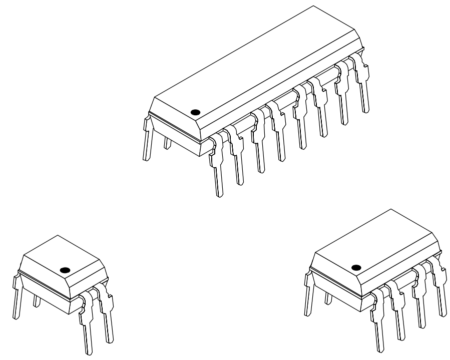
Optocoupler with Phototransistor Output

Description

The K817P/ K827PH/ K847PH consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in an 4-lead up to 16 lead plastic dual inline package.

The elements are mounted on one leadframe using a **coplanar technique,** providing a fixed distance between input and output for highest safety requirements.



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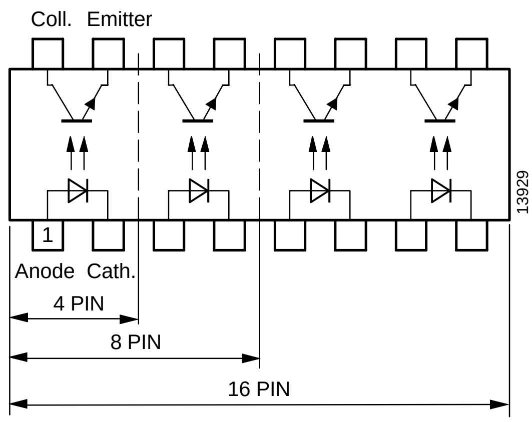
Applications

Programmable logic controllers, modems, answering machines, general applications

Features

- Endstackable to 2.54 mm (0.1”) spacing
- DC isolation test voltage V_{IO} = 5 kV
- Low coupling capacitance of typical 0.3 pF
- **C**urrent **T**ransfer **R**atio (CTR) selected into groups
- Low temperature coefficient of CTR
- Wide ambient temperature range
- **U**nderwriters **L**aboratory (UL) 1577 recognized, file number E-76222
- **CSA** (C-UL) 1577 recognized, file number E- 76222 - Double Protection
- Coupling System U



Order Instruction

Ordering Code	CTR Ranking	Remarks
K817P	50 to 600%	4 Pin = Single channel
K827PH	50 to 600%	8 Pin = Dual channel
K847PH	50 to 600%	16 Pin = Quad channel
K817P1	40 to 80%	4 Pin = Single channel
K817P2	63 to 125%	4 Pin = Single channel
K817P3	100 to 200%	4 Pin = Single channel
K817P4	160 to 320%	4 Pin = Single channel
K817P5	50 to 150%	4 Pin = Single channel
K817P6	100 to 300%	4 Pin = Single channel
K817P7	80 to 160%	4 Pin = Single channel
K817P8	130 to 260%	4 Pin = Single channel
K817P9	200 to 400%	4 Pin = Single channel

Absolute Maximum Ratings

Input (Emitter)

Parameter	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10\ \mu s$	I_{FSM}	1.5	A
Power dissipation	$T_{amb} \leq 25^\circ C$	P_V	100	mW
Junction temperature		T_j	125	°C

Output (Detector)

Parameter	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Peak collector current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation	$T_{amb} \leq 25^\circ C$	P_V	150	mW
Junction temperature		T_j	125	°C

Coupler

Parameter	Test Conditions	Symbol	Value	Unit
AC isolation test voltage (RMS)	t = 1 min	V_{IO} 1)	5	kV
Total power dissipation	$T_{amb} \leq 25^\circ C$	P_{tot}	250	mW
Operating ambient temperature range		T_{amb}	–40 to +100	°C
Storage temperature range		T_{stg}	–55 to +125	°C
Soldering temperature	2 mm from case, $t \leq 10$ s	T_{sd}	260	°C
1) Related to standard climate 23/50 DIN 50014				

Electrical Characteristics (T_{amb} = 25°C)

Input (Emitter)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		50		pF

Output (Detector)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter voltage	I_C = 100 µA	V_{CEO}	70			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector dark current	V_{CE} = 20 V, I_F = 0, E = 0	I_{CEO}			100	nA

Coupler

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	V_{CEsat}			0.3	V
Cut-off frequency	I_F = 10 mA, V_{CE} = 5 V, R_L = 100 Ω	f_c		100		kHz
Coupling capacitance	f = 1 MHz	C_k		0.3		pF

