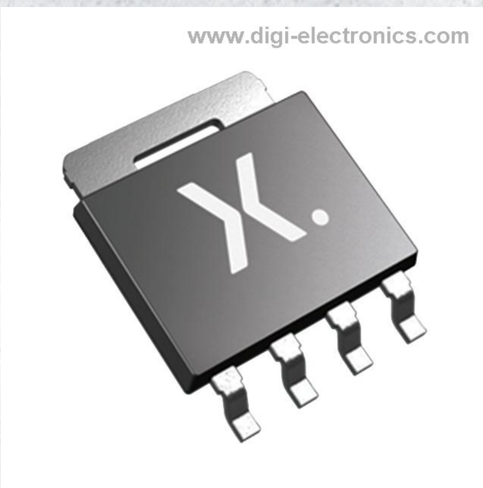
PHPT61006PYX Datasheet



https://www.DiGi-Electronics.com

DiGi Electronics Part Number	PHPT61006PYX-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	PHPT61006PYX
Description	TRANS PNP 100V 6A LFPAK56 PWRSO8
Detailed Description	Bipolar (BJT) Transistor PNP 100 V 6 A 116MHz 1.3 W Surface Mount LFPAK56, Power-SO8

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
PHPT61006PYX	Nexperia USA Inc.
Series:	Product Status:
-	Active
Transistor Type:	Current - Collector (Ic) (Max):
PNP	6 A
Voltage - Collector Emitter Breakdown (Max):	Vce Saturation (Max) @ Ib, Ic:
100 V	130mV @ 50mA, 1A
Current - Collector Cutoff (Max):	DC Current Gain (hFE) (Min) @ Ic, Vce:
100nA	170 @ 500mA, 2V
Power - Max:	Frequency - Transition:
1.3 W	116MHz
Operating Temperature:	Grade:
175°C (TJ)	Automotive
Qualification:	Mounting Type:
AEC-Q100	Surface Mount
Package / Case:	Supplier Device Package:
SC-100, SOT-669	LFPAK56, Power-SO8
Base Product Number:	
PHPT61006	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.29.0075	

PHPT61006PY

100 V, 6 A PNP high power bipolar transistor

21 January 2015 — Product data sheet

1. General description

PNP high power bipolar transistor in a SOT669 (LFPAK56) Surface-Mounted Device (SMD) power plastic package.

NPN complement: PHPT61006NY

2. Features and benefits

- High thermal power dissipation capability
- 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
- AEC-Q101 qualified.

3. Applications

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

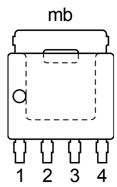
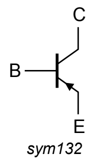
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-100	V
I_C	collector current			-	-	-6	A
I_{CM}	peak collector current	$t_p \leq 1$ ms; single pulse		-	-	-12	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -6$ A; $I_B = -600$ mA; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_{amb} = 25$ °C; pulsed		-	85	270	mΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 **LFPAK56; Power-SO8 (SOT669)**	
2	E	emitter		
3	E	emitter		
4	B	base		
mb	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PHPT61006PY	LFPAK56; Power-SO8	Plastic single-ended surface-mounted package (LFPAK56; Power-SO8); 4 leads	SOT669

