



NHUMH11/1/2-Q series

80 V, 100 mA NPN/NPN resistor-equipped double transistors

Rev. 1 — 9 September 2024

Product data sheet

1. General description

NPN/NPN Resistor-Equipped double Transistor (RET) family in a very small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	R1	R2	Package		PNP/PNP complement:	NPN/PNP complement:
	k Ω	k Ω	Nexperia	JEITA		
NHUMH11-Q	10	10	SOT363	SC-88	NHUMB11-Q	NHUMD3-Q
NHUMH1-Q	22	22			NHUMB1-Q	NHUMD2-Q
NHUMH2-Q	47	47			NHUMB2-Q	NHUMD12-Q

2. Features and benefits

- 100 mA output current capability
- High breakdown voltage
- Built-in resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Digital applications
- Cost saving alternative for BC846 series in digital applications
- Controlling IC inputs
- Switching loads

4. Quick reference data

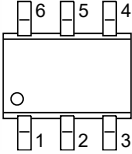
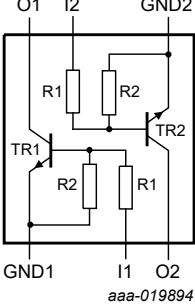
Table 2. Quick reference data

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	80	V
I_O	output current		-	-	100	mA

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1		
2	I1	input (base) TR1		
3	O2	output (collector) TR2		
4	GND2	GND (emitter) TR2		
5	I2	input (base) TR2		
6	O1	output (collector) TR1		

6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
NHUMH11-Q	SC-88	plastic surface-mounted package; 6 leads	SOT363
NHUMH1-Q			
NHUMH2-Q			

7. Marking

Table 5. Marking

Type number	Marking code [1]
NHUMH11-Q	6F%
NHUMH1-Q	6J%
NHUMH2-Q	6L%

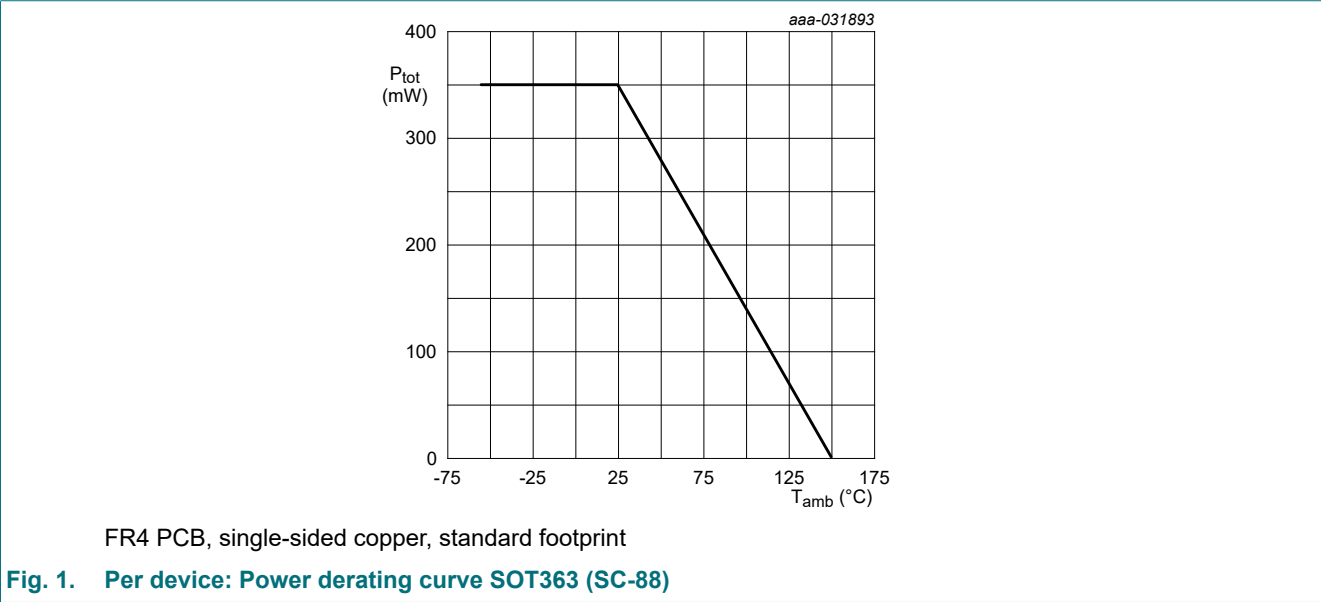
[1] % = placeholder for manufacturing site code

8. Limiting values

Table 6. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
Per transistor					
V_{CBO}	collector-base voltage	open emitter	-	80	V
V_{CEO}	collector-emitter voltage	open base	-	80	V
V_{EBO}	emitter-base voltage	open collector	-	10	V
V_I	input voltage				
	NHUMH11-Q		-10	+40	V
	NHUMH1-Q		-10	+60	V
	NHUMH2-Q		-10	+80	V
I_O	output current		-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$ [1]	-	235	mW
Per device					
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$ [1]	-	350	mW
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-55	150	°C
T_{stg}	storage temperature		-65	150	°C

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.



