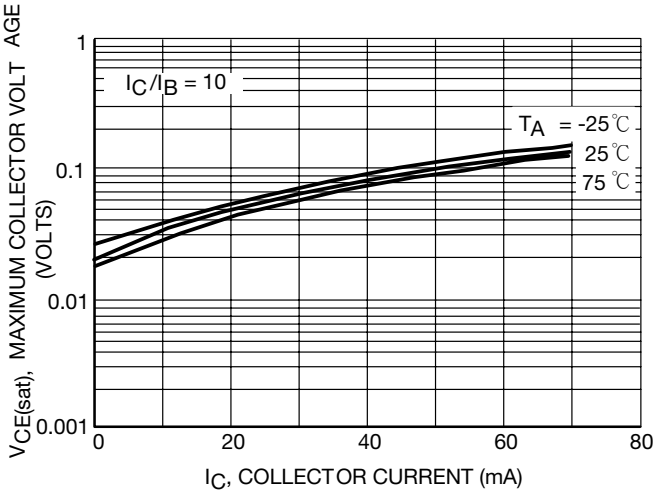


Figure 2. $V_{CE(sat)}$ vs. I_C

MMUN2212

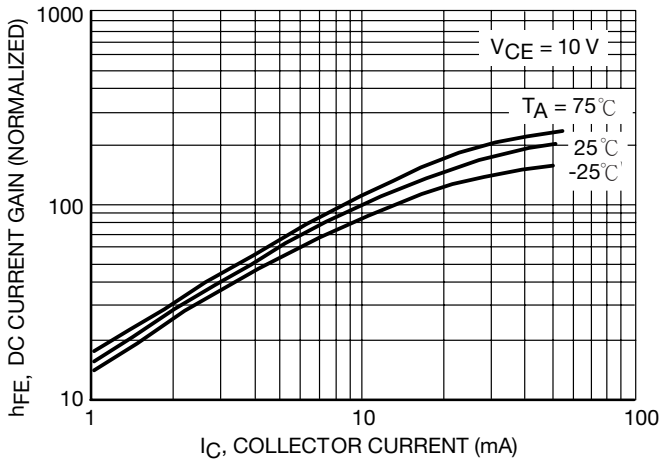
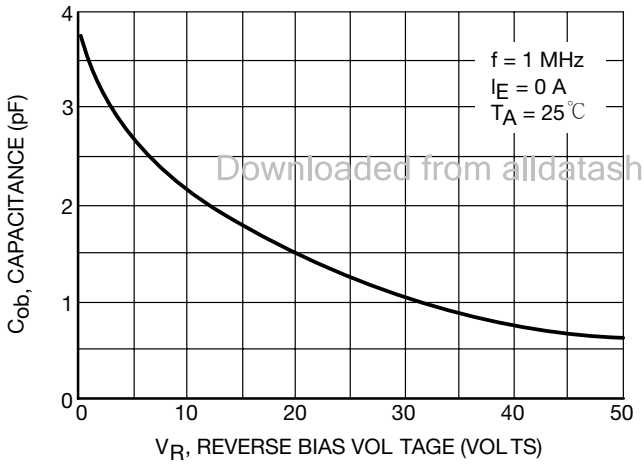


