



PHPT610030NK

NPN/NPN high power double bipolar transistor

8 October 2024

Product data sheet

1. General description

NPN/NPN high power double bipolar transistor in a SOT1205 (LFPK56D) Surface-Mounted Device (SMD) power plastic package.

PNP/PNP complement: PHPT610030PK

NPN/PNP complement: PHPT610030NPK

2. Features and benefits

- High thermal power dissipation capability
- Suitable for high temperature applications up to 175 °C
- Reduced Printed-Circuit Board (PCB) requirements comparing to transistors in DPAK
- High energy efficiency due to less heat generation

3. Applications

- Motor control
- Power management
- Load switch
- Linear mode voltage regulator
- Backlighting applications
- Relay replacement

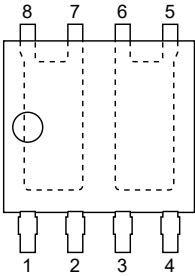
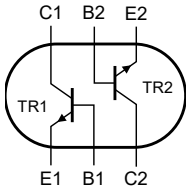
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	100	V
I_C	collector current		-	-	3	A
h_{FE}	DC current gain	$V_{CE} = 10\text{ V}$; $I_C = 500\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25\text{ }^\circ\text{C}$	150	250	-	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 LPAK56D; Dual LPAK (SOT1205)	 sym140
2	B1	base TR1		
3	E2	emitter TR2		
4	B2	base TR2		
5	C2	collector TR2		
6	C2	collector TR2		
7	C1	collector TR1		
8	C1	collector TR1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PHPT610030NK	LPAK56D; Dual LPAK	plastic, single ended surface mounted package (LPAK56D); 8 leads	SOT1205

7. Marking

Table 4. Marking codes

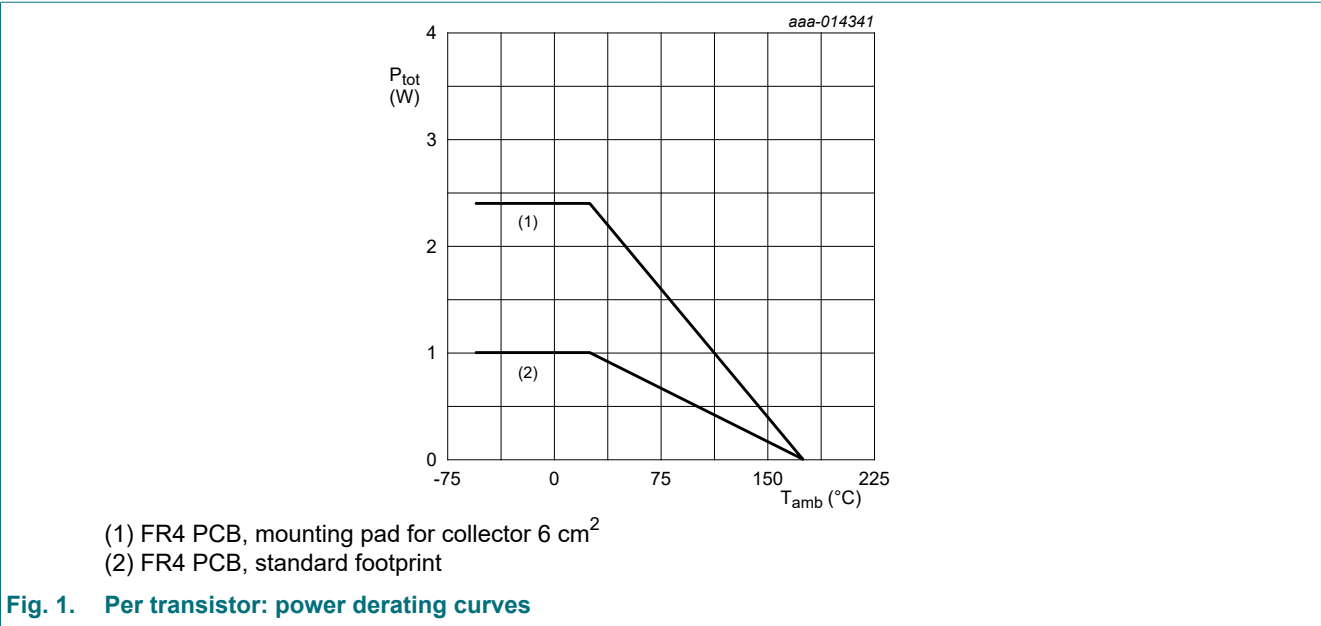
Type number	Marking code
PHPT610030NK	10030NK