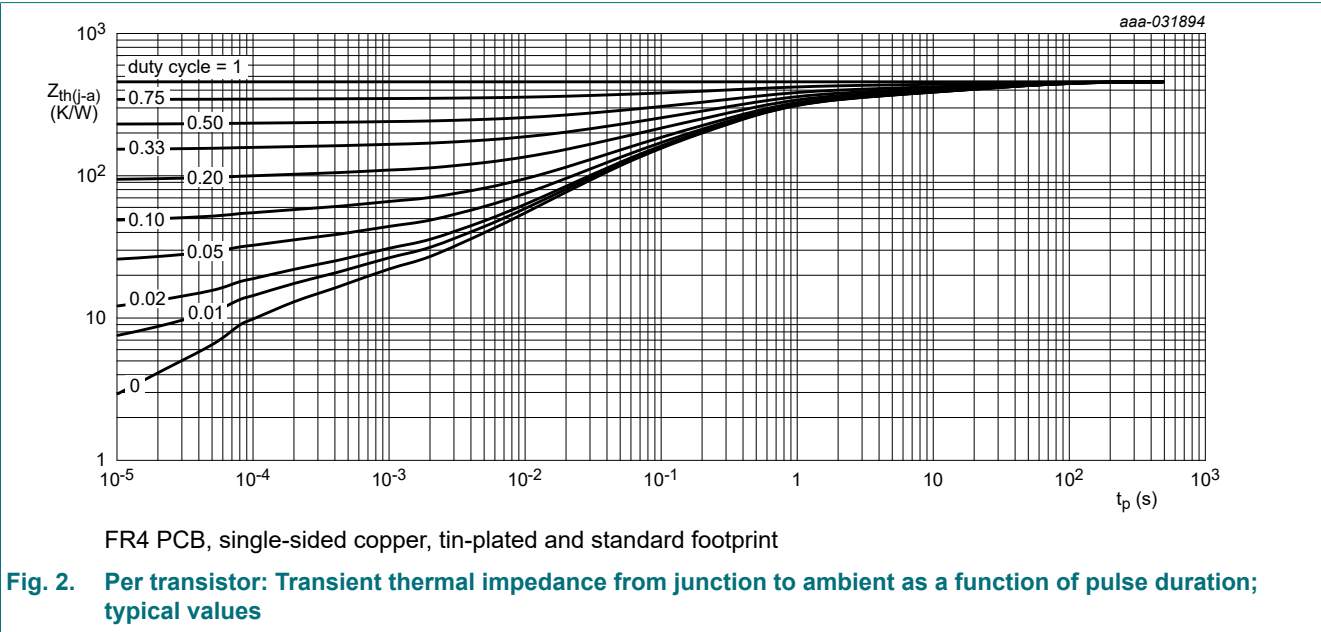
9. Thermal characteristics

Table 7. Thermal characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	532	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	150	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	358	K/W

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.



10. Characteristics

Table 8. Characteristics
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit		
Per transistor								
V _{(BR)CBO}	collector-base breakdown voltage	I _C = 100 μA; I _E = 0 A	80	-	-	V		
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = 2 mA; I _B = 0 A	80	-	-	V		
I _{CBO}	collector-base cut-off current	V _{CB} = 80 V; I _E = 0 A	-	-	100	nA		
I _{CEO}	collector-emitter cut-off current	V _{CE} = 60 V; I _B = 0 A	-	-	100	nA		
		V _{CE} = 60 V; I _B = 0 A; T _J = 150 °C	-	-	5	μA		
I _{EBO}	emitter-base cut-off current							
	NHUMH11-Q	V _{EB} = 7 V; I _C = 0 A	-	-	600	μA		
	NHUMH1-Q		-	-	270	μA		
	NHUMH2-Q		-	-	130	μA		
h _{FE}	DC current gain							
	NHUMH11-Q	V _{CE} = 5 V; I _C = 10 mA	50	-	-			
	NHUMH1-Q		70	-	-			
	NHUMH2-Q		100	-	-			
V _{CEsat}	collector-emitter saturation voltage	I _C = 10 mA; I _B = 0.5 mA	-	-	100	mV		
V _{I(off)}	off-state input voltage	V _{CE} = 5 V ; I _C = 100 μA	-	1.15	0.8	V		
V _{I(on)}	on-state input voltage							
	NHUMH11-Q	V _{CE} = 0.3 V ; I _C = 10 mA	2.5	1.8	-	V		
	NHUMH1-Q		3	2.3	-	V		
	NHUMH2-Q		5	3.3	-	V		
R1	bias resistor 1 (input)		[1]					
	NHUMH11-Q		7	10	13	kΩ		
	NHUMH1-Q		15.4	22	28.6	kΩ		
	NHUMH2-Q		33	47	61	kΩ		
R2/R1	bias resistor ratio		[1]	0.8	1	1.2		
f _T	transition frequency	V _{CE} = 5 V; I _C = 10 mA; f = 100 MHz	[2]		-	170	-	MHz
C _c	collector capacitance	V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz	-	-	2.5	pF		

[1] See section "Test information" for resistor calculation and test conditions
[2] Characteristics of built-in transistor