Figure 3. DC Current Gain



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Figure 4. Output Capcitance

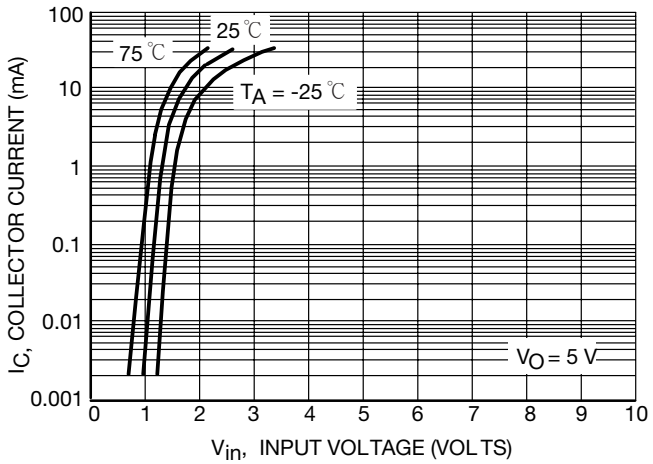


Figure 5. Output Current vs. Input Voltage

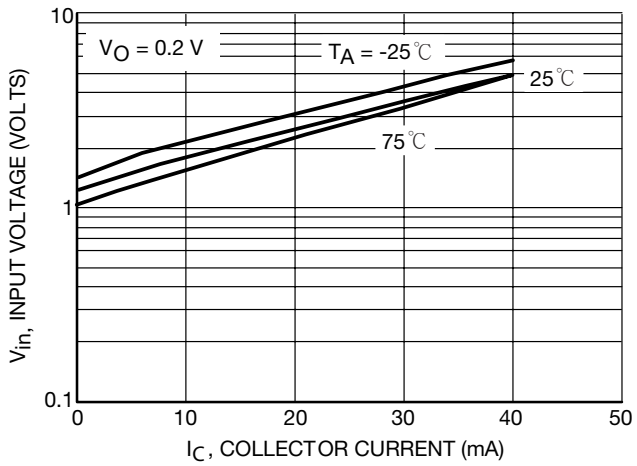


Figure 6. Input Voltage vs. Output Current