8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
V _{CBO}	collector-base voltage	open emitter		-	100	V
V _{CEO}	collector-emitter voltage	open base		-	100	V
V _{EBO}	emitter-base voltage	open collector		-	7	V
I _C	collector current			-	3	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	8	A
I _B	base current			-	0.5	A
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	1	W
			[2]	-	2.4	W
			[3]	-	25	W
Per device						
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	1.25	W
			[4]	-	5	W
			[2]	-	3	W
T _j	junction temperature			-	175	°C
T _{amb}	ambient temperature			-55	175	°C
T _{stg}	storage temperature			-65	175	°C

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [3] Power dissipation from junction to mounting base.
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

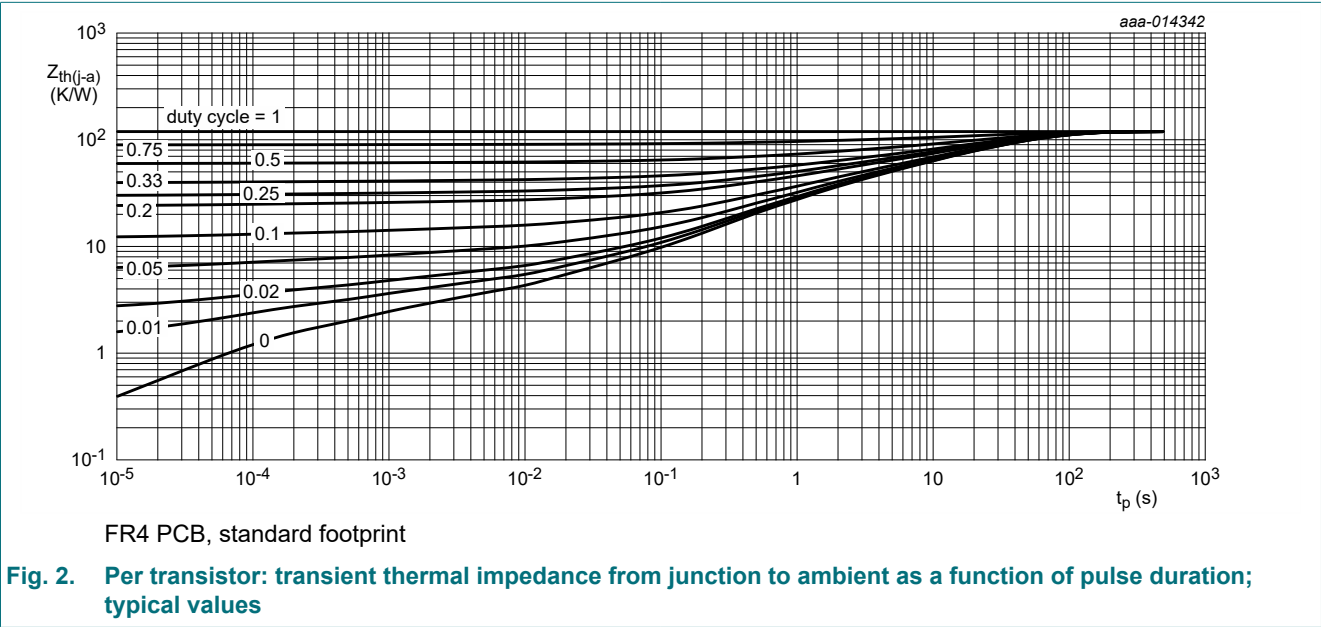


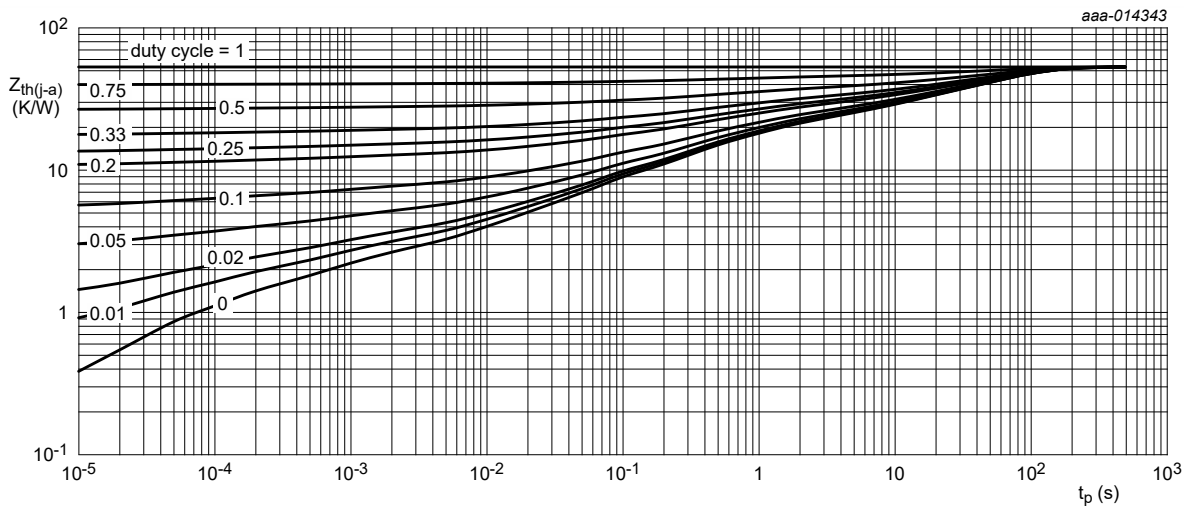
9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	150	K/W
			[2]	-	-	62.5	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	6	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	120	K/W
			[2]	-	-	50	K/W
			[3]	-	-	30	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.





FR4 PCB, mounting pad for collector 6 cm²

Fig. 3. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
I _{CBO}	collector-base cut-off current	V _{CB} = 80 V; I _E = 0 A; T _{amb} = 25 °C		-	-	100	nA
		V _{CB} = 80 V; I _E = 0 A; T _j = 150 °C		-	-	50	µA
I _{CES}	collector-emitter cut-off current	V _{CE} = 80 V; V _{BE} = 0 V; T _{amb} = 25 °C		-	-	100	nA
I _{EBO}	emitter-base cut-off current	V _{EB} = 7 V; I _C = 0 A; T _{amb} = 25 °C		-	-	100	nA
