

PUMD12/DG/B4X Datasheet

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DiGi Electronics Part Number	PUMD12/DG/B4X-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	PUMD12/DG/B4X
Description	TRANS PREBIAS 1NPN 1PNP 6TSSOP
Detailed Description	Pre-Biased Bipolar Transistor (BJT) 1 NPN, 1 PNP - P re-Biased (Dual) 50V 100mA 230MHz, 180MHz 300m W Surface Mount 6-TSSOP



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Purchase and inquiry

Manufacturer Product Number:

PUMD12/DG/B4X

Series:

-

Transistor Type:

1 NPN, 1 PNP - Pre-Biased (Dual)

Voltage - Collector Emitter Breakdown (Max):

50V

Resistor - Emitter Base (R2):

47kOhms

Vce Saturation (Max) @ Ib, Ic:

150mV @ 500µA, 10mA

Frequency - Transition:

230MHz, 180MHz

Mounting Type:

Surface Mount

Supplier Device Package:

6-TSSOP

Manufacturer:

Nexperia USA Inc.

Product Status:

Active

Current - Collector (Ic) (Max):

100mA

Resistor - Base (R1):

47kOhms

DC Current Gain (hFE) (Min) @ Ic, Vce:

80 @ 5mA, 5V

Current - Collector Cutoff (Max):

1µA

Power - Max:

300mW

Package / Case:

6-TSSOP, SC-88, SOT-363

Base Product Number:

PUMD12

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.21.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



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Kind regards,

Team Nexperia

PEMD12; PUMD12

NPN/PNP resistor-equipped transistors;
R1 = 47 k Ω , R2 = 47 k Ω

Rev. 4 — 21 November 2011

Product data sheet

1. Product profile

1.1 General description

NPN/PNP double Resistor-Equipped Transistors (RET) in Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number	Package		PNP/PNP complement	NPN/PNP complement	Package configuration
	NXP	JEITA			
PEMD12	SOT666	-	PEMB2	PEMH2	ultra small and flat lead
PUMD12	SOT363	SC-88	PUMB2	PUMH2	very small

1.2 Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified

1.3 Applications

- Low current peripheral driver
- Control of IC inputs
- Replaces general-purpose transistors in digital applications

1.4 Quick reference data

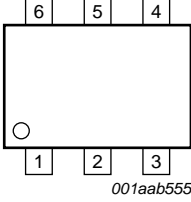
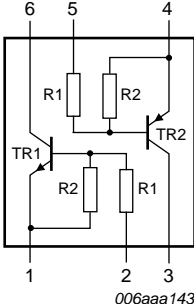
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor; for the PNP transistor (TR2) with negative polarity						
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current		-	-	100	mA
R1	bias resistor 1 (input)		33	47	61	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	



2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	GND (emitter) TR1		
2	input (base) TR1		
3	output (collector) TR2		
4	GND (emitter) TR2		
5	input (base) TR2		
6	output (collector) TR1		

3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
PEMD12	-	plastic surface-mounted package; 6 leads	SOT666
PUMD12	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PEMD12	D2
PUMD12	D*1