Current Transfer Ratio (CTR)

Parameter	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
I_C/I_F	V_{CE} = 5 V, I_F = 5 mA	K817P	CTR	0.5		6.0	
	V_{CE} = 5 V, I_F = 5 mA	K827PH	CTR	0.5		6.0	
	V_{CE} = 5 V, I_F = 5 mA	K847PH	CTR	0.5		6.0	
	V_{CE} = 5 V, I_F = 10 mA	K817P1	CTR	0.4		0.8	
	V_{CE} = 5 V, I_F = 10 mA	K817P2	CTR	0.63		1.25	
	V_{CE} = 5 V, I_F = 10 mA	K817P3	CTR	1.0		2.0	
	V_{CE} = 5 V, I_F = 10 mA	K817P4	CTR	1.6		3.2	
	V_{CE} = 5 V, I_F = 5 mA	K817P5	CTR	0.5		1.5	
	V_{CE} = 5 V, I_F = 5 mA	K817P6	CTR	1.0		3.0	
	V_{CE} = 5 V, I_F = 5 mA	K817P7	CTR	0.8		1.6	
	V_{CE} = 5 V, I_F = 5 mA	K817P8	CTR	1.3		2.6	
	V_{CE} = 5 V, I_F = 5 mA	K817P9	CTR	2.0		4.0	

Switching Characteristics

Parameter	Test Conditions	Symbol	Typ.	Unit
Delay time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω (see figure 1)	t_d	3.0	µs
Rise time		t_r	3.0	µs
Fall time		t_f	4.7	µs
Storage time		t_s	0.3	µs
Turn-on time		t_{on}	6.0	µs
Turn-off time		t_{off}	5.0	µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ (see figure 2)	t_{on}	9.0	µs
Turn-off time		t_{off}	18.0	µs

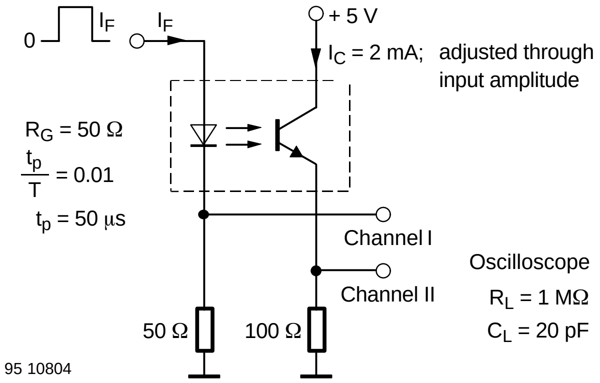


Figure 1. Test circuit, non-saturated operation

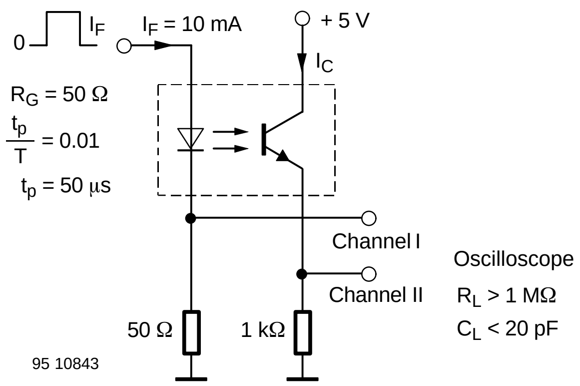
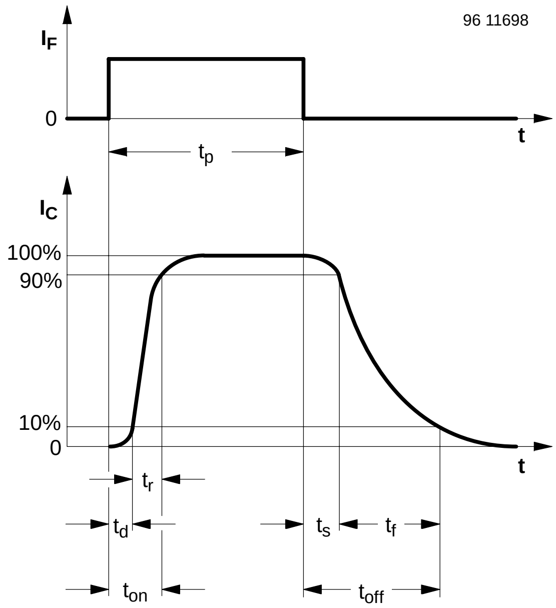