MMUN2211

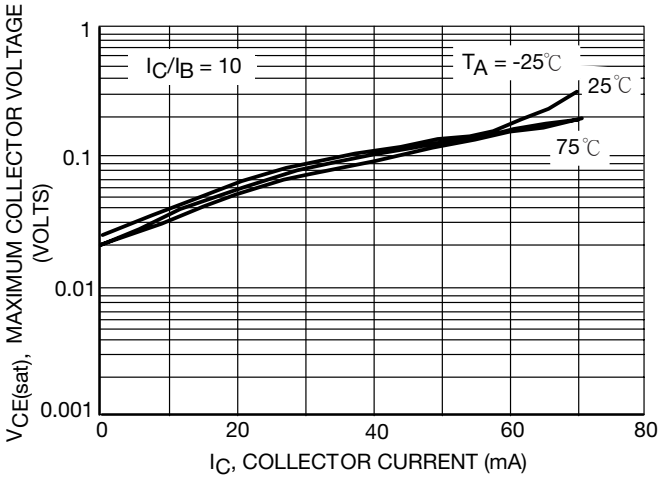


Figure 7. $V_{CE(sat)}$ vs. I_C

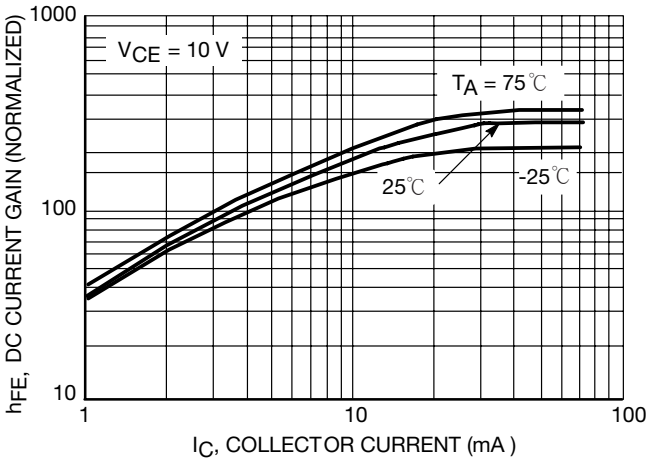


Figure 8. DC Current Gain

MMUN2212

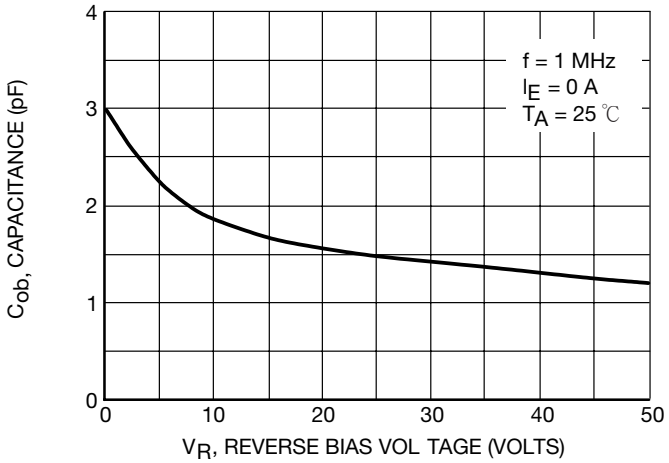
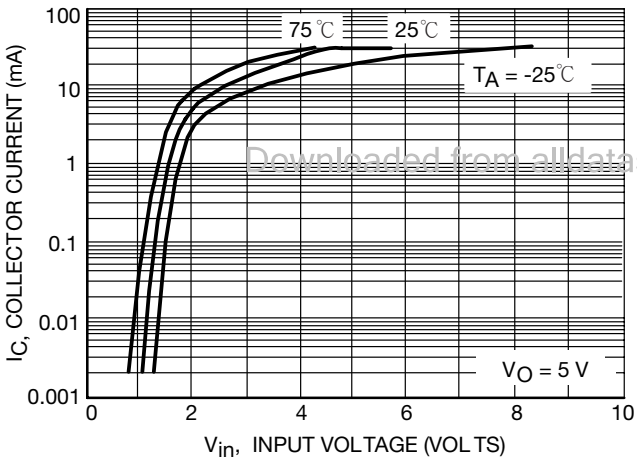