[1] * = placeholder for manufacturing site code

5. Limiting values

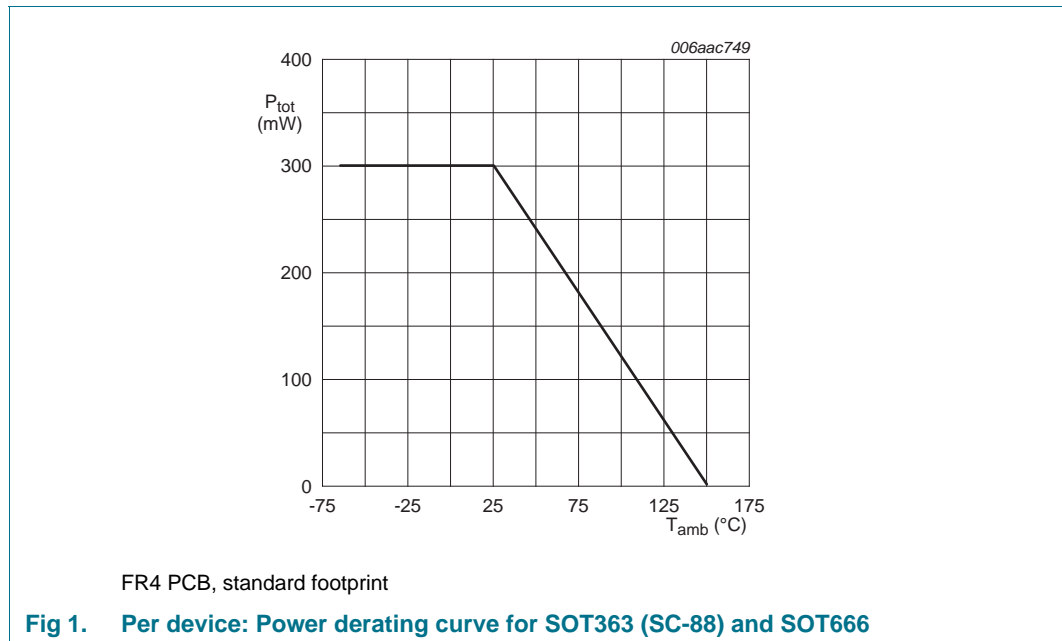
Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
Per transistor; for the PNP transistor (TR2) with negative polarity						
V_{CBO}	collector-base voltage	open emitter	-	50	V	
V_{CEO}	collector-emitter voltage	open base	-	50	V	
V_{EBO}	emitter-base voltage	open collector	-	10	V	
V_I	input voltage TR1					
		positive	-	+40	V	
		negative	-	-10	V	
	input voltage TR2					
		positive	-	+10	V	
		negative	-	-40	V	
I_O	output current		-	100	mA	
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	100	mA	
P_{tot}	total power dissipation		$T_{amb} \leq 25$ °C			
	PEMD12 (SOT666)		[1][2]	-	200	mW
	PUMD12 (SOT363)		[1]	-	200	mW
Per device						
P_{tot}	total power dissipation		$T_{amb} \leq 25$ °C			
	PEMD12 (SOT666)		[1][2]	-	300	mW
	PUMD12 (SOT363)		[1]	-	300	mW
T_j	junction temperature		-	150	°C	
T_{amb}	ambient temperature		-65	+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.

[2] Reflow soldering is the only recommended soldering method.



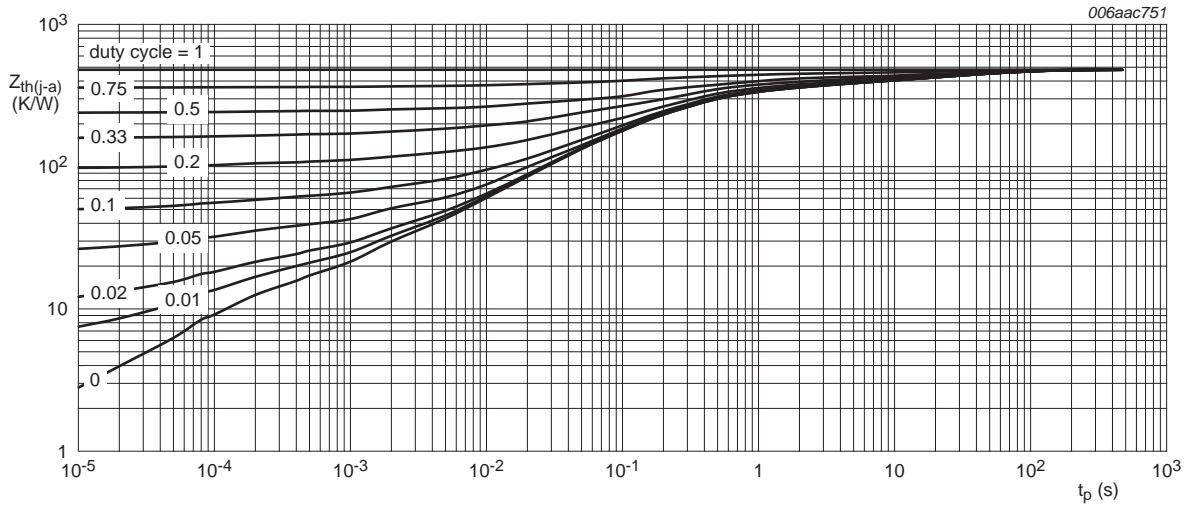
6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMD12 (SOT666)		[1][2]	-	625	K/W
	PUMD12 (SOT363)		[1]	-	625	K/W
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMD12 (SOT666)		[1][2]	-	417	K/W
	PUMD12 (SOT363)		[1]	-	417	K/W

