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by 2N5301/D

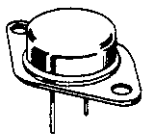
2N5301
2N5302
2N5303

High-Power NPN Silicon Transistors

. . . for use in power amplifier and switching circuits applications.

- High Collector–Emitter Sustaining Voltage —
  $V_{CEO(sus)}$ = 80 Vdc (Min) @ I_C = 200 mAdc (2N5303)
- Low Collector–Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.75 Vdc (Max) @ I_C = 10 Adc (2N5301, 2N5302)
  1.0 Vdc (Max) @ I_C = 10 Adc (2N5303)
- Excellent Safe Operating Area —
  200-Watt dc Power Rating to 30 Vdc (2N5303)
- Complements to PNP 2N4398, 2N4399 and 2N5745

20 AND 30 AMPERE
POWER TRANSISTORS
NPN SILICON
40–60–80 VOLTS
200 WATTS



CASE 1–07
TO–204AA
(TO–3)

***MAXIMUM RATINGS**

Rating	Symbol	2N5301	2N5302	2N5303	Unit
Collector–Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector–Base Voltage	V_{CB}	40	60	80	Vdc
Collector Current — Continuous	I_C	30	30	20	Adc
Base Current	I_B	7.5			Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	200 1.14			Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	0.875	°C/W
Thermal Resistance, Case to Ambient	θ_{CA}	34	°C/W

* Indicates JEDEC Registered Data.

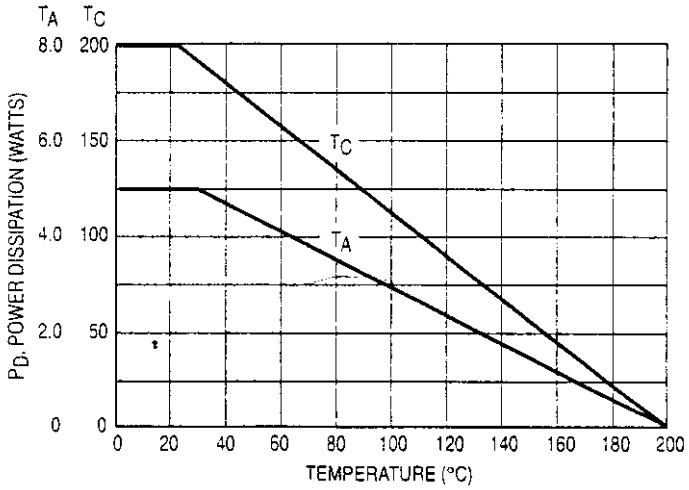


Figure 1. Power Temperature Derating Curve

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
***OFF CHARACTERISTICS**					
Collector–Emitter Sustaining Voltage (Note 1) (I_C = 200 mAdc, I_B = 0)	2N5301	$V_{CEO(sus)}$	40	—	Vdc
	2N5302		60	—	
	2N5303		80	—	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 40 Vdc, I_B = 0)	2N5301		—	5.0	
(V_{CE} = 60 Vdc, I_B = 0)	2N5302		—	5.0	
(V_{CE} = 80 Vdc, I_B = 0)	2N5303		—	5.0	
Collector Cutoff Current		I_{CEX}			mAdc
(V_{CE} = 40 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5301		—	1.0	
(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5302		—	1.0	
(V_{CE} = 80 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5303		—	1.0	
Collector Cutoff Current		I_{CEX}			mAdc
(V_{CE} = 40 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N5301		—	10	
(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N5302		—	10	
(V_{CE} = 80 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N5303		—	10	
Collector Cutoff Current		I_{CBO}			mAdc
(V_{CB} = 40 Vdc, I_E = 0)	2N5301		—	1.0	
(V_{CB} = 80 Vdc, I_E = 0)	2N5302		—	1.0	
(V_{CB} = 80 Vdc, I_E = 0)	2N5303		—	1.0	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	5.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (Note 1)		h_{FE}			—
*(I_C = 1.0 Adc, V_{CE} = 2.0 Vdc)	ALL TYPES		40	—	
*(I_C = 10 Adc, V_{CE} = 2.0 Vdc)	2N5303		15	60	
*(I_C = 15 Adc, V_{CE} = 2.0 Vdc)	2N5301, 2N5302		15	60	
(I_C = 20 Adc, V_{CE} = 4.0 Vdc)	2N5303		5.0	—	
(I_C = 30 Adc, V_{CE} = 4.0 Vdc)	2N5301, 2N5302		5.0	—	
*Collector–Emitter Saturation Voltage (Note 1)		$V_{CE(sat)}$			Vdc
(I_C = 10 Adc, I_B = 1.0 Adc)	2N5301, 2N5302		—	0.75	
(I_C = 10 Adc, I_B = 1.0 Adc)	2N5303		—	1.0	
(I_C = 15 Adc, I_B = 1.5 Adc)	2N5303		—	1.5	
(I_C = 20 Adc, I_B = 2.0 Adc)	2N5301, 2N5302		—	2.0	
(I_C = 20 Adc, I_B = 4.0 Adc)	2N5303		—	2.0	
(I_C = 30 Adc, I_B = 6.0 Adc)	2N5301, 2N5302		—	3.0	
*Base Emitter Saturation Voltage (Note 1)		$V_{BE(sat)}$			Vdc
(I_C = 10 Adc, I_B = 1.0 Adc)	ALL TYPES		—	1.7	
(I_C = 15 Adc, I_B = 1.5 Adc)	2N5301, 2N5302		—	1.8	
(I_C = 15 Adc, I_B = 1.5 Adc)	2N5303		—	2.0	
(I_C = 20 Adc, I_B = 2.0 Adc)	2N5301, 2N5302		—	2.5	
(I_C = 20 Adc, I_B = 4.0 Adc)	2N5303		—	2.5	
*Base–Emitter On Voltage (Note 1)		$V_{BE(on)}$			Vdc
(I_C = 10 Adc, V_{CE} = 2.0 Vdc)	2N5303		—	1.5	
(I_C = 15 Adc, V_{CE} = 2.0 Vdc)	2N5301, 2N5302		—	1.7	
(I_C = 20 Adc, V_{CE} = 4.0 Vdc)	2N5303		—	25	
(I_C = 30 Adc, V_{CE} = 4.0 Vdc)	2N5301, 2N5302		—	3.0	
***DYNAMIC CHARACTERISTICS**					
Current–Gain — Bandwidth Product (I_C = 1.0 Adc, V_{CE} = 10 Vdc, f = 1.0 MHz)		f_T	2.0	—	MHz
Small–Signal Current Gain (I_C = 1.0 Adc, V_{CE} = 10 Vdc, f = 1.0 kHz)		h_{fe}	40	—	—
***SWITCHING CHARACTERISTICS**					
Rise Time	(V_{CC} = 30 Vdc, I_C = 10 Adc, I_{B1} = I_{B2} = 1.0 Adc)	t_r	—	1.0	µs
Storage Time		t_s	—	2.0	µs
Fall Time		t_f	—	1.0	µs