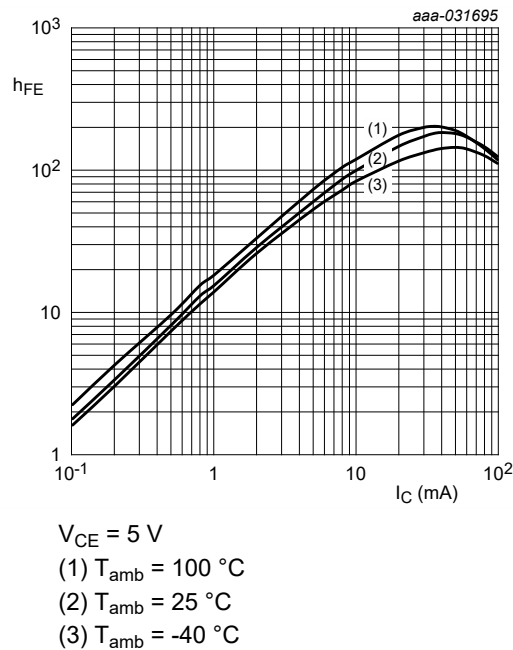


Fig. 3. NHUMH11-Q: DC current gain as a function of collector current; typical values

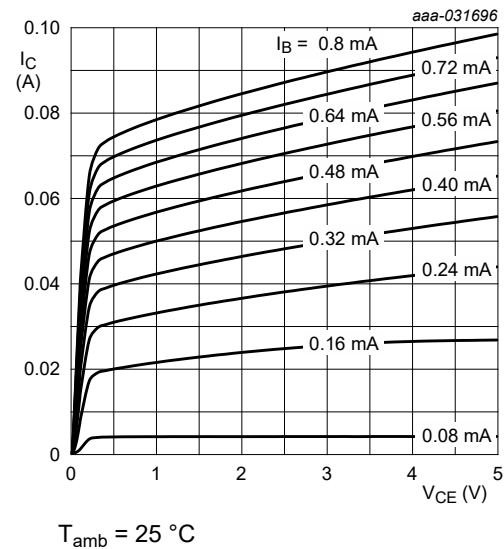


Fig. 4. NHUMH11-Q: Collector current as a function of collector-emitter voltage; typical values

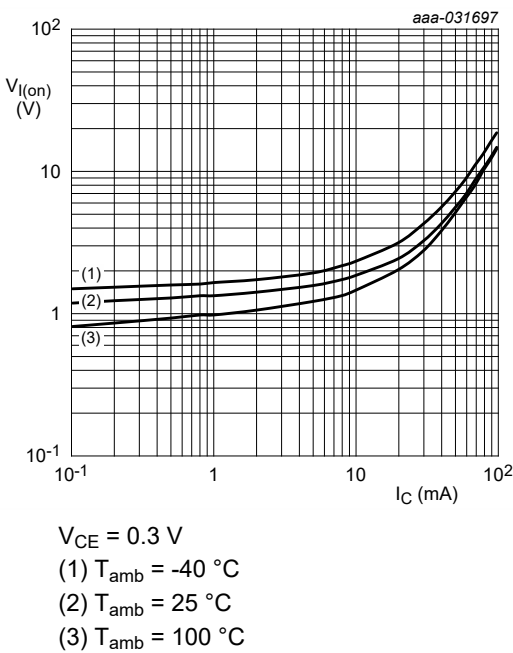


Fig. 5. NHUMH11-Q: On-state input voltage as a function of collector current; typical values

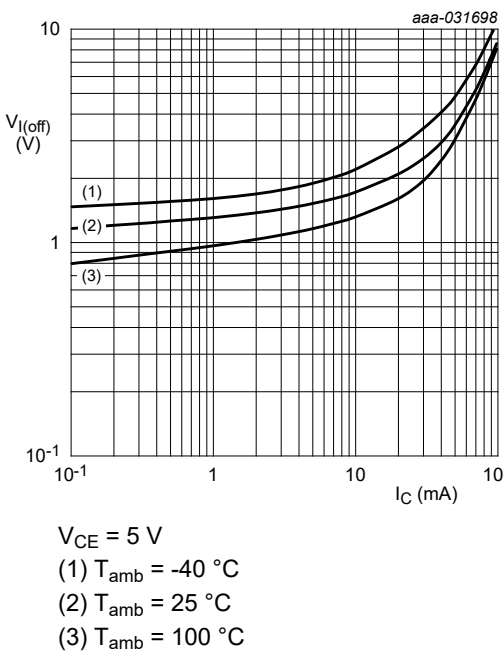


Fig. 6. NHUMH11-Q: Off-state input voltage as a function of collector current; typical values

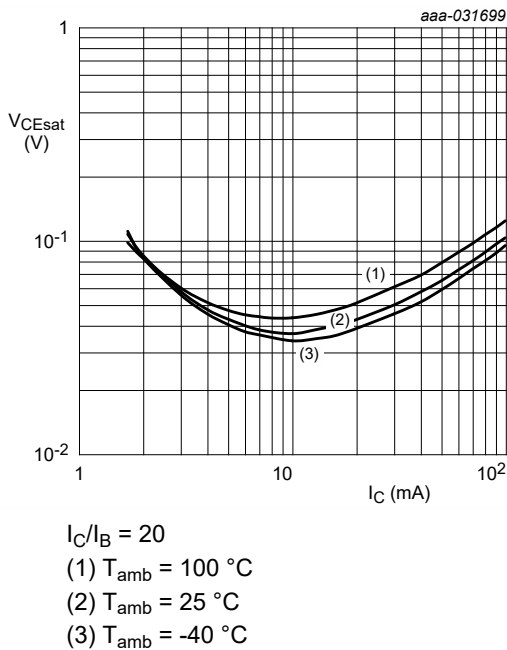


Fig. 7. NHUMH11-Q: Collector-emitter saturation voltage as a function of collector current; typical values