Figure 9. Output Capacitance



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Figure 10. Output Current vs. Input Voltage

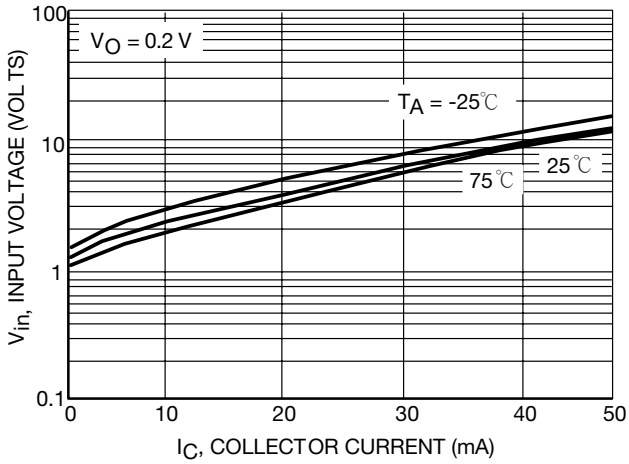


Figure 11. Input V oltage vs. Output Current

MMUN2213

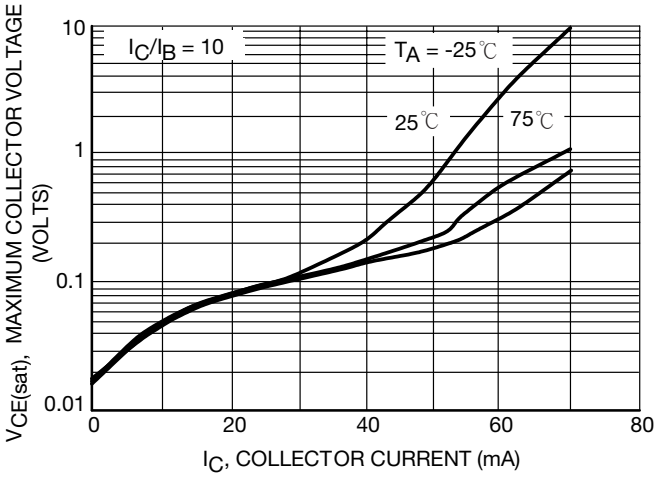


Figure 12. $V_{CE(sat)}$ vs. I_C

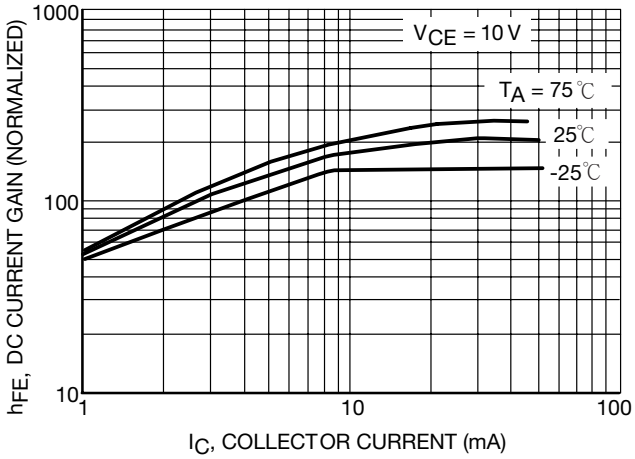


Figure 13. DC Current Gain

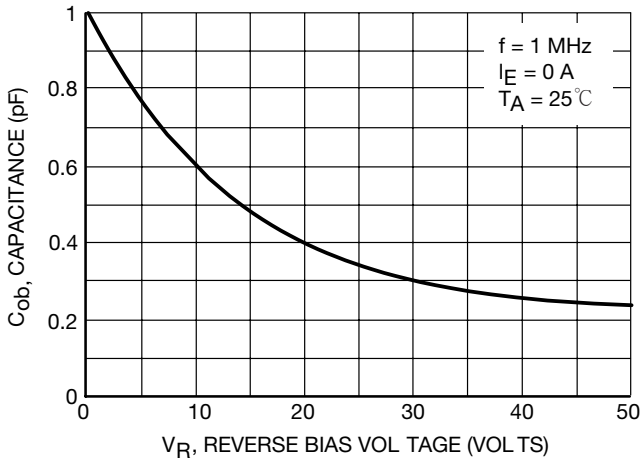
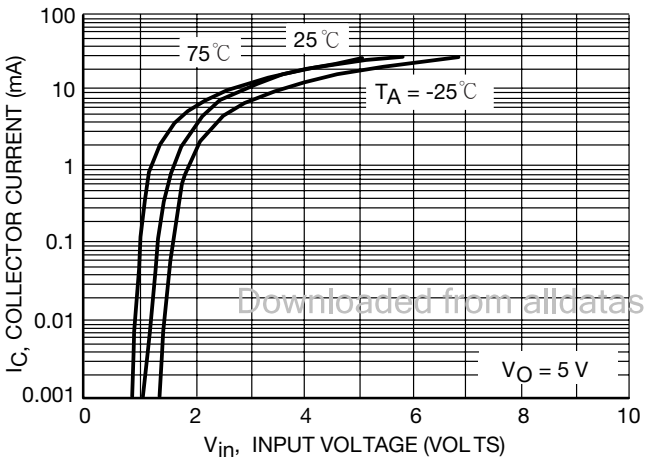


Figure 14. Output Capacitance



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Figure 15. Output Current vs. Input Voltage