* Indicates JEDEC Registered Data.

Note 1: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

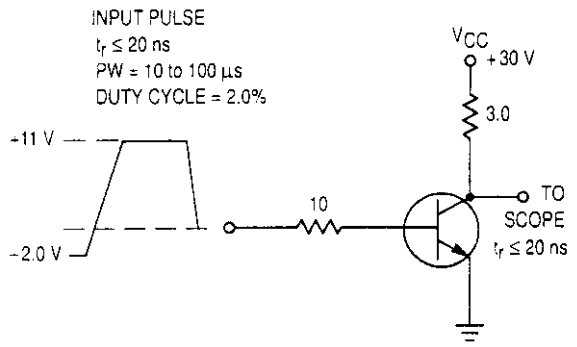


Figure 2. Turn–On time

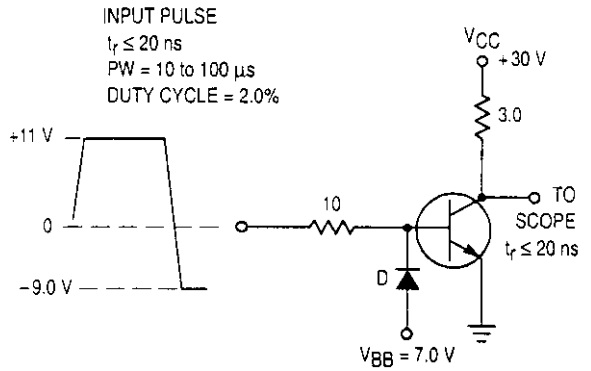


Figure 3. Turn–Off time

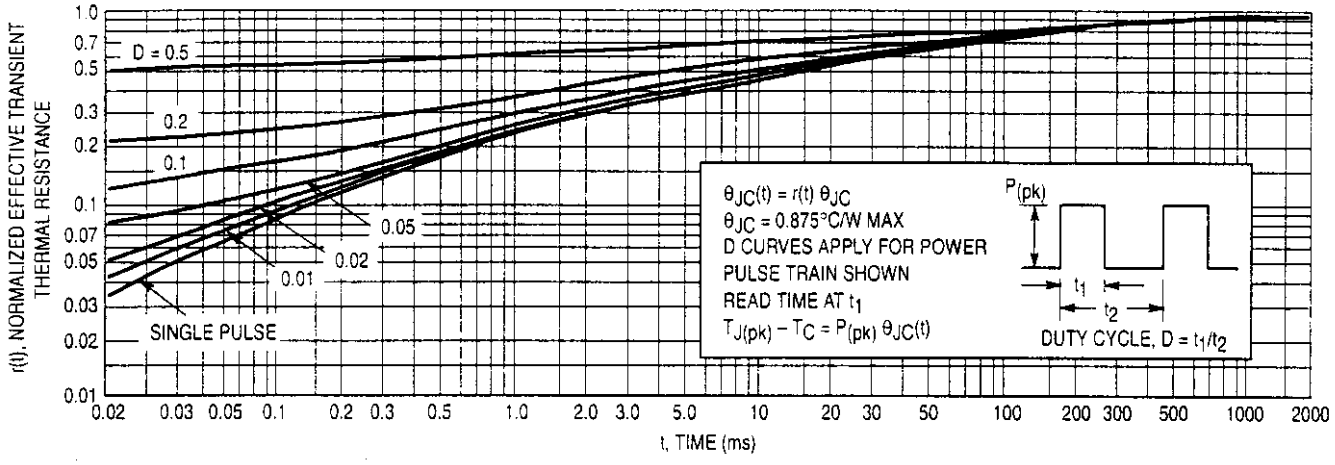


Figure 4. Thermal Response

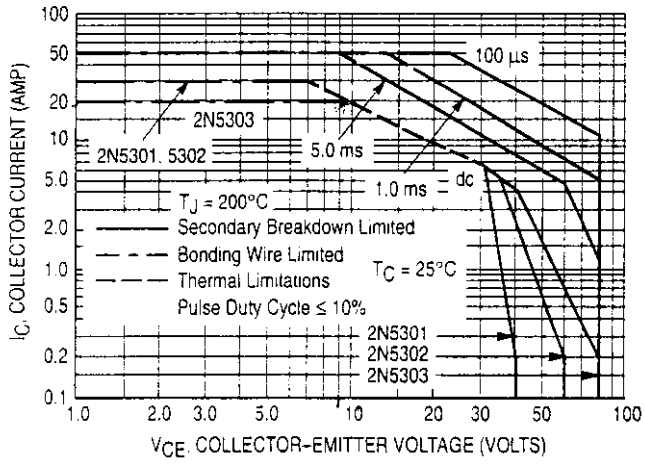


Figure 5. Active–Region Safe Operating Area

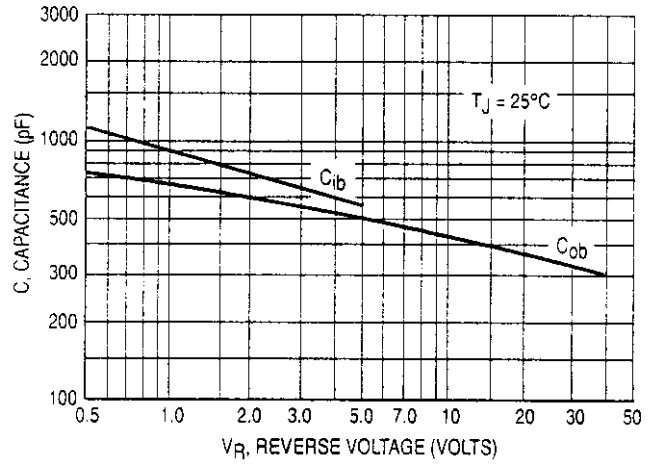