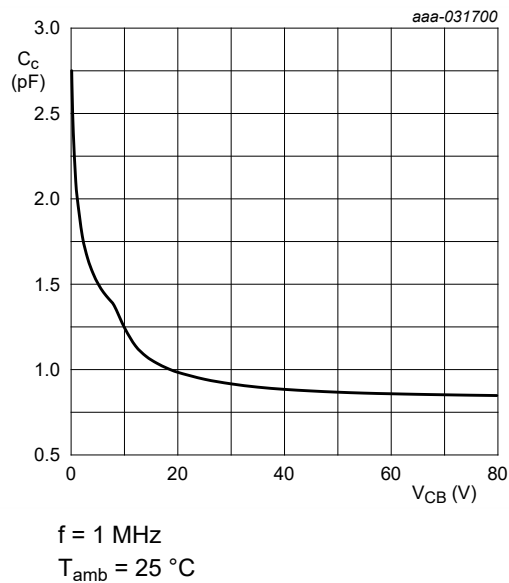


Fig. 8. NHUMH11-Q: Collector capacitance as a function of collector-base voltage; typical values

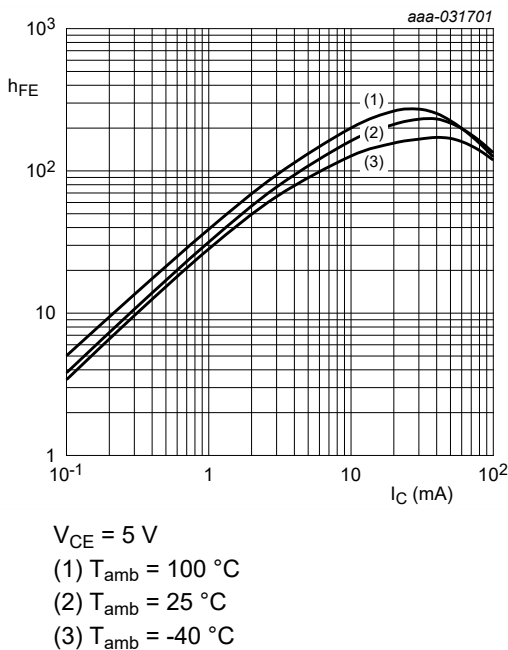


Fig. 9. NHUMH11V: DC current gain as a function of collector current; typical values

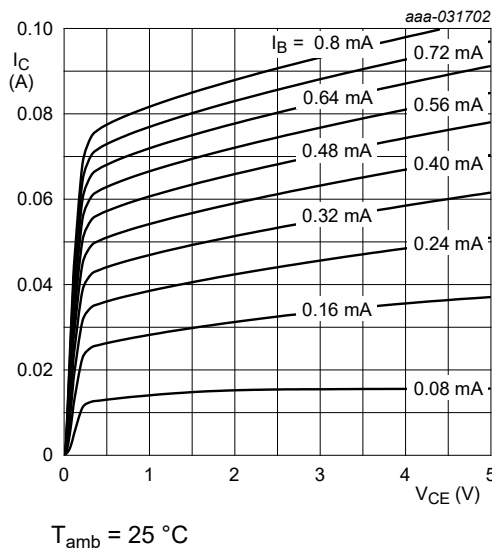


Fig. 10. NHUMH11V: Collector current as a function of collector-emitter voltage; typical values

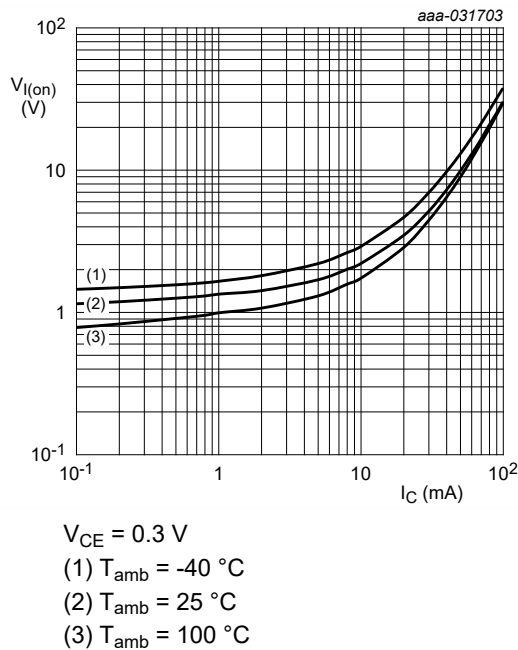


Fig. 11. NHUMH1V: On-state input voltage as a function of collector current; typical values