h _{FE}	DC current gain	V _{CE} = 10 V; I _C = 500 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		150	250	-	
		V _{CE} = 10 V; I _C = 1 A; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		80	250	-	
		V _{CE} = 10 V; I _C = 2 A; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		20	100	-	
		V _{CE} = 10 V; I _C = 3 A; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		10	40	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 1 A; I _B = 50 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		-	90	150	mV
		I _C = 3 A; I _B = 300 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		-	225	330	mV
R _{CEsat}	collector-emitter saturation resistance	I _C = 3 A; I _B = 0.3 A; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		-	75	110	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = 1 A; I _B = 50 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		-	0.86	1	V
		I _C = 2 A; I _B = 200 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		-	1	1.2	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = 2 V; I _C = 0.1 A; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C		-	0.67	0.85	V
t _d	delay time	V _{CC} = 12.5 V; I _C = 1 A; I _{Bon} = 50 mA; I _{Boff} = -50 mA; T _{amb} = 25 °C		-	20	-	ns
t _r	rise time			-	300	-	ns
t _{on}	turn-on time			-	320	-	ns
t _s	storage time			-	830	-	ns
t _f	fall time			-	470	-	ns
t _{off}	turn-off time			-	1300	-	ns
f _T	transition frequency	V _{CE} = 10 V; I _C = 100 mA; f = 100 MHz; T _{amb} = 25 °C		-	140	-	MHz
C _c	collector capacitance	V _{CB} = 10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	11	-	pF