7. Marking

Table 4. Marking codes

Type number	Marking code
PHPT61006PY	1006PAB

8. Limiting values

Table 5. Limiting values

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

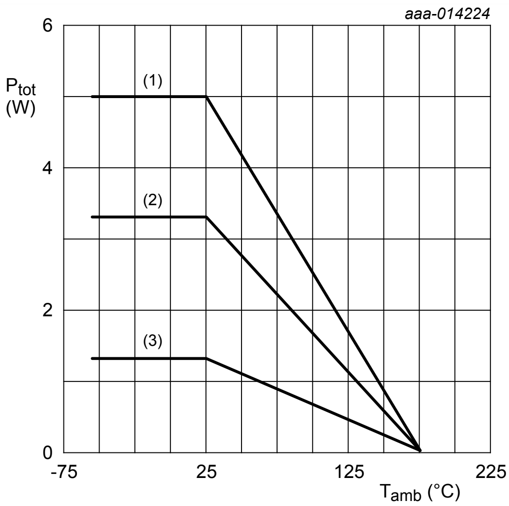
Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-100	V
V_{CEO}	collector-emitter voltage	open base		-	-100	V
V_{EBO}	emitter-base voltage	open collector		-	-8	V
I_C	collector current			-	-6	A
I_{CM}	peak collector current	$t_p \leq 1$ ms; single pulse		-	-12	A
I_B	base current			-	-1	A
I_{BM}	peak base current	$t_p \leq 1$ ms; pulsed		-	-2	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	1.3	W
			[2]	-	3.3	W
			[3]	-	5	W
			[4]	-	25	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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated mounting pad for collector 6 cm^2.

[3] Device mounted on an ceramic Printed-Circuit Board (PCB), Al_2O_3, standard footprint.

[4] Power dissipation from junction to mounting base.



(1) Ceramic PCB, Al_2O_3, standard footprint

(2) FR4 PCB, mounting pad for collector 6 cm^2

(3) FR4 PCB, standard footprint

Fig. 1. Power derating curves

9. Thermal characteristics

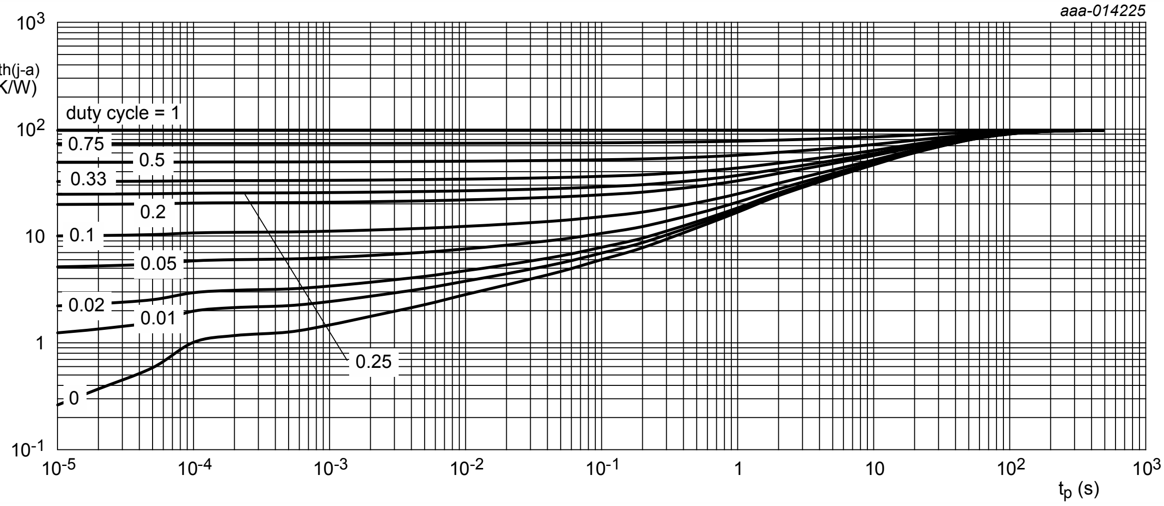
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	115	K/W
			[2]	-	-	45	K/W
			[3]	-	-	30	K/W
$R_{th(j-mb)}$	thermal resistance from junction to mounting base			-	-	6	K/W