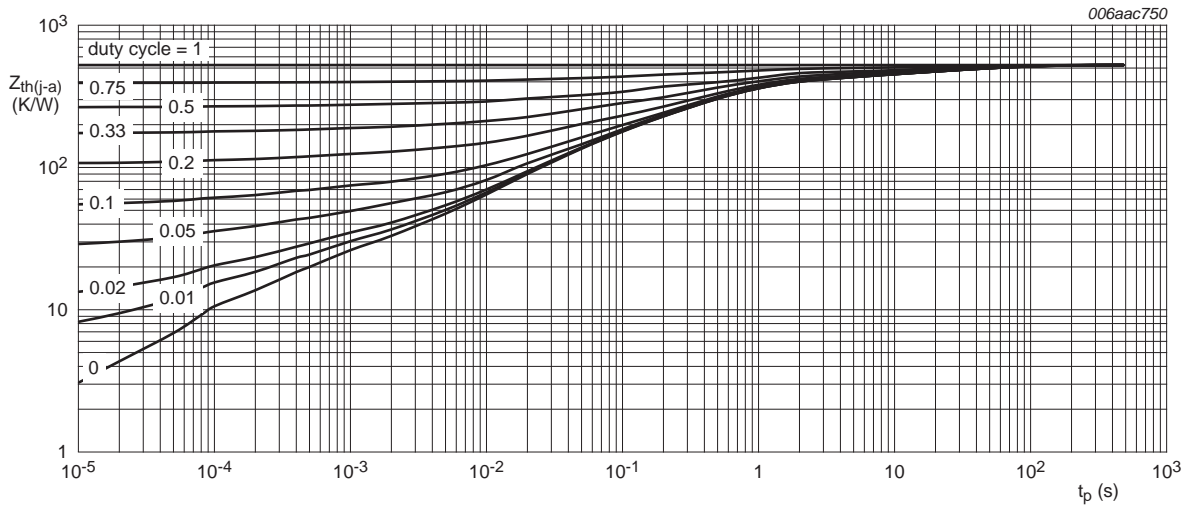
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Reflow soldering is the only recommended soldering method.



FR4 PCB, standard footprint

Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PEMD12 (SOT666); typical values



FR4 PCB, standard footprint

Fig 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PUMD12 (SOT363); typical values

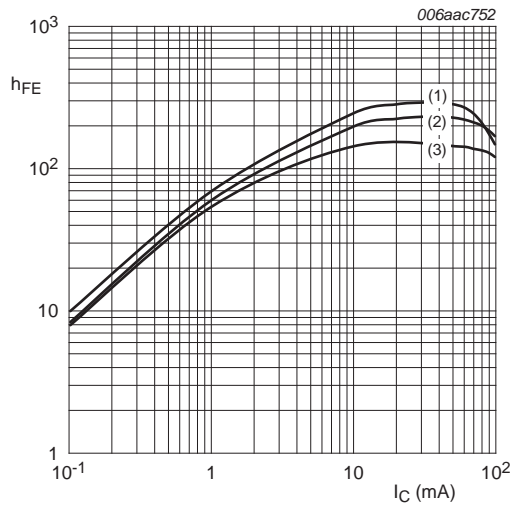
7. Characteristics

Table 8. Characteristics

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

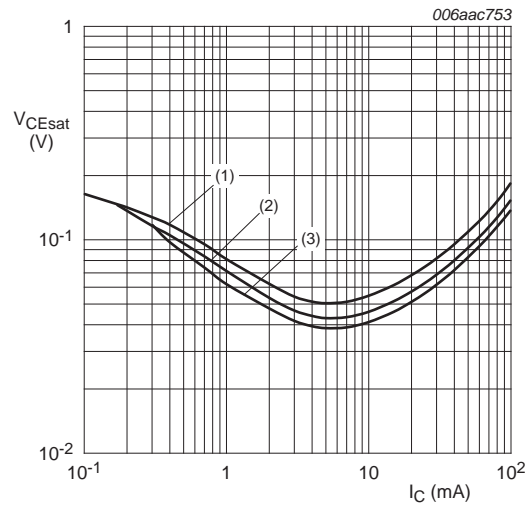
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor; for the PNP transistor (TR2) with negative polarity						
I_{CBO}	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30\text{ V}; I_B = 0\text{ A}$	-	-	1	μA
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	90	μA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$	80	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}$	-	1.2	0.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 2\text{ mA}$	3	1.6	-	V
R1	bias resistor 1 (input)		33	47	61	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$				
		TR1 (NPN)	-	-	2.5	pF
		TR2 (PNP)	-	-	3	pF
f_T	transition frequency	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$ [1]				
		TR1 (NPN)	-	230	-	MHz
		TR2 (PNP)	-	180	-	MHz