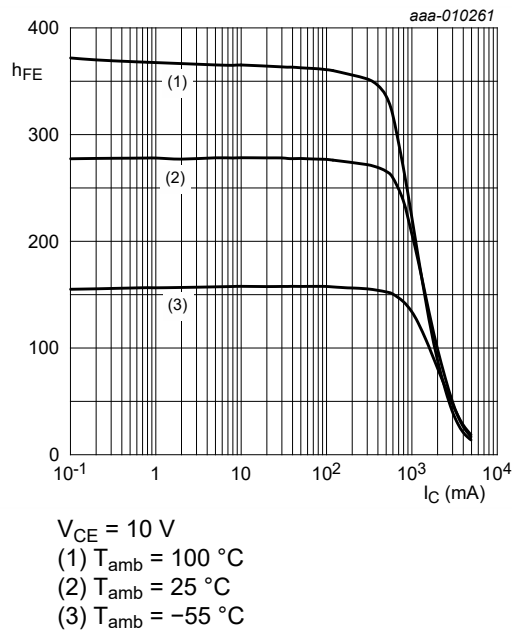


Fig. 4. DC current gain as a function of collector current; typical values

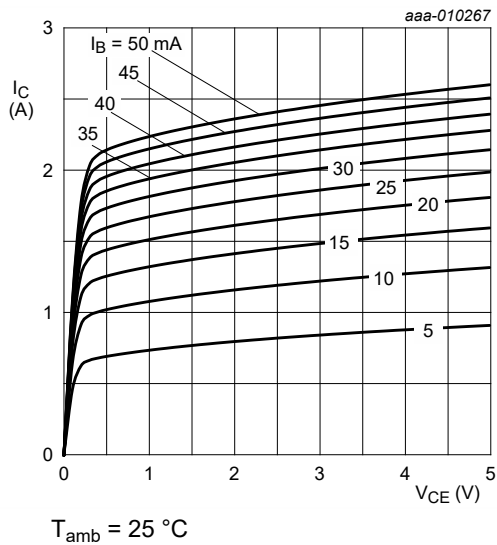


Fig. 5. Collector current as a function of collector-emitter voltage; typical values