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

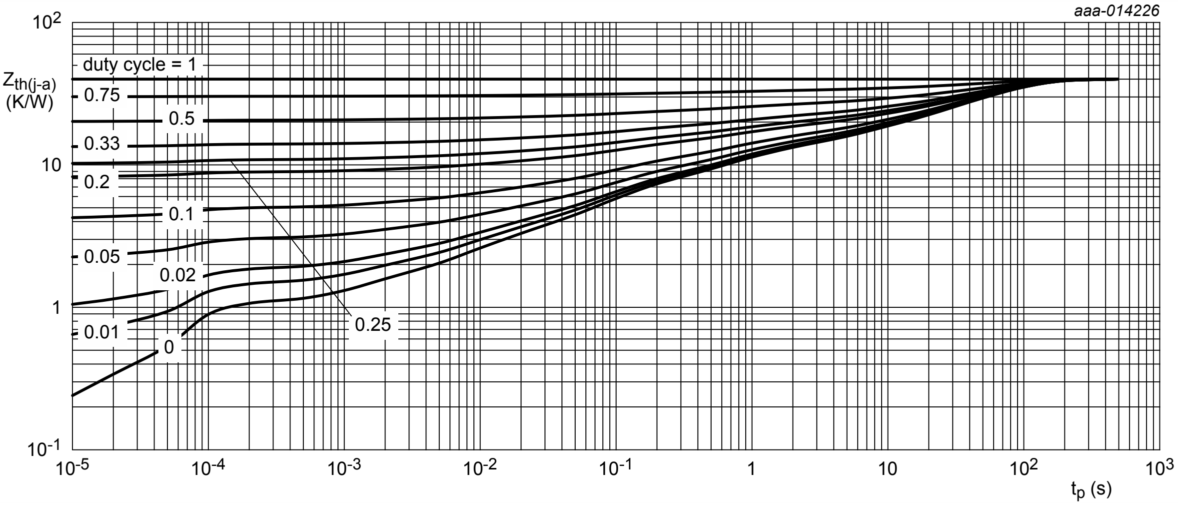
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for collector 6 cm^2.

[3] Device mounted on an ceramic Printed-Circuit Board (PCB), Al_2O_3, standard footprint.



FR4 PCB, standard footprint

Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for collector 6 cm^2

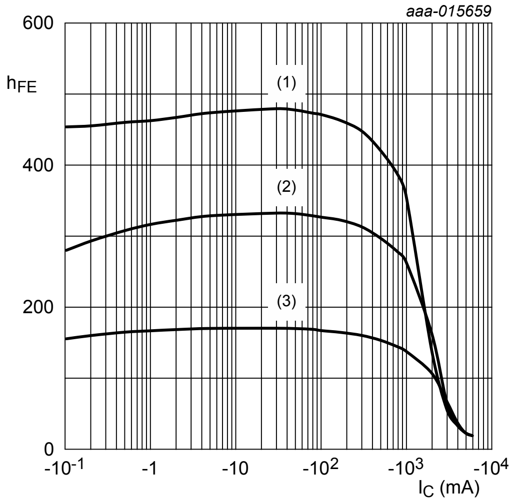
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
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} = -8 V; I_C = 0 A; T_{amb} = 25 °C		-	-	-100	nA
h_{FE}	DC current gain	V_{CE} = -2 V; I_C = -500 mA; T_{amb} = 25 °C		170	305	-	
		V_{CE} = -2 V; I_C = -1 A; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C; pulsed		160	275	-	
		V_{CE} = -2 V; I_C = -3 A; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C; pulsed		45	90	-	
		V_{CE} = -2 V; I_C = -6 A; pulsed; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		10	20	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -1 A; I_B = -50 mA; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		-	-75	-130	mV
		I_C = -3 A; I_B = -300 mA; pulsed; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		-	-150	-240	mV
		I_C = -6 A; I_B = -600 mA; pulsed; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		-	-900	-1600	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = -6 A; I_B = -600 mA; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C; pulsed		-	85	270	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		-	-0.8	-0.95	V
		I_C = -3 A; I_B = -300 mA; pulsed; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		-	-0.95	-1.1	V
		I_C = -6 A; I_B = -600 mA; pulsed; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		-	-1.1	-1.25	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = -2 V; I_C = -500 mA; T_{amb} = 25 °C		-	-0.7	-0.8	V
t_d	delay time	V_{CC} = -12.5 V; I_C = -3 A; I_{Bon} = -150 mA; I_{Boff} = 150 mA; T_{amb} = 25 °C		-	15	-	ns
t_r	rise time			-	220	-	ns
t_{on}	turn-on time			-	235	-	ns
t_s	storage time			-	160	-	ns
t_f	fall time			-	185	-	ns
t_{off}	turn-off time			-	345	-	ns