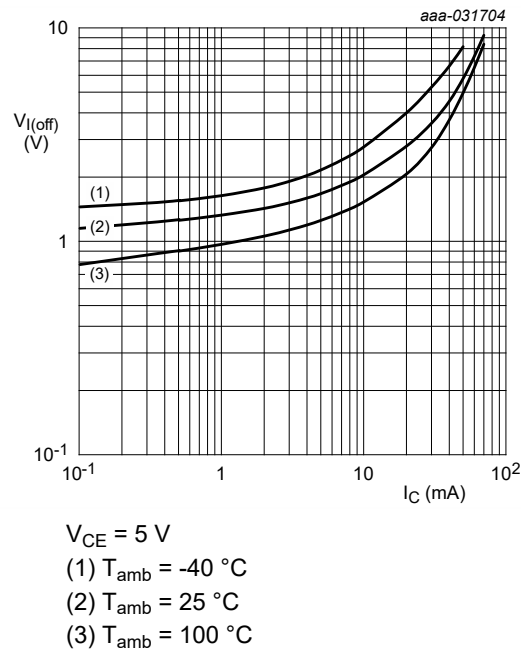


Fig. 12. NHUMH1V: Off-state input voltage as a function of collector current; typical values

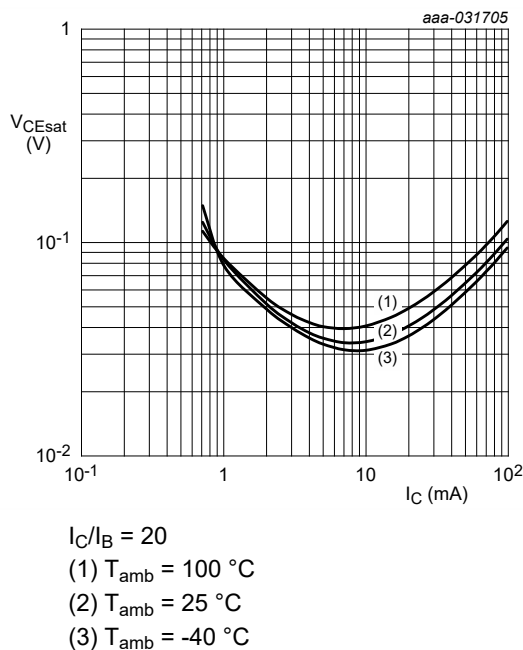


Fig. 13. NHUMH1V: Collector-emitter saturation voltage as a function of collector current; typical values

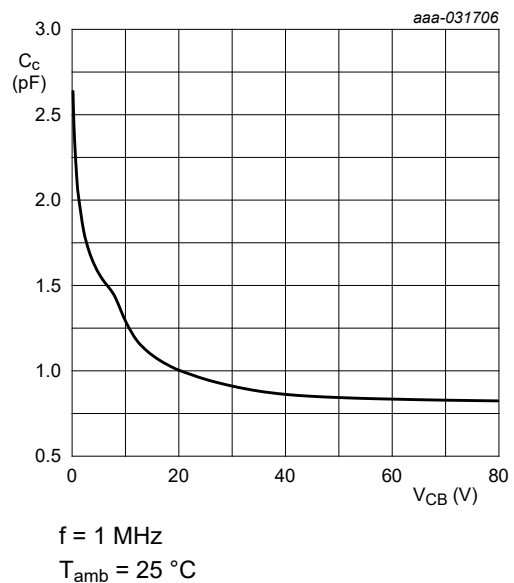


Fig. 14. NHUMH1C: Collector capacitance as a function of collector-base voltage; typical values

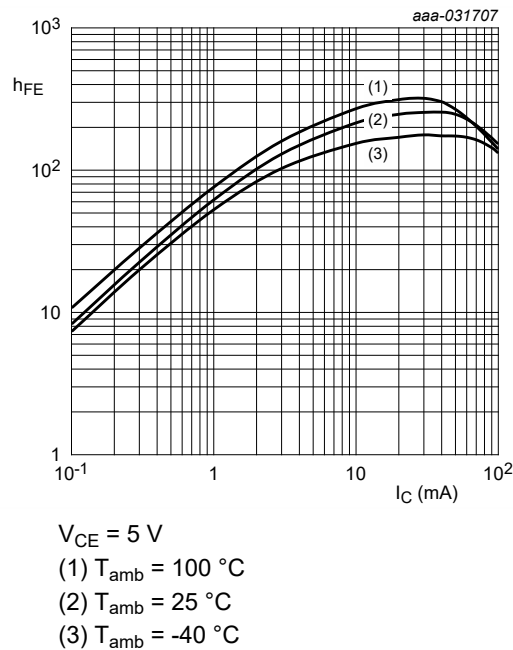


Fig. 15. NHUMH2-Q: DC current gain as a function of collector current; typical values

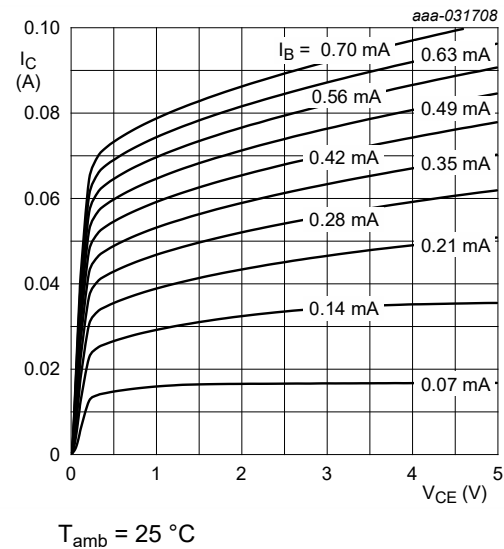


Fig. 16. NHUMH2-Q: Collector current as a function of collector-emitter voltage; typical values