Figure 6. Capacitance versus Voltage

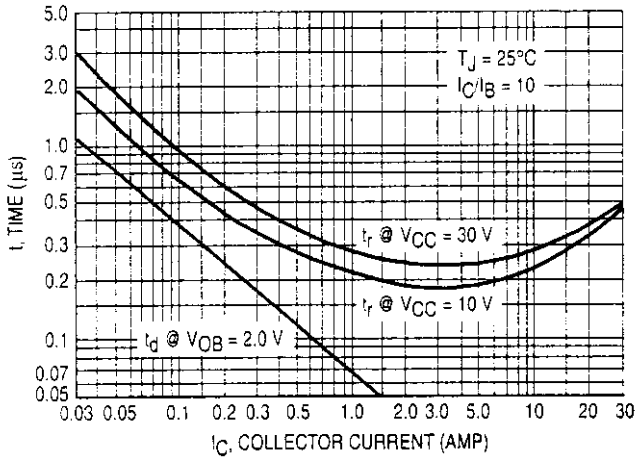


Figure 7. Turn–On Time

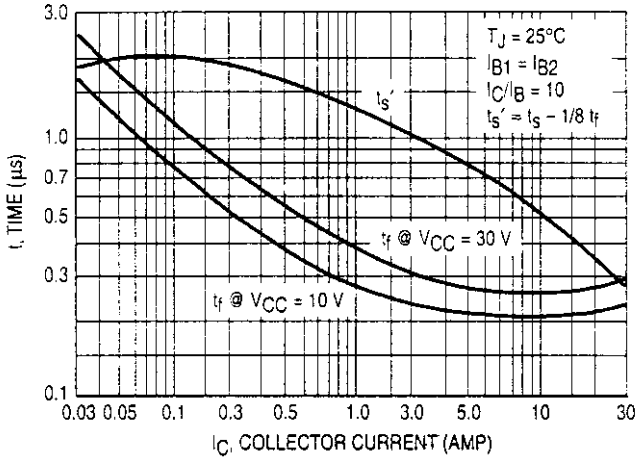


Figure 8. Turn–Off Time

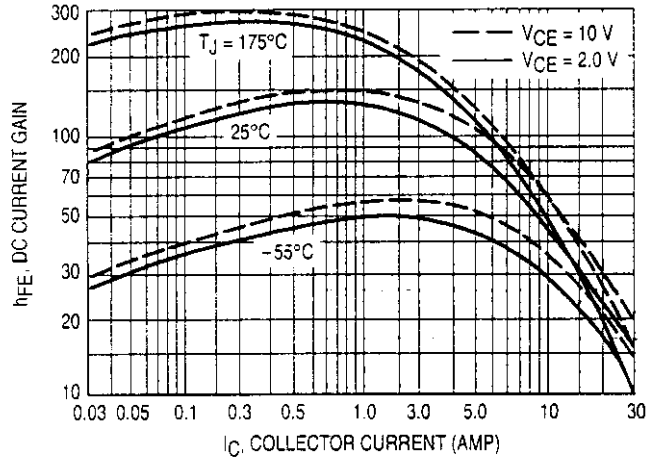


Figure 9. DC Current Gain

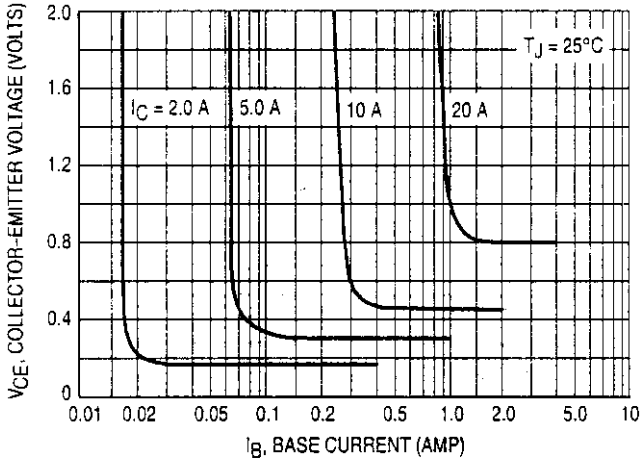


Figure 10. Collector Saturation Region

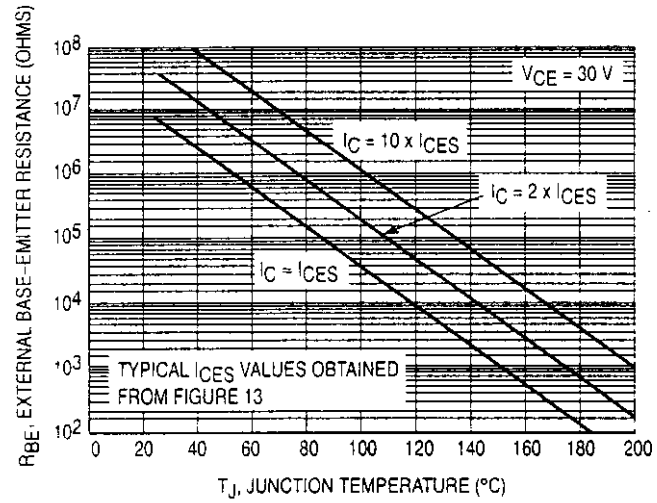


Figure 11. Effects of Base–Emitter Resistance