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f_T	transition frequency	V_{CE} = -10 V; I_C = -500 mA; f = 100 MHz; T_{amb} = 25 °C		-	116	-	MHz
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	52	-	pF



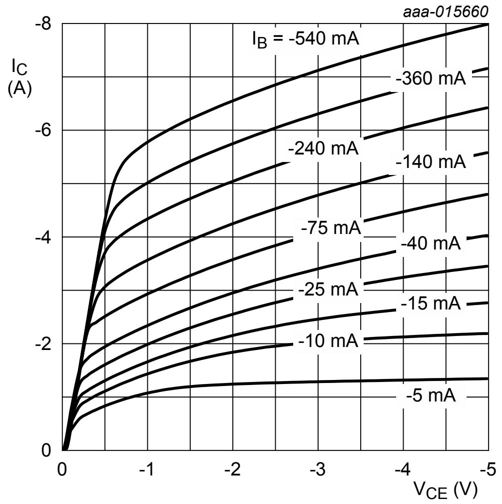
V_{CE} = -2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

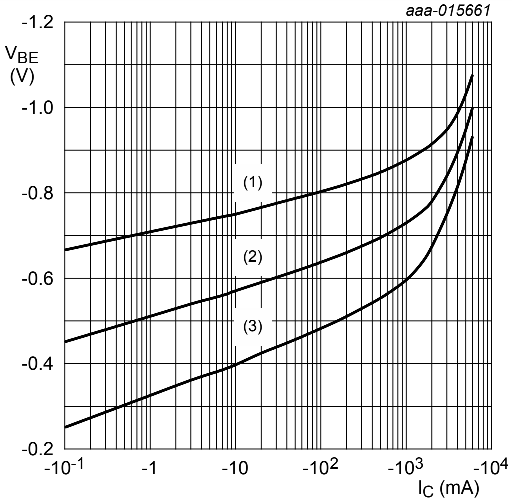
(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

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



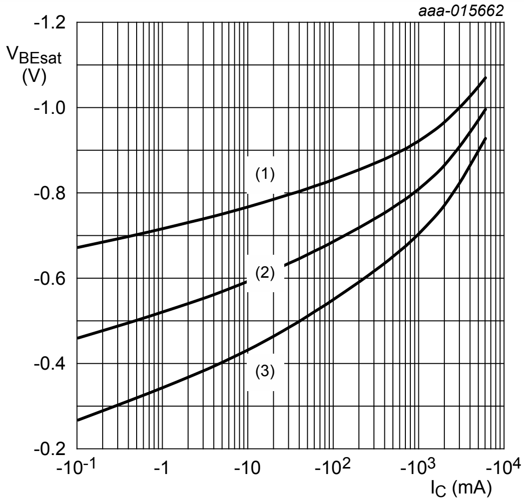
V_{CE} = -2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



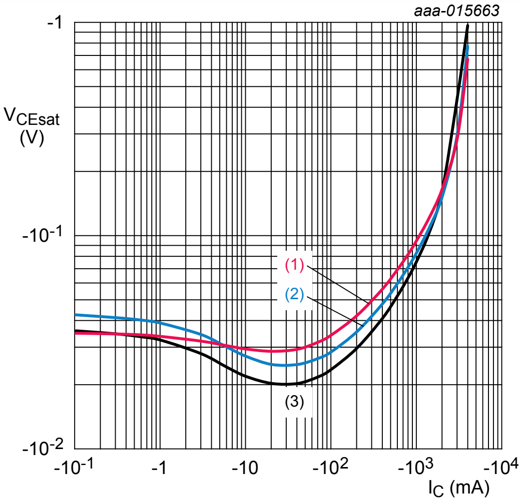
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