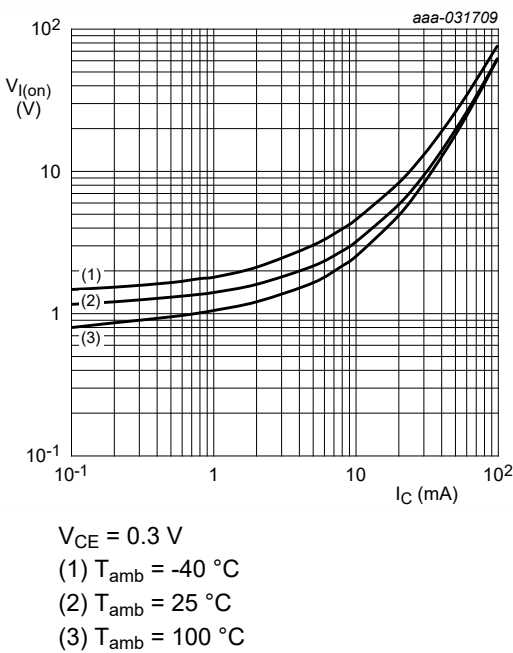


Fig. 17. NHUMH2-Q: On-state input voltage as a function of collector current; typical values

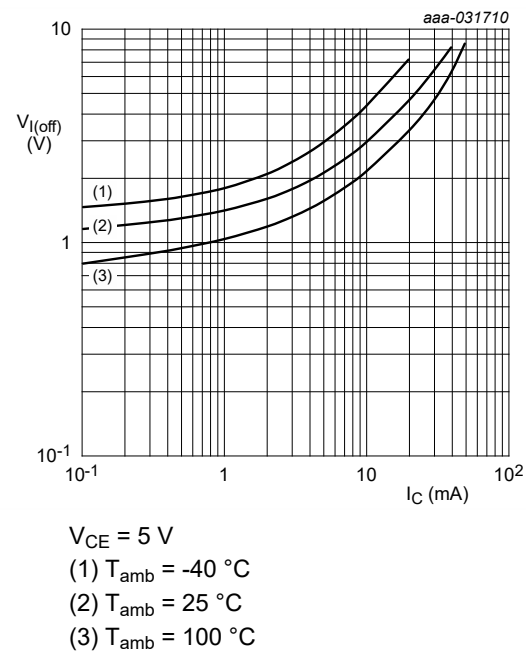


Fig. 18. NHUMH2-Q: Off-state input voltage as a function of collector current; typical values

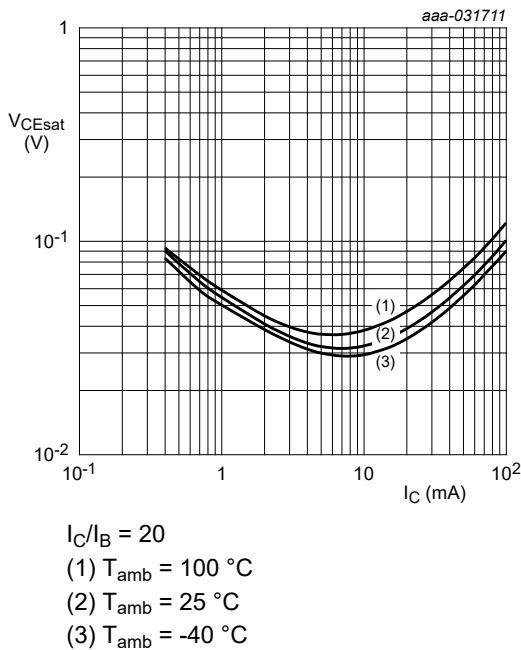


Fig. 19. NHUMH2-Q: Collector-emitter saturation voltage as a function of collector current; typical values

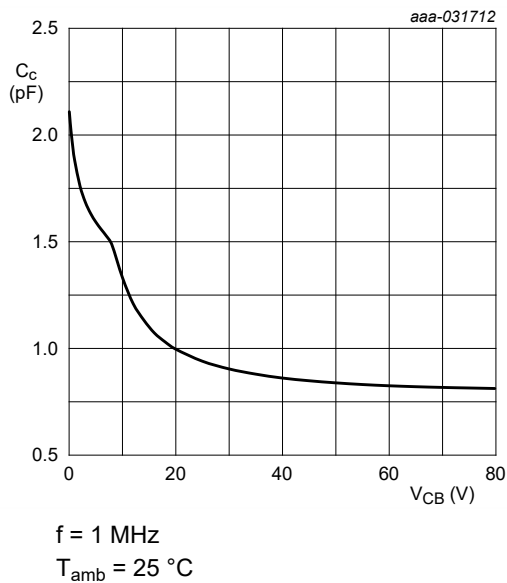


Fig. 20. NHUMH2-Q: Collector capacitance as a function of collector-base voltage; typical values of built-in transistor