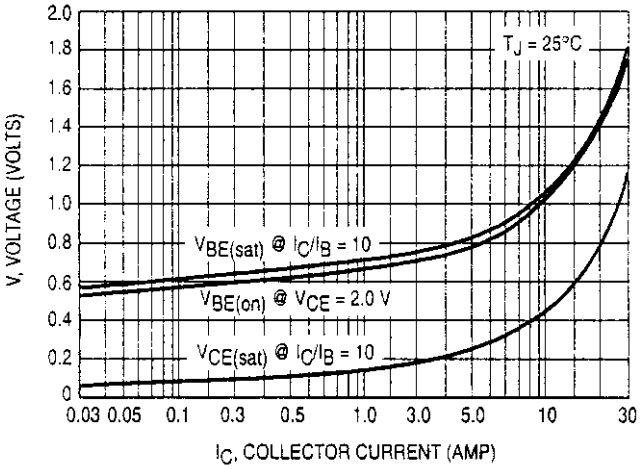
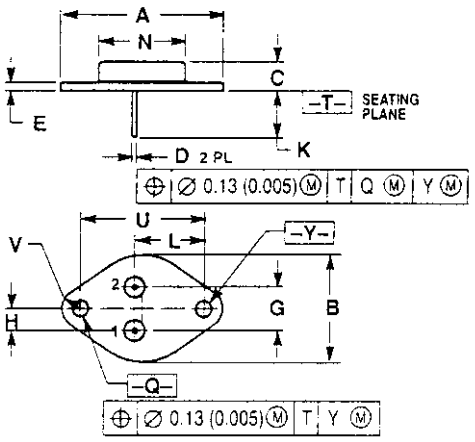


Figure 12. "On" Voltages

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF		39.37 REF	
B	—	1.050	—	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	—	0.830	—	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

CASE 1–07
TO–204AA (TO–3)
ISSUE Z

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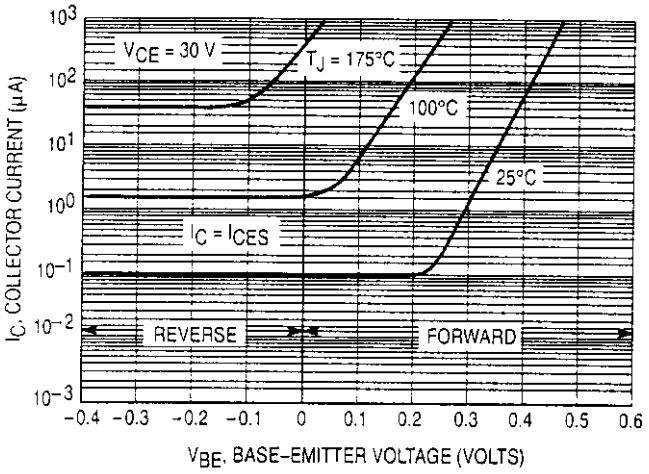