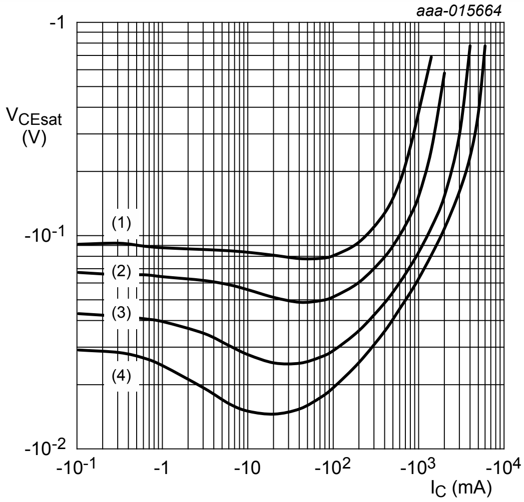
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

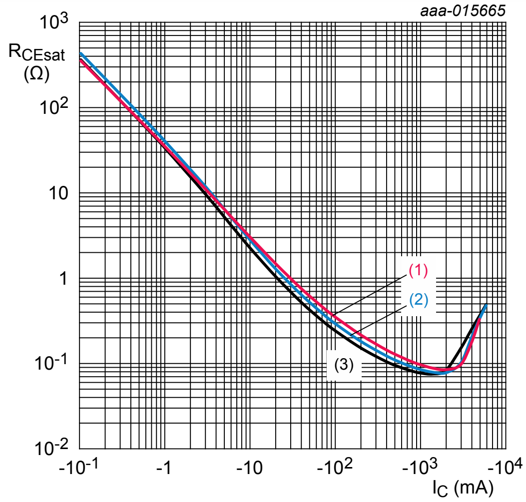
(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 20