[1] Characteristics of built-in transistor



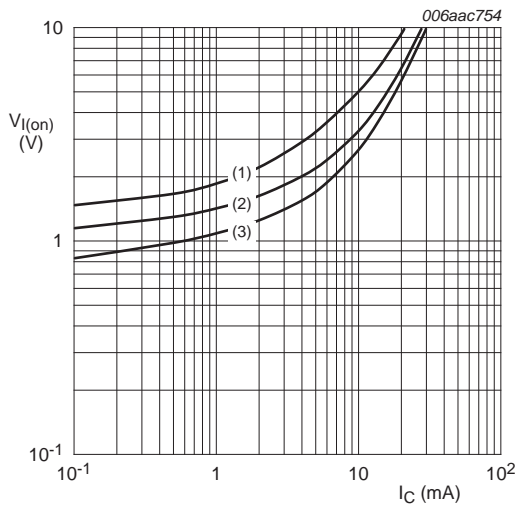
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 4. TR1 (NPN): DC current gain as a function of collector current; typical values



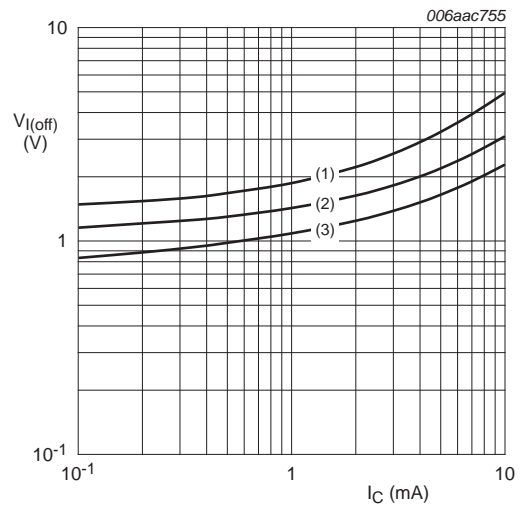
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 5. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values



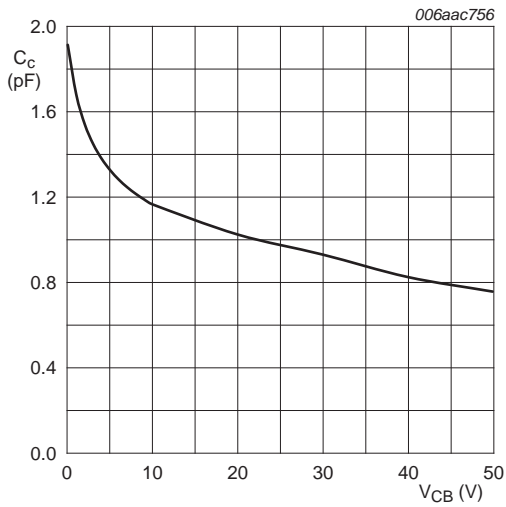
$V_{CE} = 0.3\text{ V}$
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 6. TR1 (NPN): On-state input voltage as a function of collector current; typical values



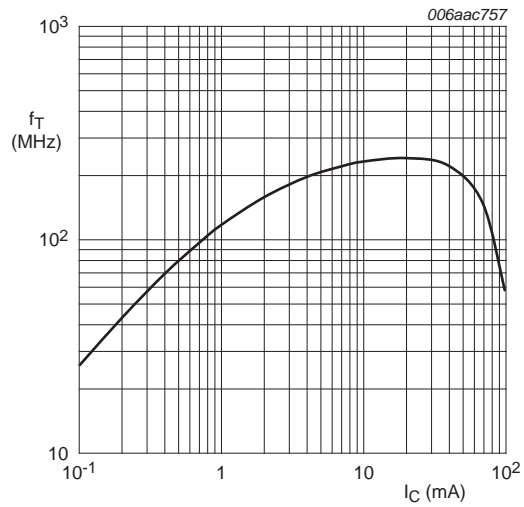
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 7. TR1 (NPN): Off-state input voltage as a function of collector current; typical values