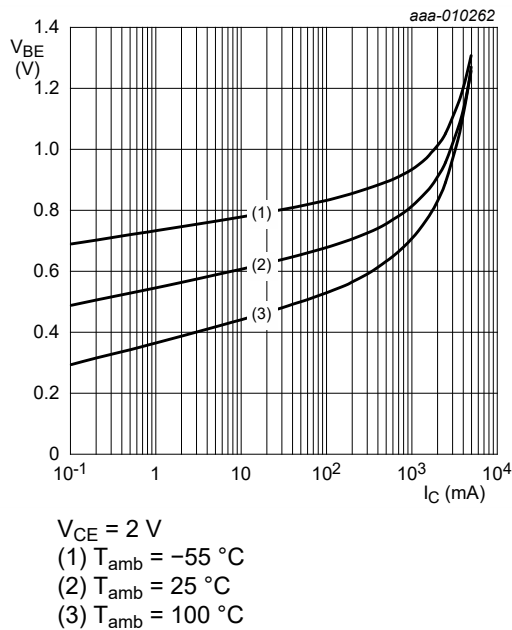


Fig. 6. Base-emitter voltage as a function of collector current; typical values

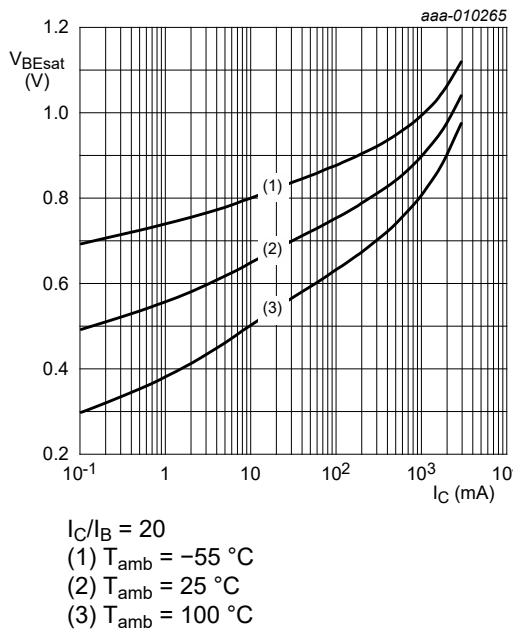


Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values

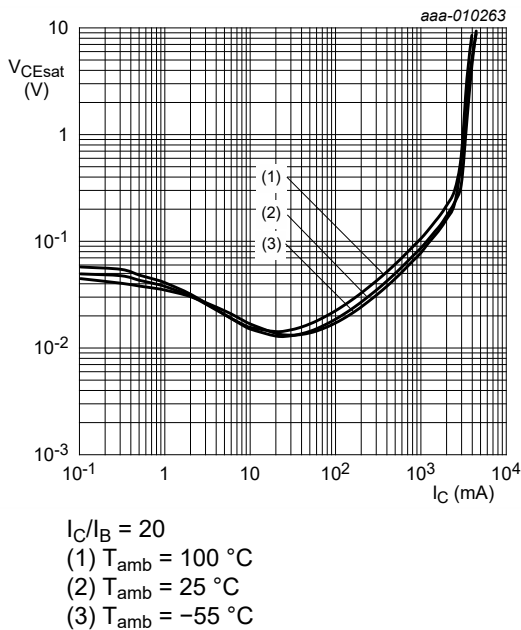


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

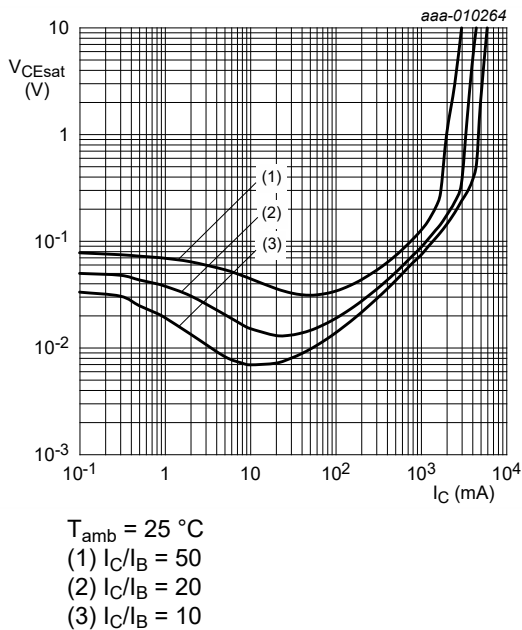