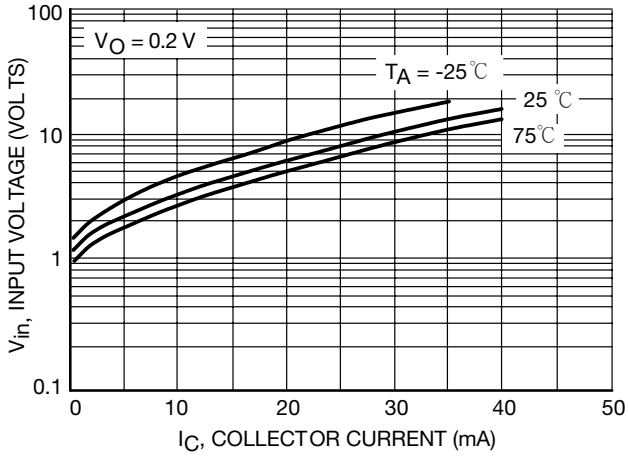


Figure 16. Input Voltage vs. Output Current

MMUN2214

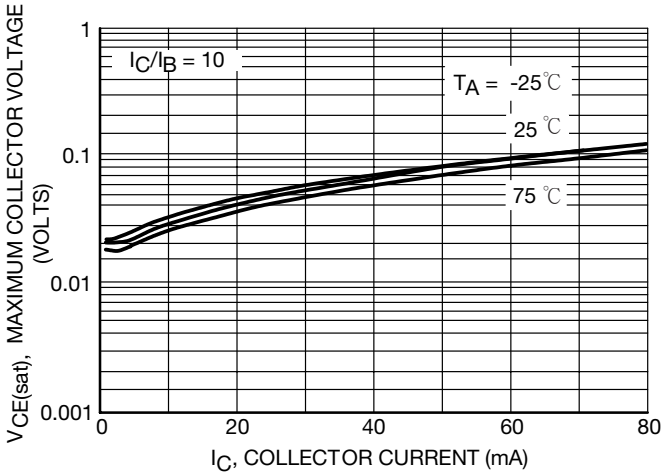


Figure 17. $V_{CE(sat)}$ vs. I_C

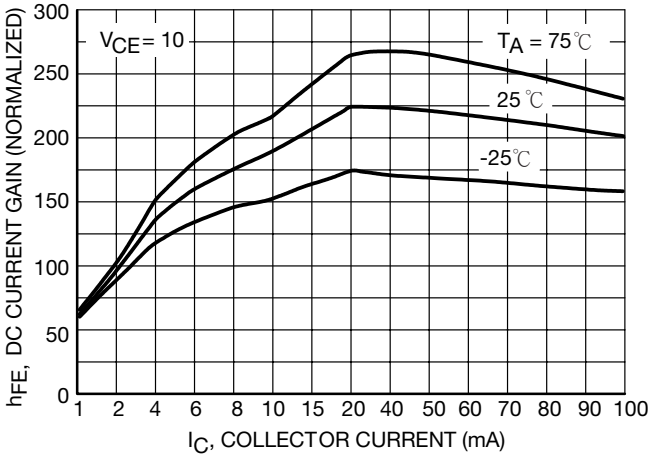


Figure 18. DC Current Gain

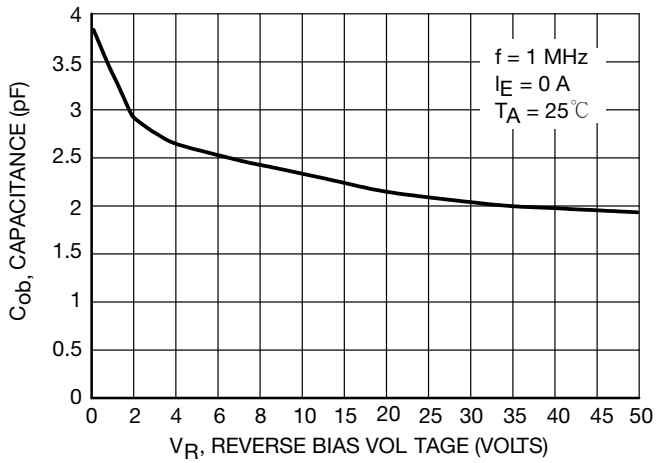
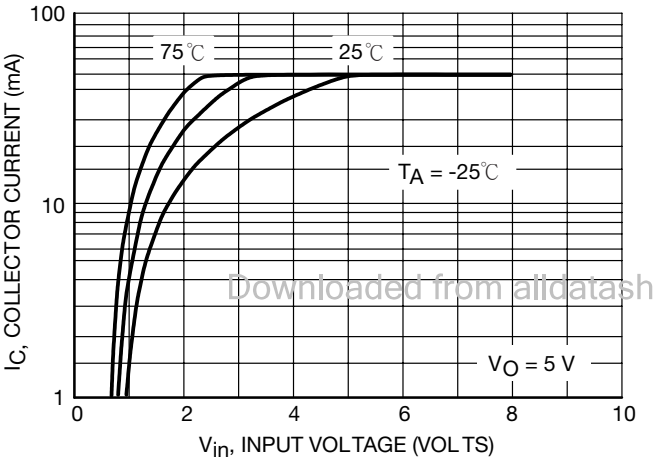


Figure 19. Output Capacitance



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Figure 20. Output Current vs. Input Voltage