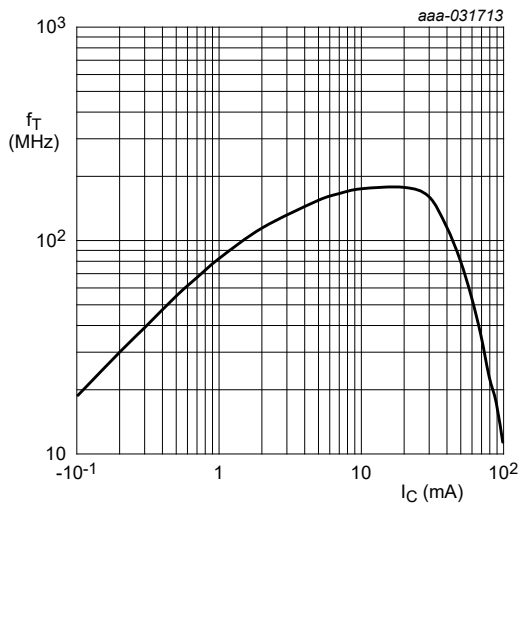


Fig. 21. Transition frequency as a function of collector current; typical values of built-in transistor

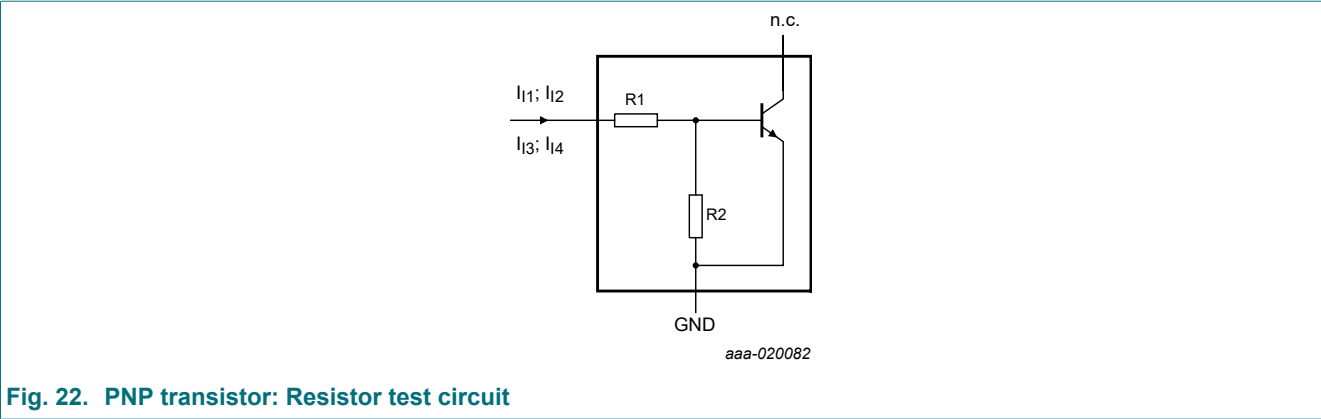
11. Test information

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

Resistor calculation

- Calculation of bias resistor 1 (R1)
$$R_I = \frac{V(I_{I2}) - V(I_{I1})}{I_{I2} - I_{I1}}$$
- Calculation of bias resistor ratio (R2/R1)
$$\frac{R2}{R1} = \frac{V(I_{I4}) - V(I_{I3})}{R1 \cdot (I_{I4} - I_{I3})} - 1$$



Resistor test conditions

Table 9. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I _{I1}	I _{I2}	I _{I3}	I _{I4}
Per transistor						
NHUMH11-Q	10	10	800 μA	1.1 mA	-350 μA	-450 μA
NHUMH1-Q	22	22	550 μA	750 μA	-150 μA	-230 μA
NHUMH2-Q	47	47	250 μA	350 μA	-55 μA	-105 μA