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

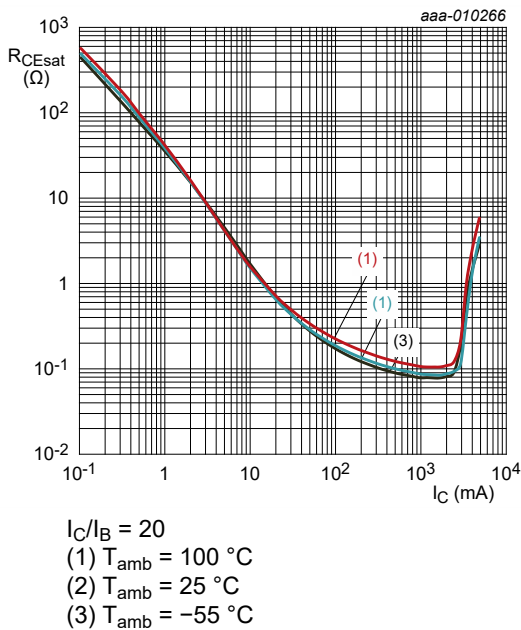


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values

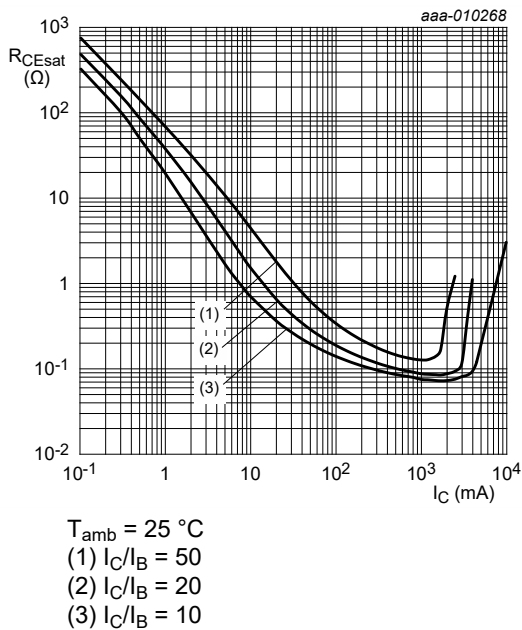


Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values

11. Package outline

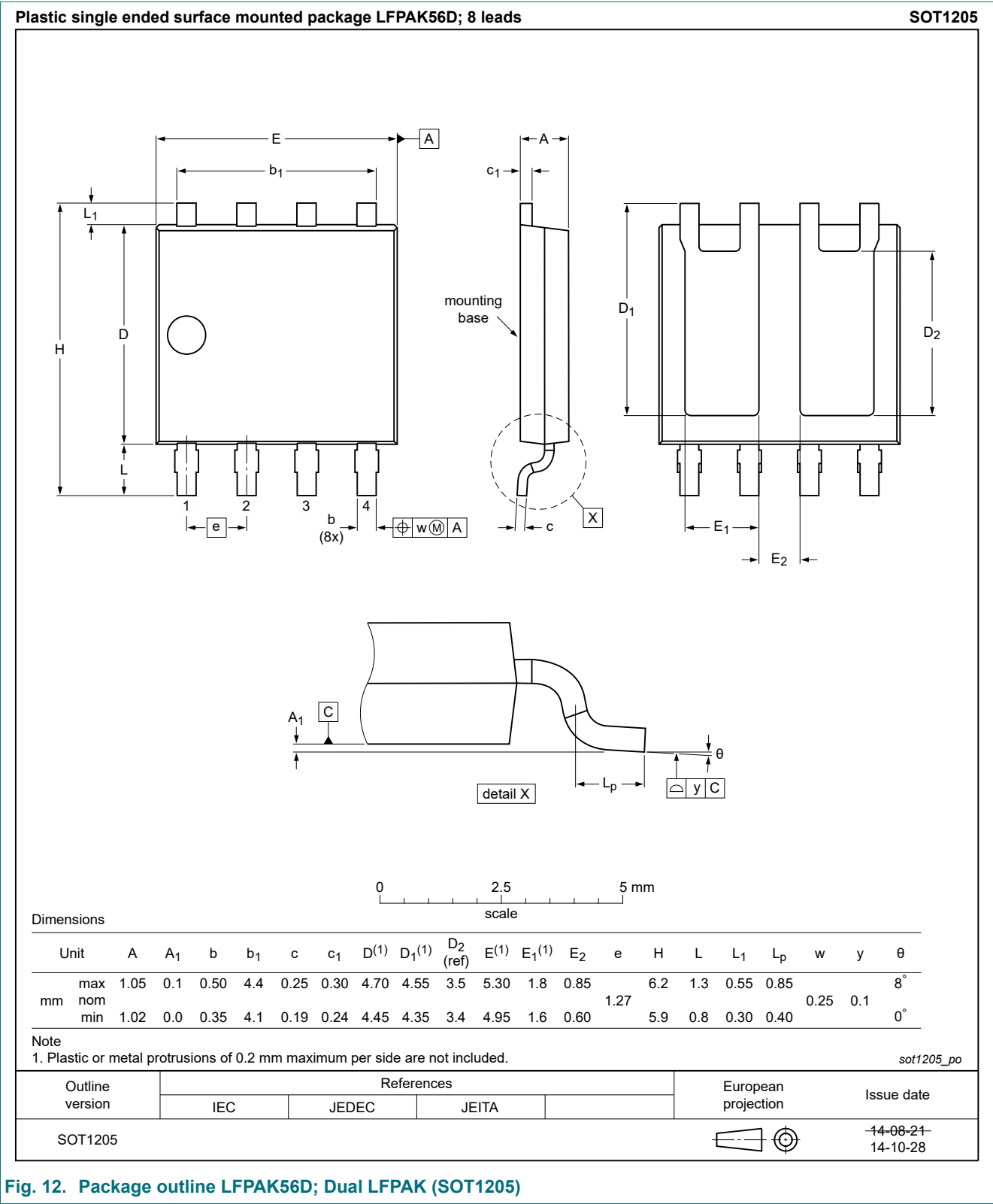


Fig. 12. Package outline LFAK56D; Dual LFAK (SOT1205)