Figure 13. Collector Cut–Off Region

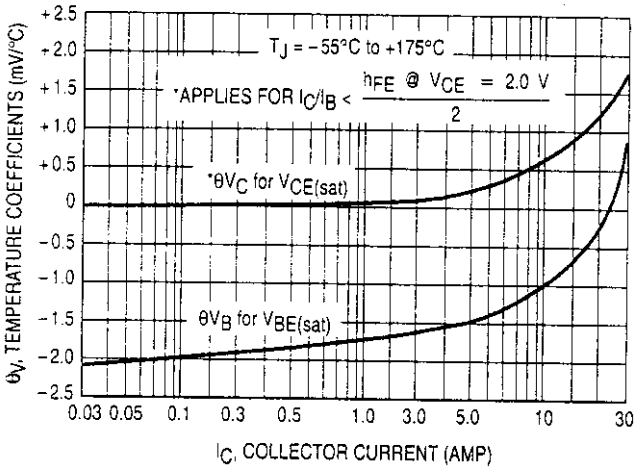


Figure 14. Temperature Coefficients

2SB544

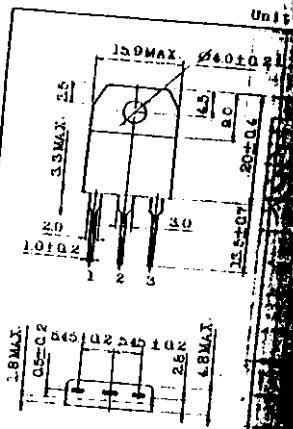
シリコンPNP三重拡散形トランジスタ(PCT プロセス)
SILICON PNP TRIPLE DIFFUSED TRANSISTOR (PCT PROCESS)

・大電流スイッチング用
・パワーアンプ用
・High Current Switching Applications.
・Power Amplifier Applications.

・許容コレクタ電流が大きい。: $I_C = -7$ A
・コレクタ飽和電圧が低い。: $V_{CE(sat)} = -0.4$ V (Max.) (at $I_C = -4$ A)
・許容コレクタ損失が大きい。: $P_C = 60$ W (at $T_C = 25$°C)
・2SD544とコンプリメンタリになります。
・Complementary to 2SD544.

最大定格 MAXIMUM RATINGS (Ta = 25°C)

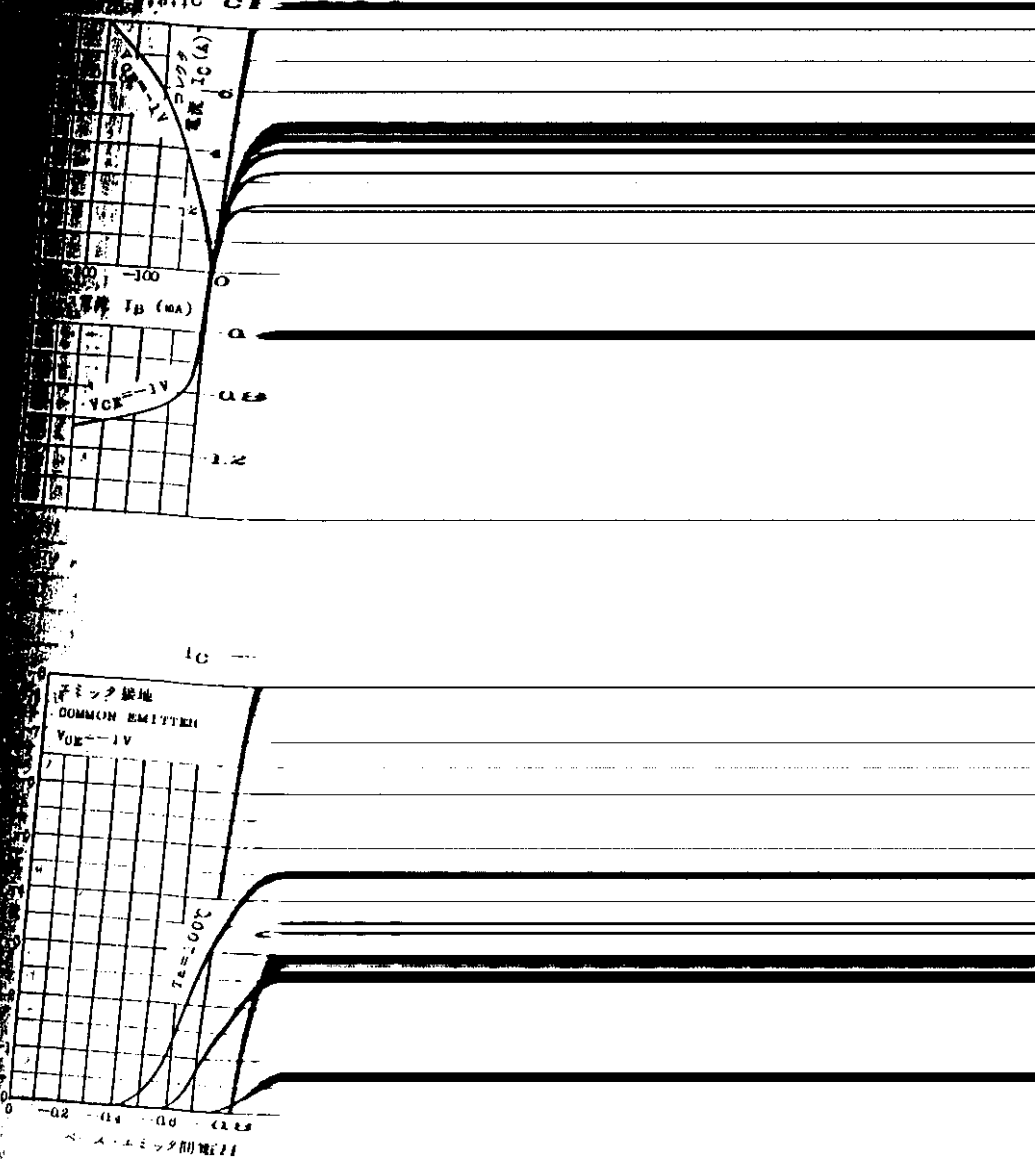
CHARACTERISTIC		SYMBOL	RATING	UNIT
コレクタ・ベース間電圧		V_{CBO}	−50	V
コレクタ・エミッタ間電圧		V_{CEO}	−50	V
エミッタ・ベース間電圧		V_{EBO}	−5	V
コレクタ電流		I_C	−7	A
エミッタ電流		I_E	7	A
コレクタ損失	Ta = 25°C	P_C	2.5	W
	Tc = 25°C		60	
接合温度		T_j	150	°C
保存温度		T_{stg}	−55 ~ 150	°C