Figure 2. Test circuit, saturated operation



t_p	pulse duration	t_s	storage time
t_d	delay time	t_f	fall time
t_r	rise time	t_{off} (= t_s + t_f)	turn-off time
t_{on} (= t_d + t_r)	turn-on time		

Figure 3. Switching times

Typical Characteristics (T_{amb} = 25°C, unless otherwise specified)

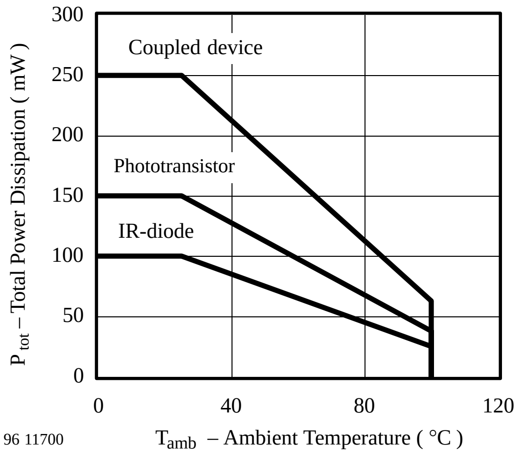


Figure 4. Total Power Dissipation vs. Ambient Temperature

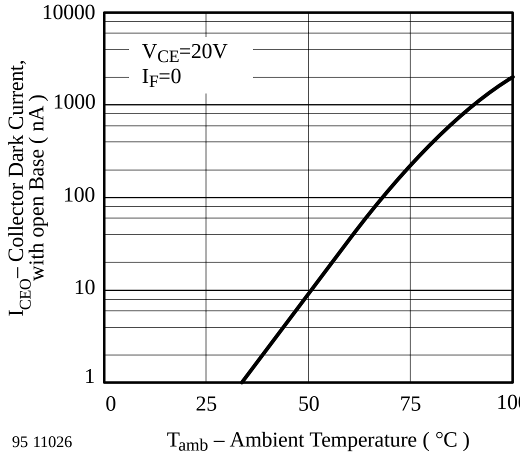


Figure 7. Collector Dark Current vs. Ambient Temperature