12. Soldering

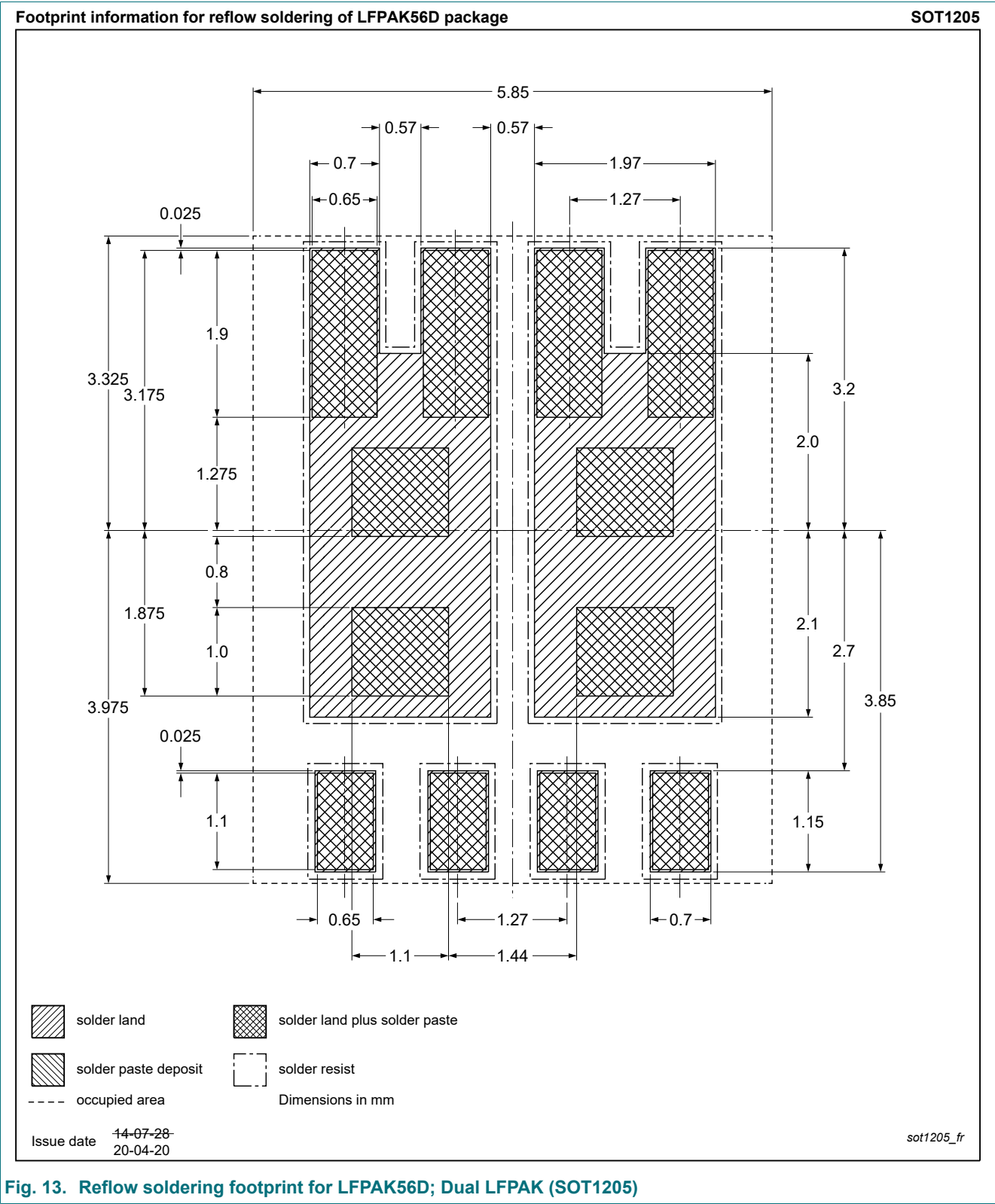


Fig. 13. Reflow soldering footprint for LFPAK56D; Dual LFPAK (SOT1205)

13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PHPT610030NK v.3	20241008	Product data sheet	-	PHPT610030NK v.2
Modifications:	Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PHPT610030NK v.2	20200910	Product data sheet	-	PHPT610030NK v.1
PHPT610030NK v.1	20141020	Product data sheet	-	-

14. 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.

- [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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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information.....2

6. Ordering information.....2

7. Marking.....2

8. Limiting values..... 3

9. Thermal characteristics..... 4

10. Characteristics..... 6

11. Package outline..... 9

12. Soldering..... 10

13. Revision history..... 11

14. Legal information..... 12

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