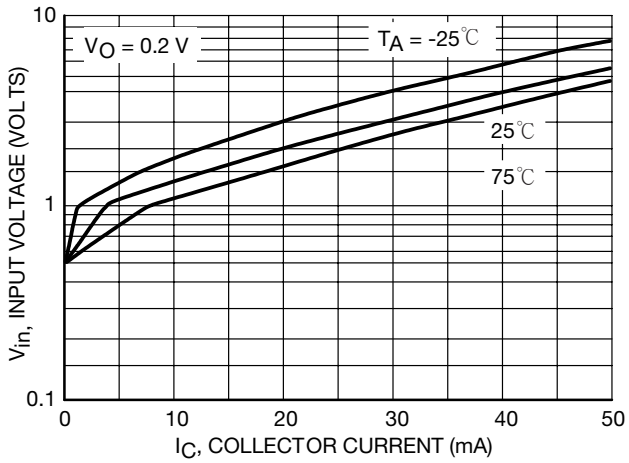


Figure 21. Input Voltage vs. Output Current

MMUN2232

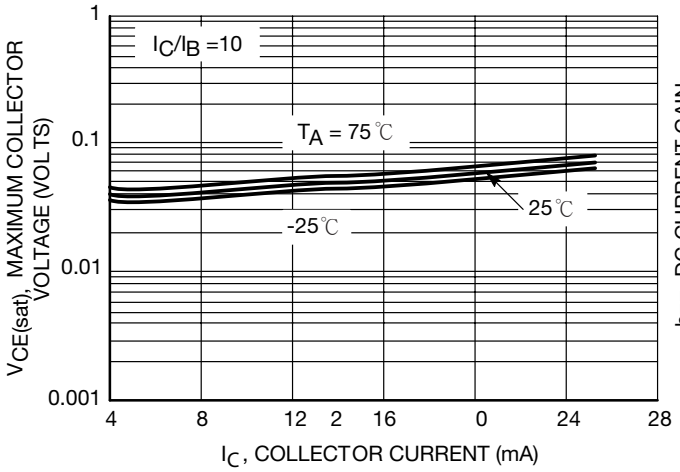


Figure 22. $V_{CE(sat)}$ vs. I_C

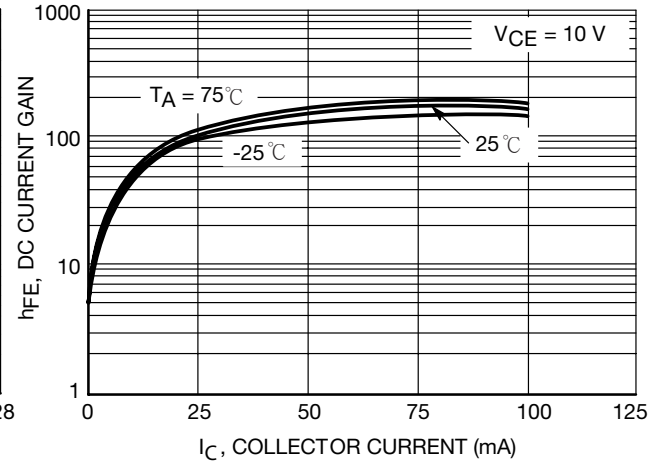


Figure 23. DC Current Gain

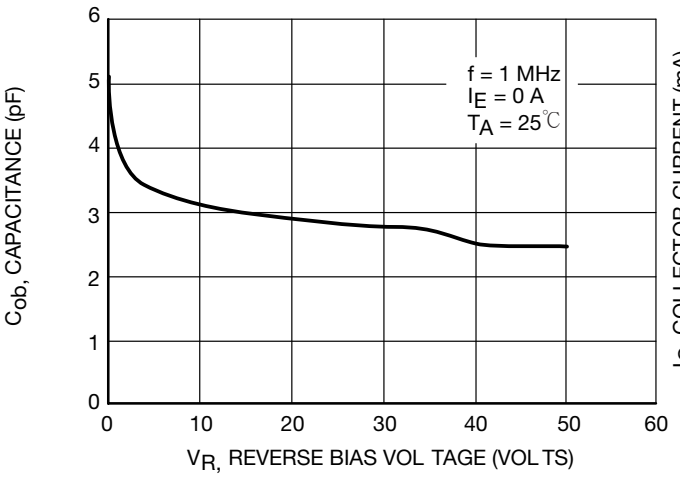
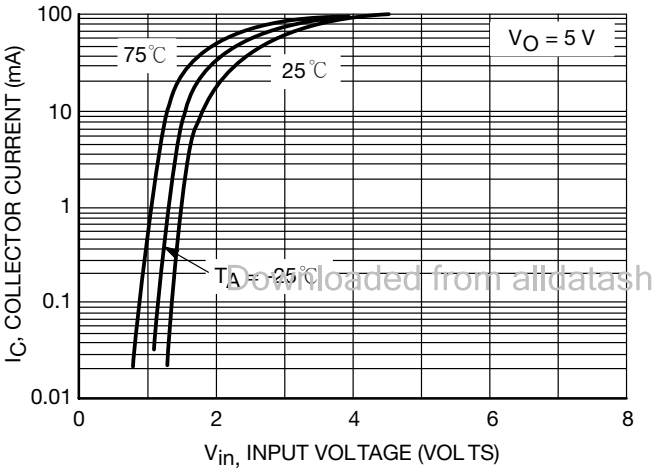


Figure 24. Output Capacitance



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Figure 25. Output Current vs. Input Voltage