電気的特性 ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
コレクタ遮断電流	I_{CBO}	$V_{CB} = -50$ V, $I_E = 0$	—	—	−10	μA
エミッタ遮断電流	I_{EBO}	$V_{EB} = -5$ V, $I_C = 0$	—	—	−10	μA
コレクタ・エミッタ間降伏電圧	$V_{(BR)CEO}$	$I_C = -50$ mA, $I_B = 0$	−50	—	—	V
エミッタ・ベース間降伏電圧	$V_{(BR)EBO}$	$I_E = -10$ mA, $I_C = 0$	−5	—	—	V
直流電流増幅率	$h_{FE(1)}$ (Note 2)	$V_{CE} = -1$ V, $I_C = -1$ A (Note 1)	70	—	240	
	$h_{FE(2)}$	$V_{CE} = -1$ V, $I_C = -4$ A (Note 1)	30	—	—	
コレクタ・エミッタ飽和電圧	$V_{CE(sat)}$	$I_C = -4$ A, $I_B = -0.4$ A (Note 1)	—	−0.2	−0.4	V
ベース・エミッタ間電圧	V_{BE}	$V_{CE} = -1$ V, $I_C = -4$ A (Note 1)	—	−0.9	−1.2	V
トランジション周波数	f_T	$V_{CE} = -5$ V, $I_C = -1$ A	—	10	—	MHz
コレクタ出力容量	C_{ob}	$V_{CB} = -10$ V, $I_E = 0$, $f = 1$ MHz	—	300	—	pF

Note 1 : Pulse Test: Pulse Width ≦ 300 μs, Duty Cycle ≦ 2%
Note 2 : $h_{FE(1)}$ 区分 — $h_{FE(1)}$ classification O : 70 ~ 140, Y : 120 ~ 240



2SB754

シリコンPNP三重拡散形トランジスタ(PCT方
SILICON PNP TRIPLE DIFFUSED TRANSISTOR
(PCT PROCESS)

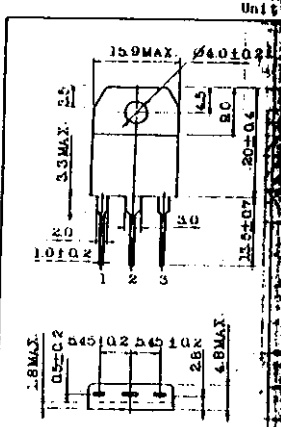
チング用

High Current Switching Applications.

Power Amplifier Applications.

- 許容コレクタ電流が大きい。：$I_C = -7$ A
- コレクタ飽和電圧が低い。：$V_{CE(sat)} = -0.4$ V (Max.)
  (at $I_C = -4$ A)
- 許容コレクタ損失が大きい。：$P_C = 60$ W (at $T_C = 25$℃)
- 2SD844とコンプリメンタリになります。
- Complementary to 2SD844.

Unit in mm



1. BASE
2. COLLECTOR (HEAT SINK)
3. EMITTER

JEDEC	—
EIAJ	—
TOSHIBA	2-16A1A

最大定格 MAXIMUM RATINGS (Ta = 25℃)

CHARACTERISTIC		SYMBOL	RATING	UNIT
コレクタ・ベース間電圧		V_{CBO}	−50	V
コレクタ・エミッタ間電圧		V_{CEO}	50	V
エミッタ・ベース間電圧		V_{EBO}	−5	V
コレクタ電流		I_C	−7	A
エミッタ電流		I_E	7	A
コレクタ損失	Ta = 25℃	P_C	25	W
	Tc = 25℃		60	
接合温度		T_j	150	℃
保存温度		T_{stg}	−55～150	℃