(4) I_C/I_B = 10

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



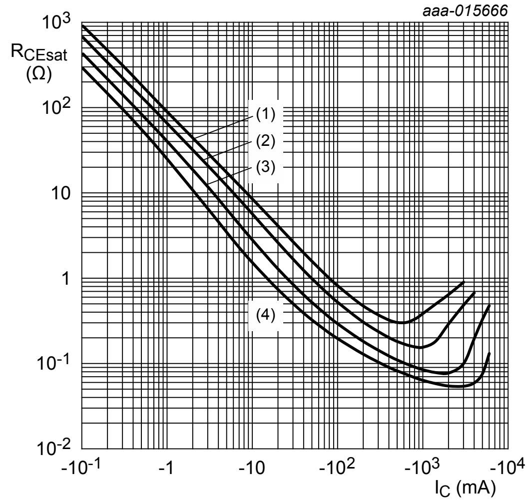
$I_C/I_B = 20$

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

(3) $I_C/I_B = 20$

(4) $I_C/I_B = 10$

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

11. Test information

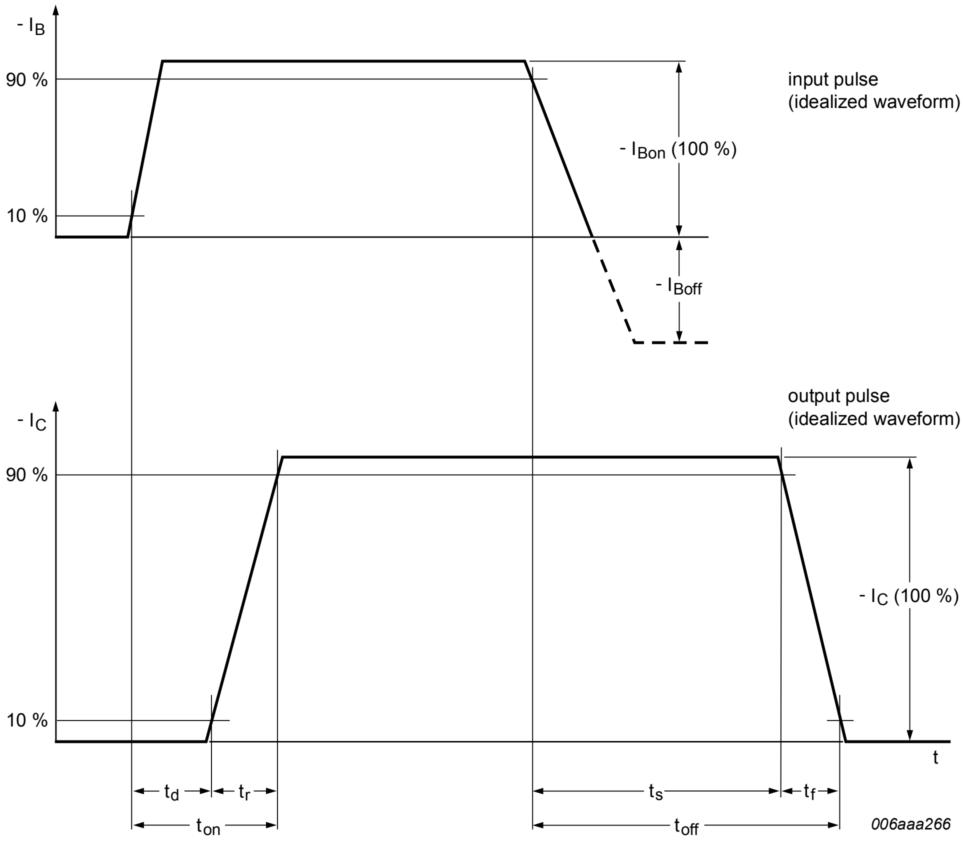


Fig. 12. BISS transistor switching time definition

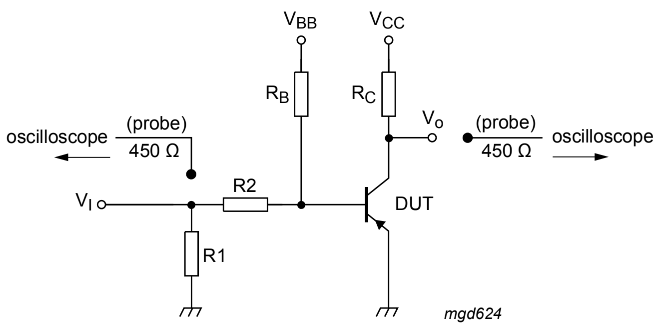


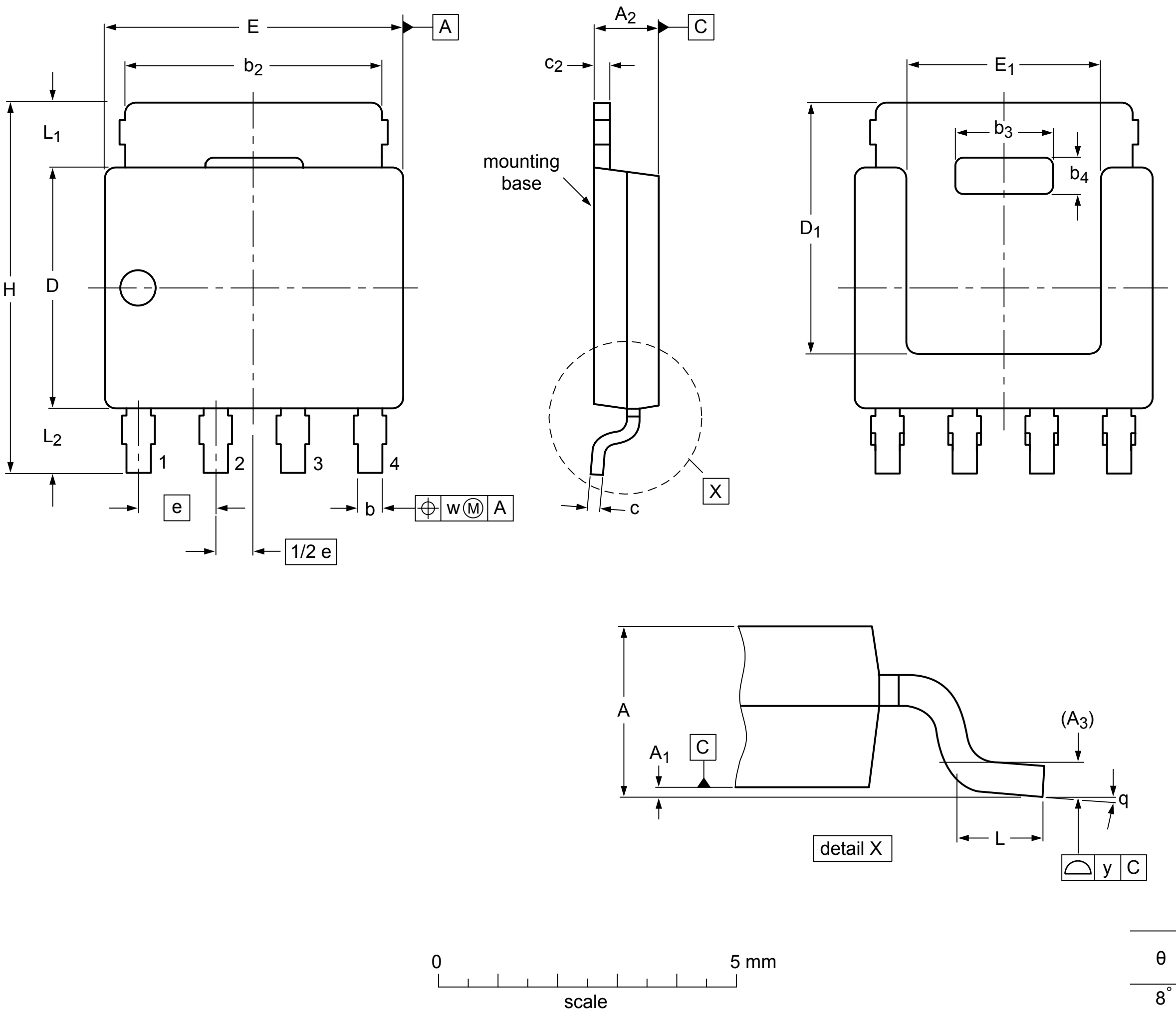
Fig. 13. Test circuit for switching times

11.1 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.

12. Package outline

Plastic single-ended surface-mounted package (LFPAK56; Power-SO8); 4 leads **SOT669**



Dimensions (mm are the original dimensions)

Unit(1)		A	A_1	A_2	A_3	b	b_2	b_3	b_4	c	c_2	D(1)	D_1(1)	E(1)	E_1(1)	e	H	L	L_1	L_2	w	y	θ
mm	max	1.20	0.15	1.10		0.50	4.41	2.2	0.9	0.25	0.30	4.10	4.20	5.0	3.3		6.2	0.85	1.3	1.3			8°
	nom				0.25											1.27					0.25	0.1	
	min	1.01	0.00	0.95		0.35	3.62	2.0	0.7	0.19	0.24	3.80		4.8	3.1		5.8	0.40	0.8	0.8			0°

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

sot669_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT669		MO-235				~~11-03-25~~ 13-02-27

Fig. 14. Package outline LFPAK56; Power-SO8 (SOT669)