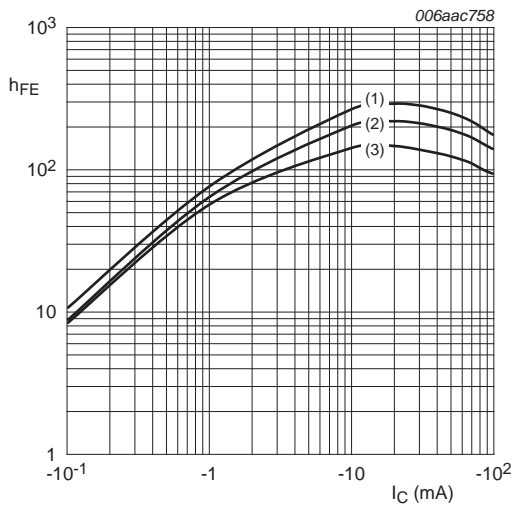
$f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

Fig 8. TR1 (NPN): Collector capacitance as a function of collector-base voltage; typical values



$V_{CE} = 5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

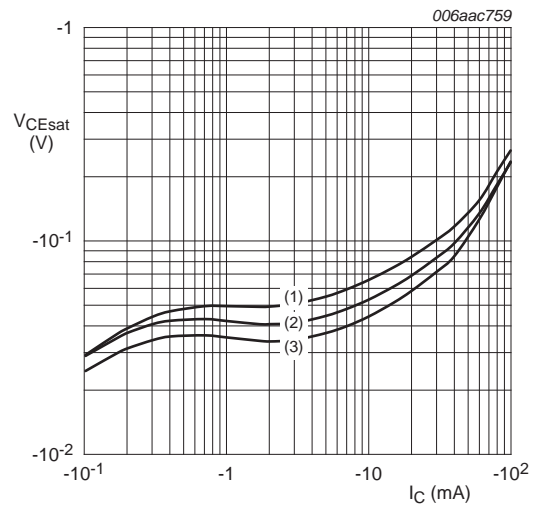
Fig 9. TR1 (NPN): Transition frequency as a function of collector current; typical values of built-in transistor



$V_{CE} = -5 \text{ V}$

- (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

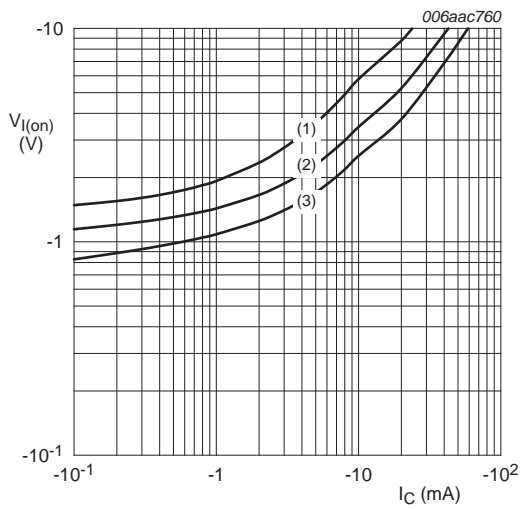
Fig 10. TR2 (PNP): DC current gain as a function of collector current; typical values



$I_C/I_B = 20$

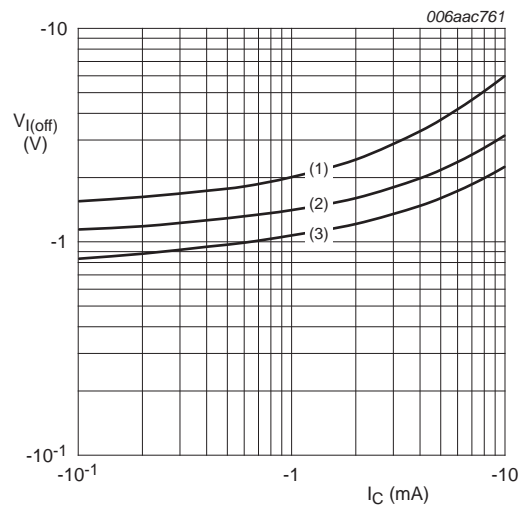
- (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