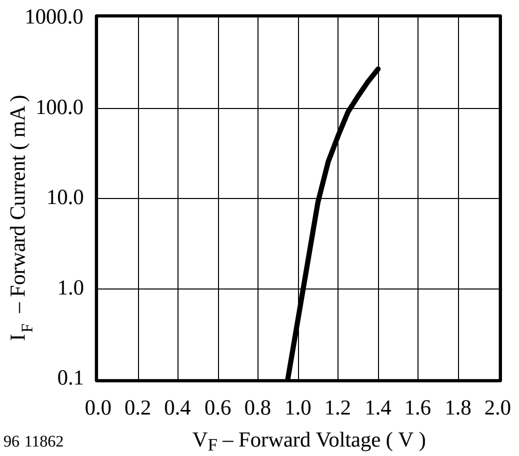


Figure 5. Forward Current vs. Forward Voltage

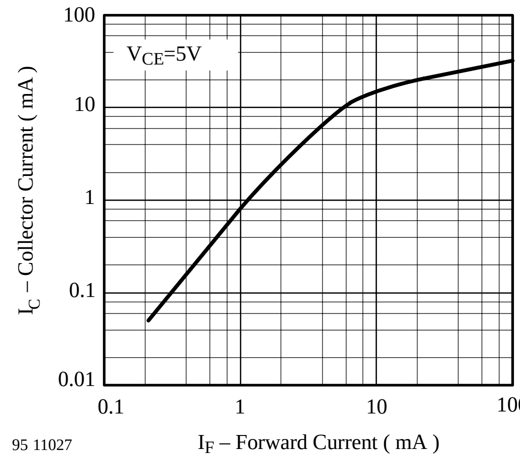


Figure 8. Collector Current vs. Forward Current

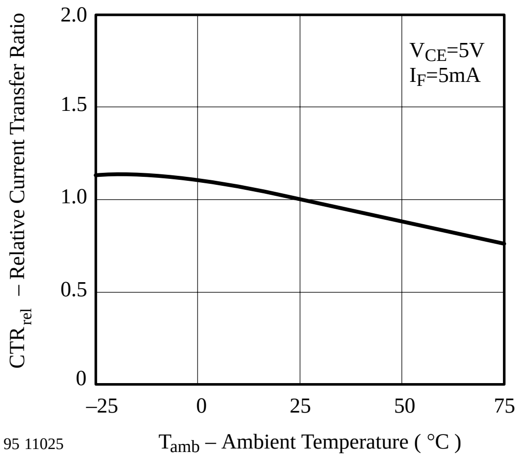


Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature

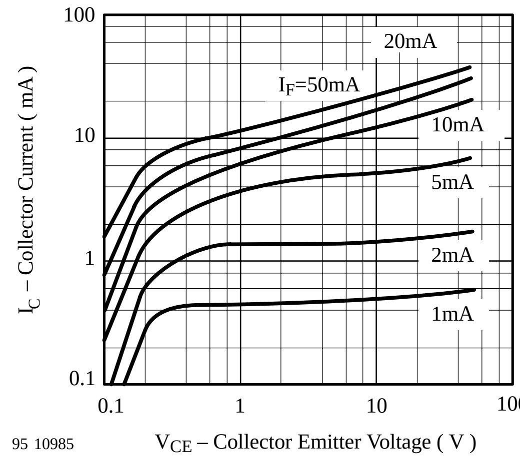


Figure 9. Collector Current vs. Collector Emitter Voltage

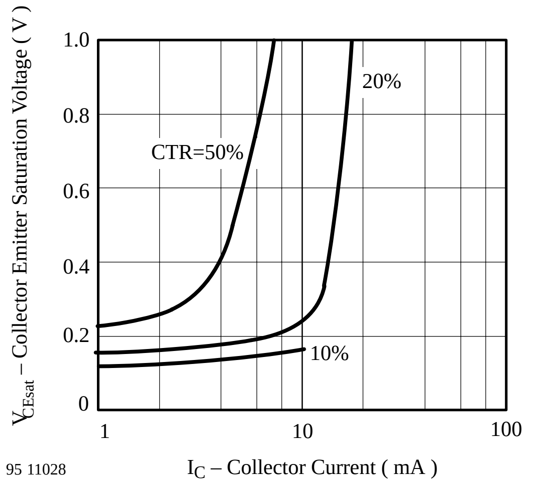


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