13. Soldering

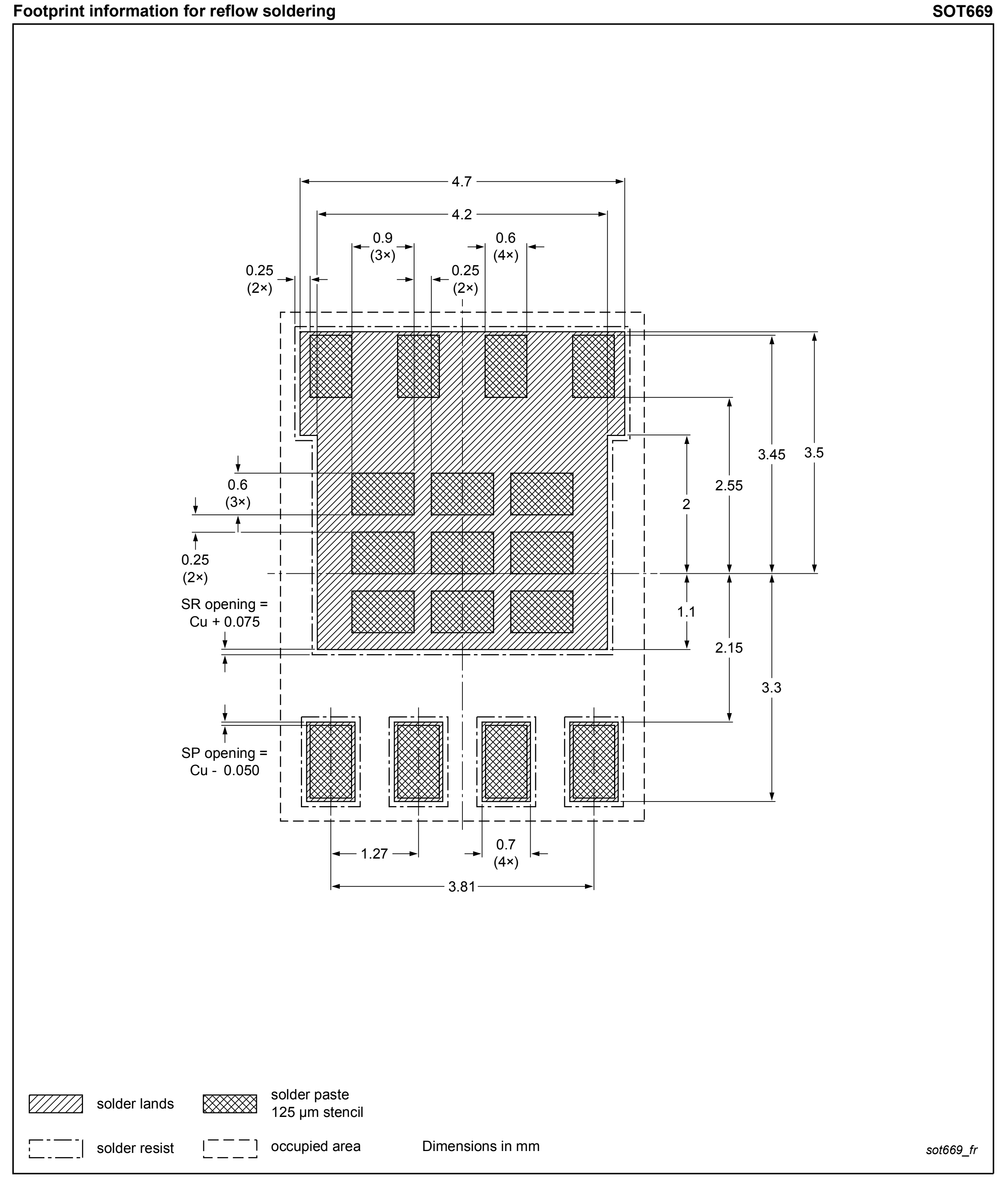


Fig. 15. Reflow soldering footprint for LFPAK56; Power-SO8 (SOT669)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PHPT61006PY v.1	20150121	Product data sheet	-	-

15. Legal information

15.1 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.
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16. Contents

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Date of release: 21 January 2015

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