Fig 11. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



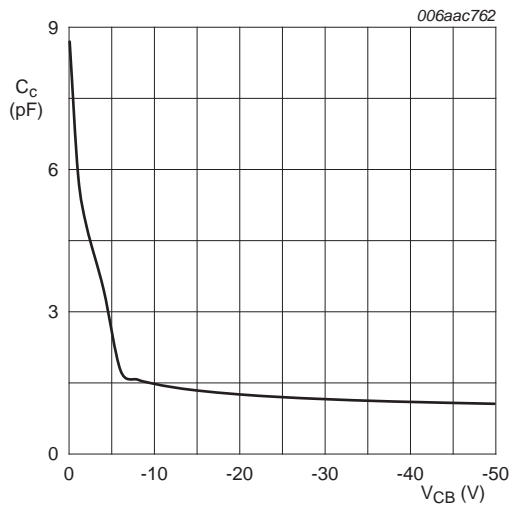
$V_{CE} = -0.3$ V
 (1) $T_{amb} = -40$ °C
 (2) $T_{amb} = 25$ °C
 (3) $T_{amb} = 100$ °C

Fig 12. TR2 (PNP): On-state input voltage as a function of collector current; typical values



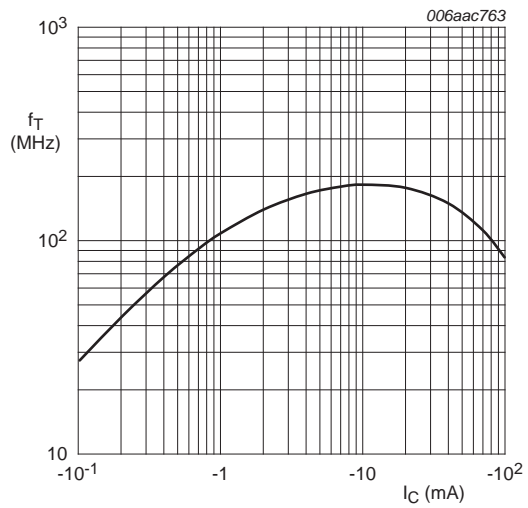
$V_{CE} = -5$ V
 (1) $T_{amb} = -40$ °C
 (2) $T_{amb} = 25$ °C
 (3) $T_{amb} = 100$ °C

Fig 13. TR2 (PNP): Off-state input voltage as a function of collector current; typical values



$f = 1$ MHz; $T_{amb} = 25$ °C

Fig 14. TR2 (PNP): Collector capacitance as a function of collector-base voltage; typical values of built-in transistor



$V_{CE} = -5$ V; $T_{amb} = 25$ °C

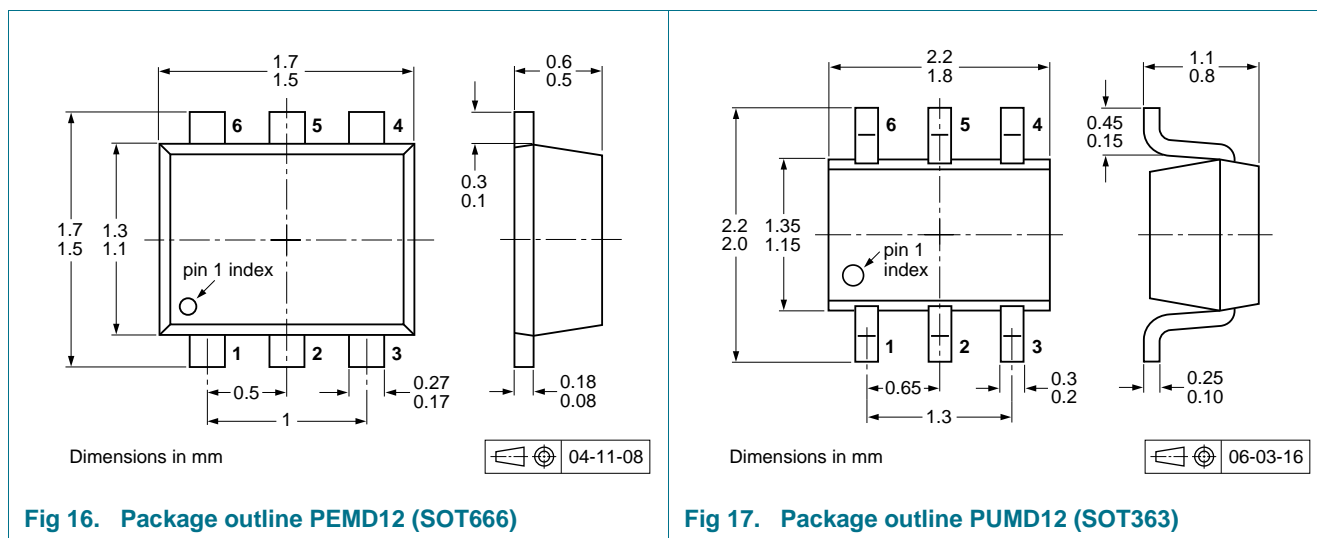
Fig 15. TR2 (PNP): Transition frequency as a function of collector current; typical values of built-in transistor

8. Test information

8.1 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.