12. Package outline

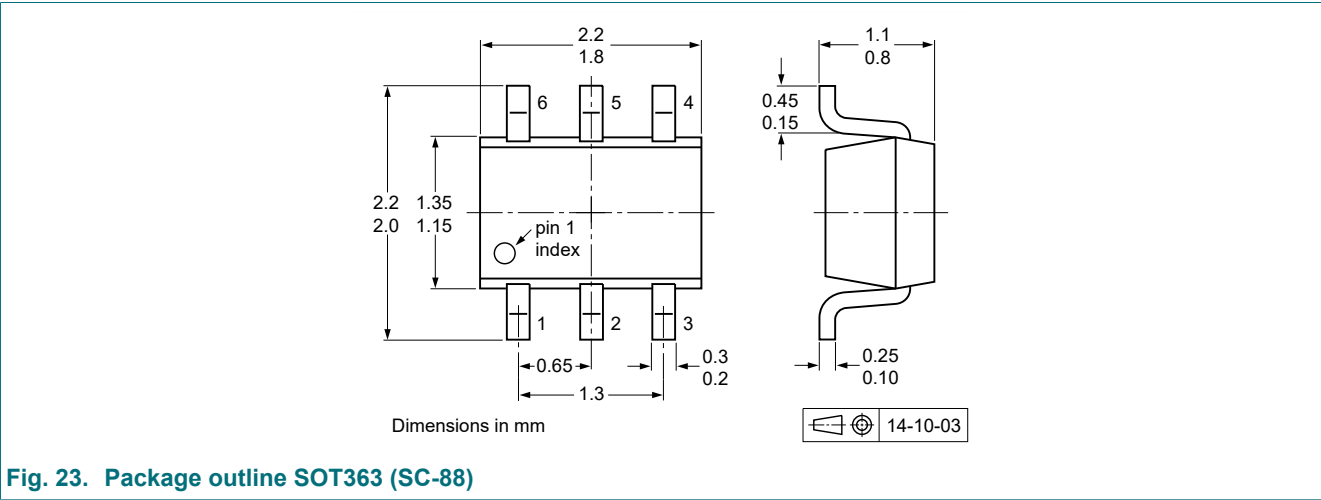


Fig. 23. Package outline SOT363 (SC-88)

13. Soldering

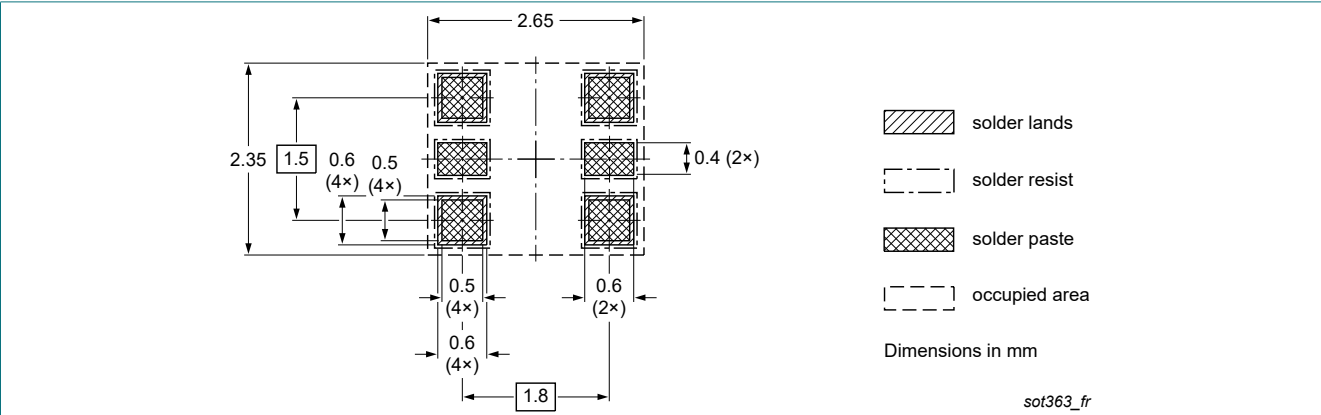


Fig. 24. Reflow soldering footprint for SOT363 (SC-88)

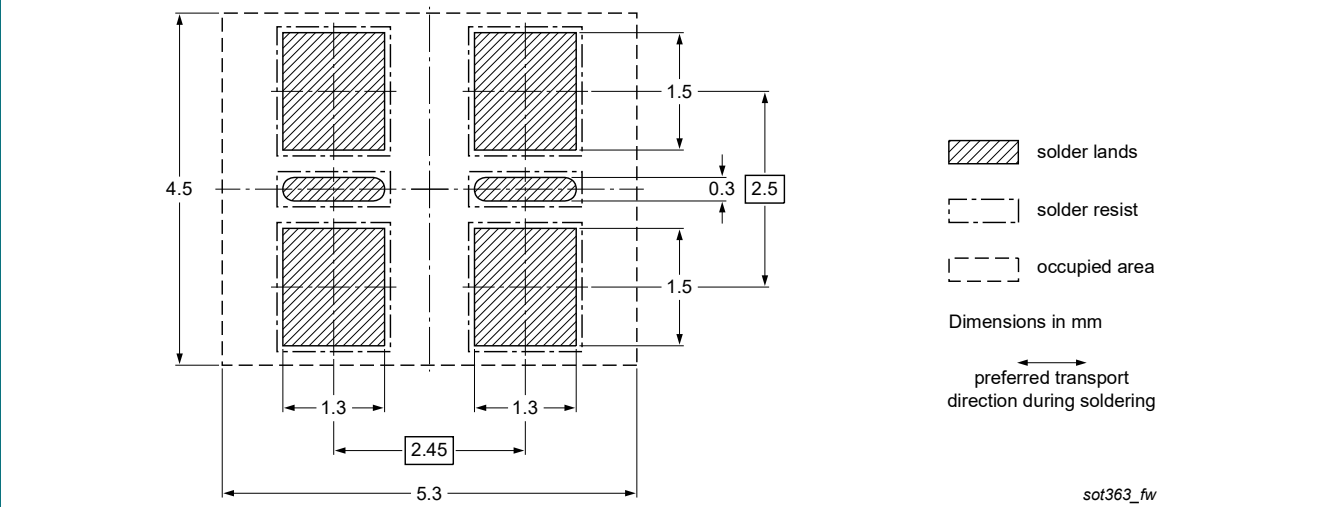


Fig. 25. Wave soldering footprint for SOT363 (SC-88)

14. Revision history

Table 10. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
NHUMH11_1_2-Q_SER v.1	20240909	Product data sheet	-	-

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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