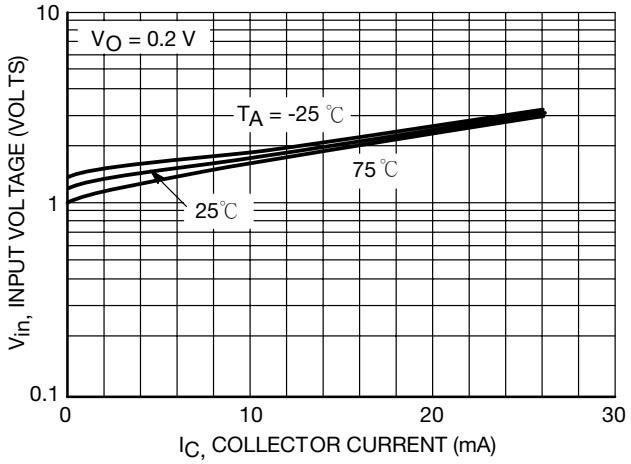


Figure 26. Output Voltage vs. Input Current

MMUN2233

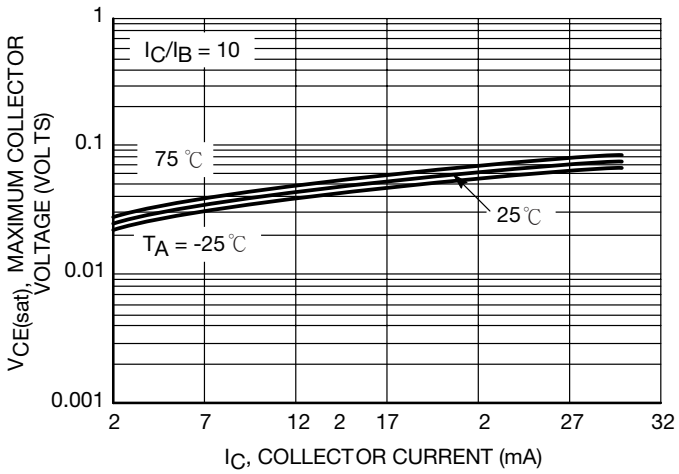


Figure 27. $V_{CE(sat)}$ vs. I_C

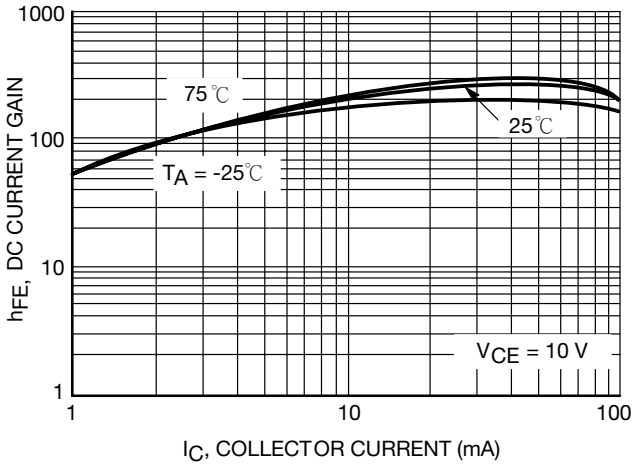
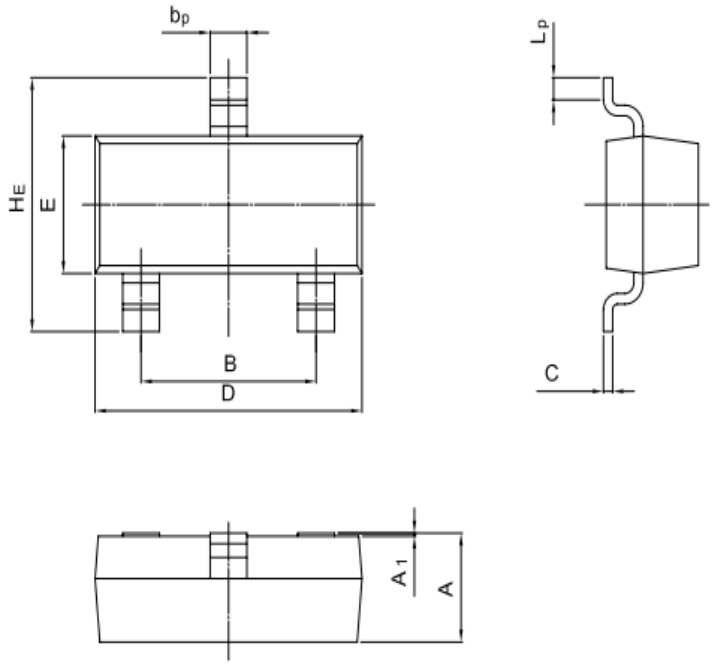