9. Package outline



10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

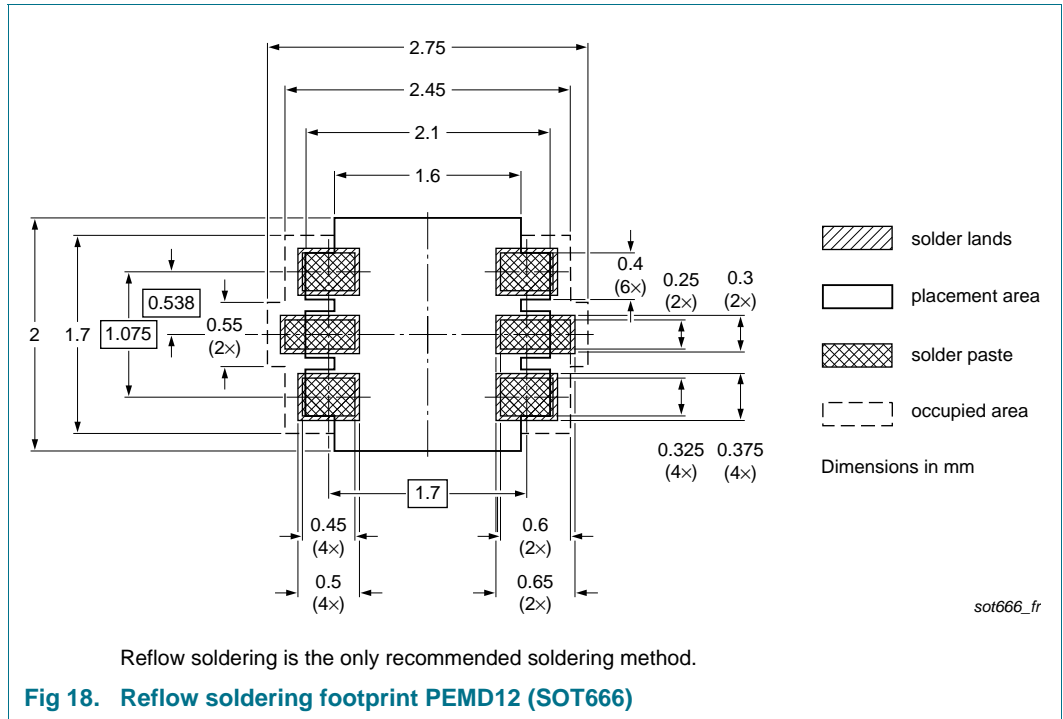
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PEMD12	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMD12	SOT363	4 mm pitch, 8 mm tape and reel; T1 ^[2]	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 ^[3]	-125	-	-	-165

[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMD12_PUMD12 v.4	20111121	Product data sheet	-	PEMD12_PUMD12 v.3
Modifications:	<ul style="list-style-type: none"> • The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 1 "Product profile": updated • Section 4 "Marking": updated • Figure 1 to 15: added • Section 6 "Thermal characteristics": updated • Table 8 "Characteristics": $V_{i(on)}$ redefined to $V_{I(on)}$ on-state input voltage, $V_{i(off)}$ redefined to $V_{I(off)}$ off-state input voltage, I_{CEO} updated, f_T added • Section 8 "Test information": added • Section 9 "Package outline": superseded by minimized package outline drawings • Section 10 "Packing information": added • Section 11 "Soldering": added • Section 13 "Legal information": updated 			
PEMD12_PUMD12 v.3	20031008	Product data sheet	-	PEMD12 v.2
PEMD12 v.2	20011107	Product specification	-	PEMD12 v.1
PEMD12 v.1	20010830	Preliminary specification	-	-
PUMD12 v.2	20010216	Product specification	-	PUMD12 v.1
PUMD12 v.1	19990426	Product specification	-	-

13. Legal information

13.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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