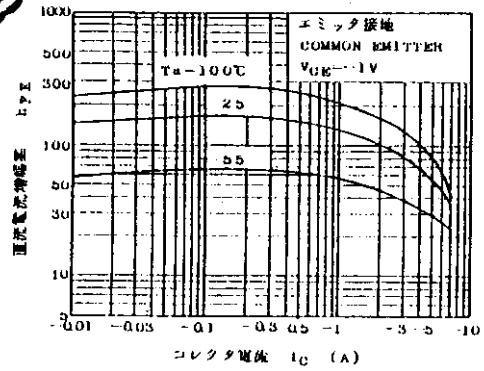
電気的特性 ELECTRICAL CHARACTERISTICS (Ta = 25℃)

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
コレクタしゃ断電流	I_{CBO}	$V_{CB} = -50$ V, $I_E = 0$			−10	μA
エミッタしゃ断電流	I_{EBO}	$V_{EB} = -5$ V, $I_C = 0$			−10	μA
コレクタ・エミッタ間降伏電圧	$V_{(BR)CEO}$	$I_C = -50$ mA, $I_B = 0$	−50		—	V
エミッタ・ベース間降伏電圧	$V_{(BR)EBO}$	$I_E = -10$ mA, $I_C = 0$	−5	—	—	V
直流電流増幅率	$h_{FE(1)}$ (Note 2)	$V_{CE} = -1$ V, $I_C = -1$ A (Note 1)	70	—	240	
	$h_{FE(2)}$	$V_{CE} = -1$ V, $I_C = -4$ A (Note 1)	30	—	—	
コレクタ・エミッタ間飽和電圧	$V_{CE(sat)}$	$I_C = -4$ A, $I_B = -0.4$ A (Note 1)	—	−0.2	−0.4	V
ベース・エミッタ間電圧	V_{BE}	$V_{CE} = -1$ V, $I_C = -4$ A (Note 1)	—	−0.9	−1.2	V
トランジション周波数	f_T	$V_{CE} = -5$ V, $I_C = -1$ A	—	10	—	MHz
コレクタ出力容量	C_{ob}	$V_{CB} = -10$ V, $I_E = 0$, $f = 1$ MHz	—	300	—	pF

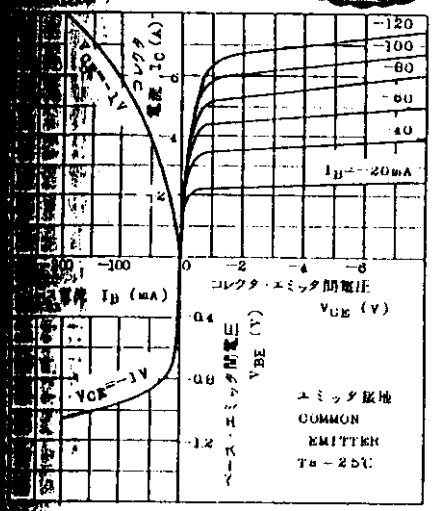
Note 1 : Pulse Test : Pulse Width ≦ 300 μs, Duty Cycle ≦ 2 %