Figure 28. DC Current Gain

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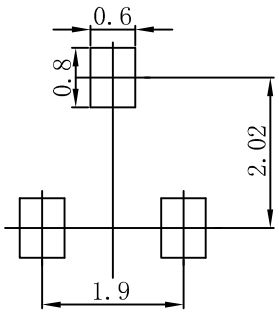
SOT-23 Package Outline Dimensions



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

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SOT-23 Suggested Pad Layout



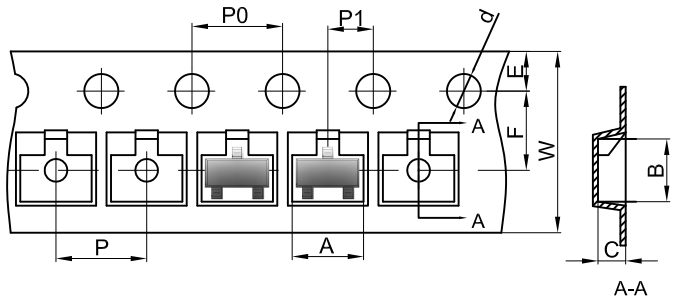
Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

NOTICE

JSHD reserve the right to make modifications,enhancements, improvements, corrections or other changes without further notice to any product herein .JSHD does not assume any liability arising out of the application or use of any product described herein.

Reel Taping Specifications For Surface Mount Devices–SOT–23

SOT-23 Embossed Carrier Tape

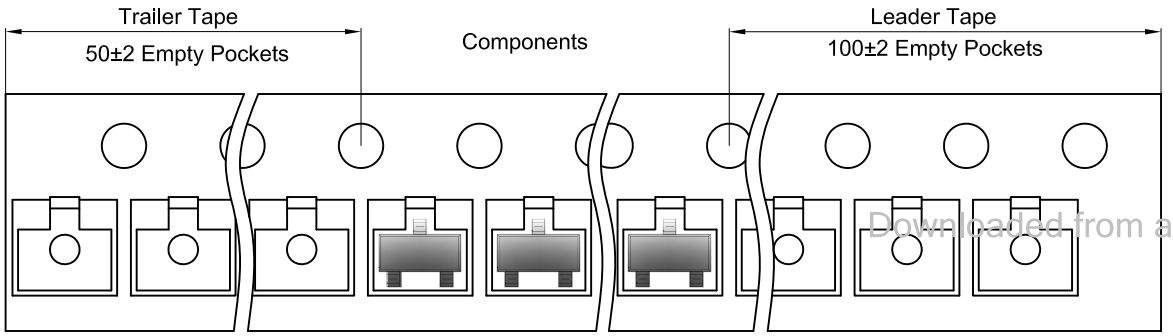


Packaging Description:

SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

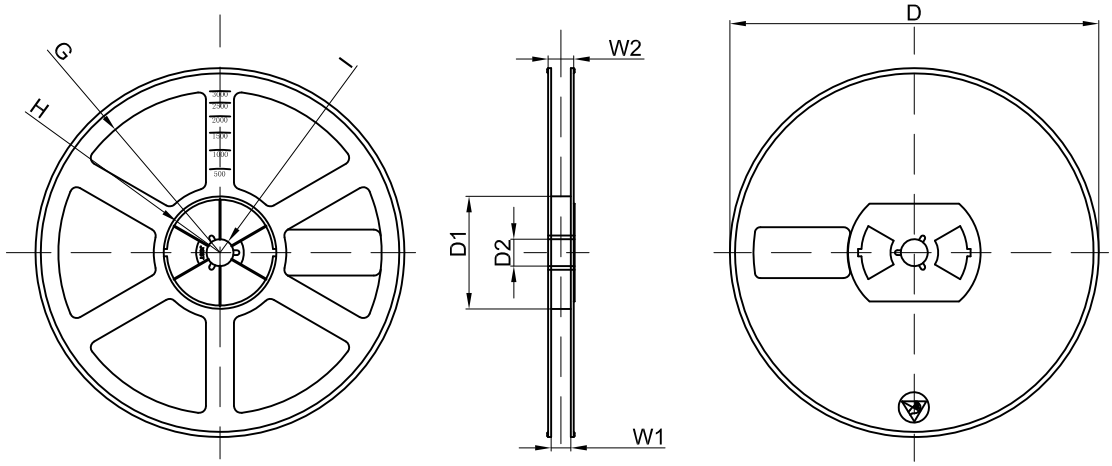
Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23 Tape Leader and Trailer



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SOT-23 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	45,000 pcs	203×203×195	180,000 pcs	438×438×230	