Note 2 : $h_{FE(1)}$ 区分 / $h_{FE(1)}$ Classification O : 70～140, Y : 120～240

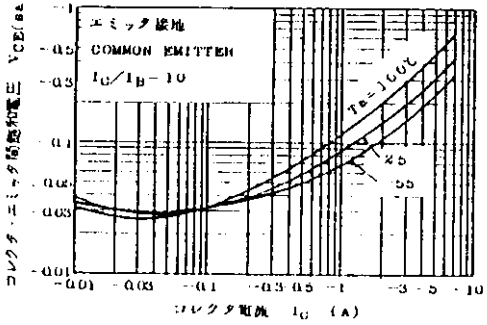
h_{FE} − I_C



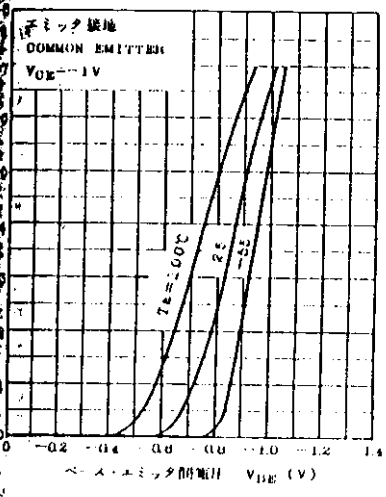
STATIC CHARACTERISTIC



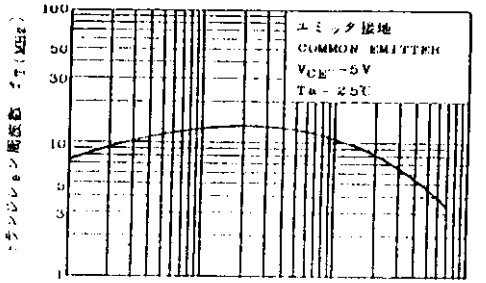
$V_{CE(sat)}$ − I_C



I_C − V_{BE}

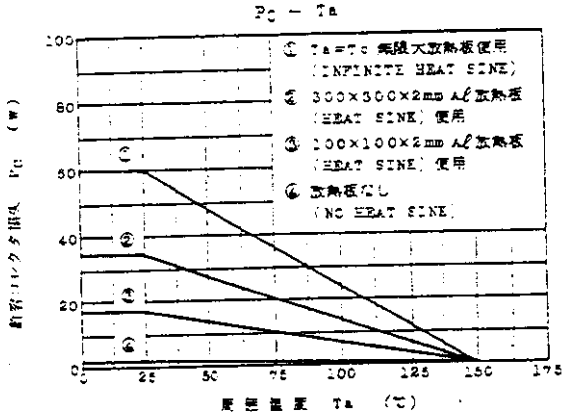


f_T − I_C

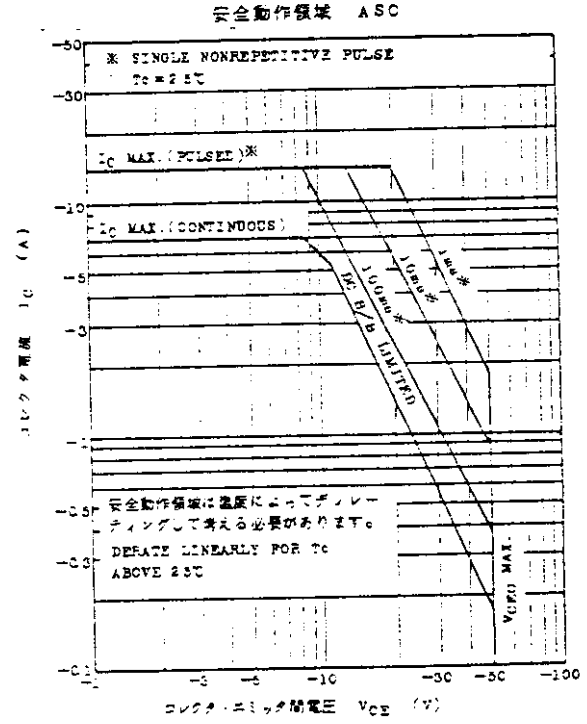


2SB754

$P_C - Ta$

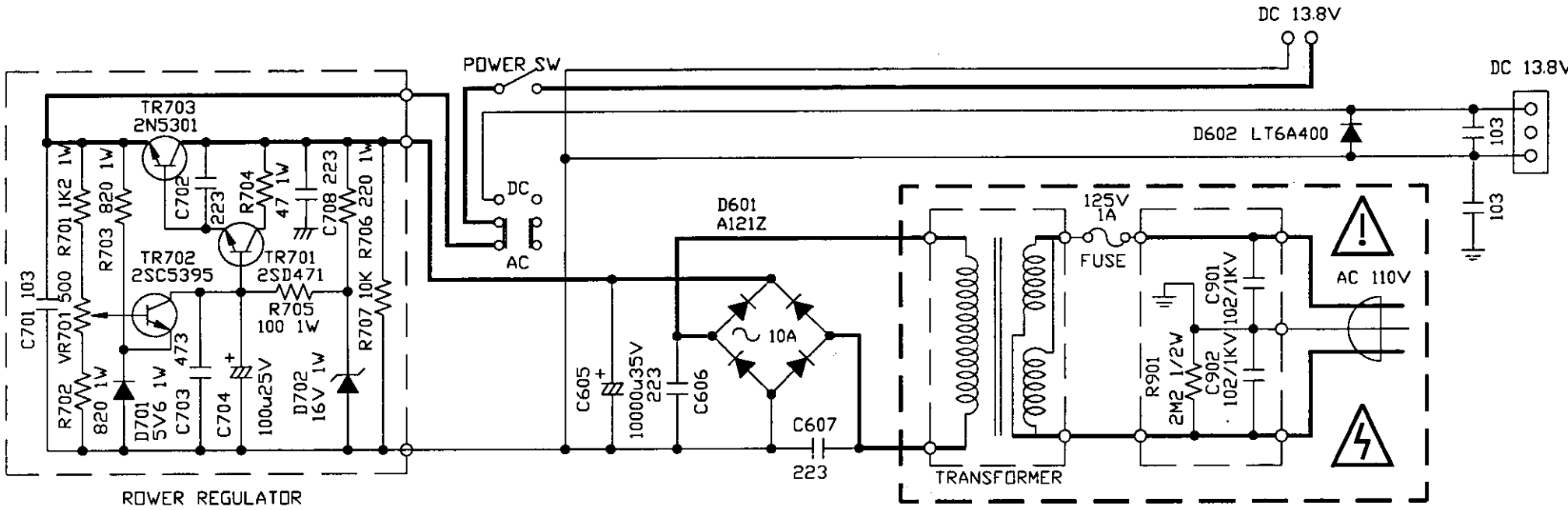


安全動作領域 ASC



DX-2537/2547 POWER RGULATOR
SCHEMATIC DIAGRAM

出圖章
MAR 2 0 1999
RANGER
工程部



1	REVISIONS	SIGN	DATE	SCALE	UNITS	MODEL	RANGER (程遠通信
2				MATERIAL			RANGER ELECTRONIC COMMUNICATIONS,
3				FINISH		APPROVED / DATE	TITLE
4				TOLERANCE UNLESS OTHERWISE STATED		CHECKED / DATE	PART NO.
5						DRAWN / DATE	USAGE / 3RD. ANG. / FILE NAM