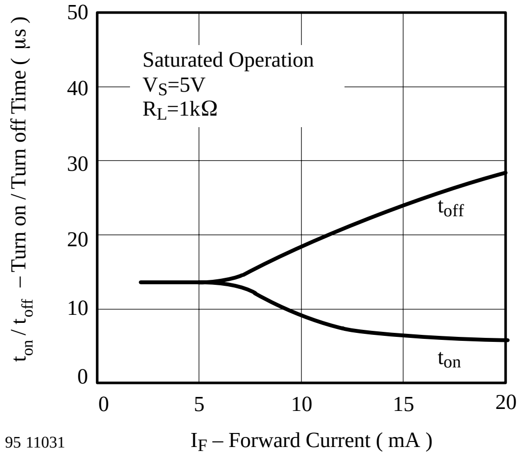


Figure 12. Turn on / off Time vs. Forward Current

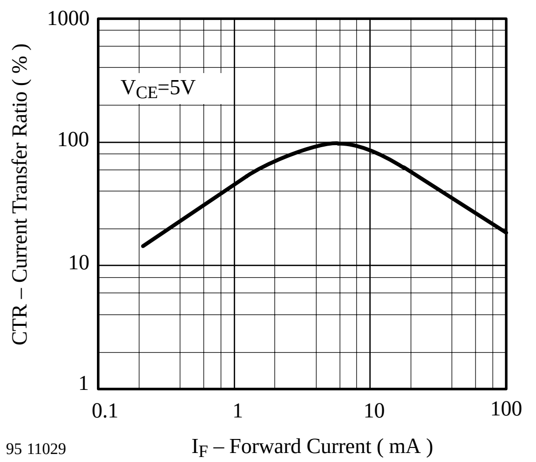


Figure 11. Current Transfer Ratio vs. Forward Current

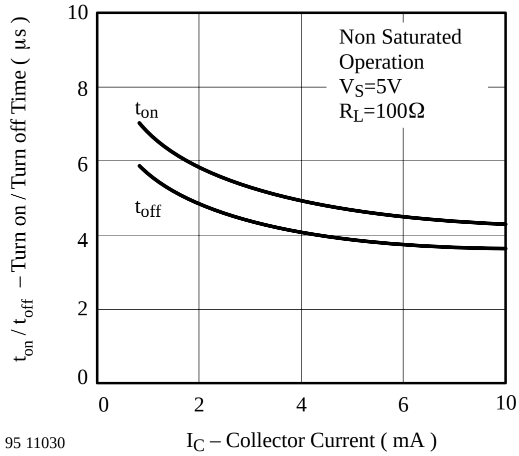


Figure 13. Turn on / off Time vs. Collector Current

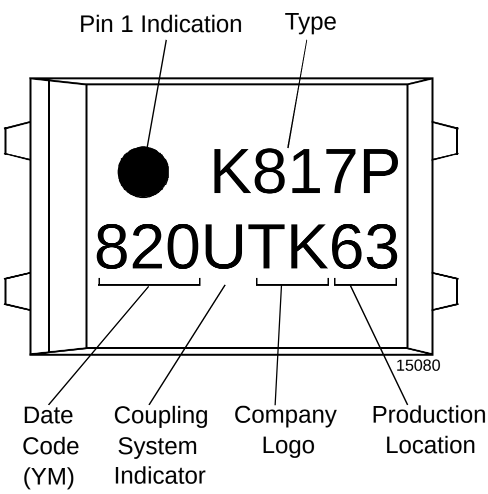
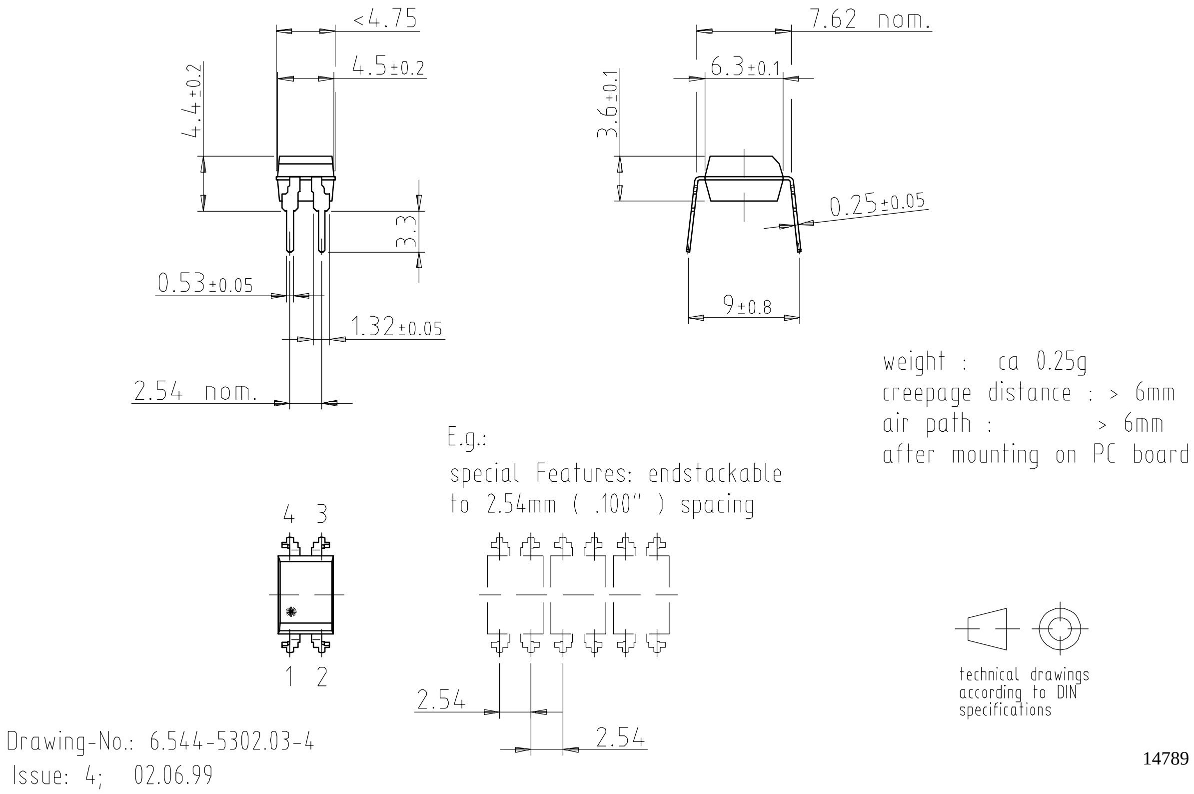


Figure 14. Marking example

Dimensions of K817P. in mm



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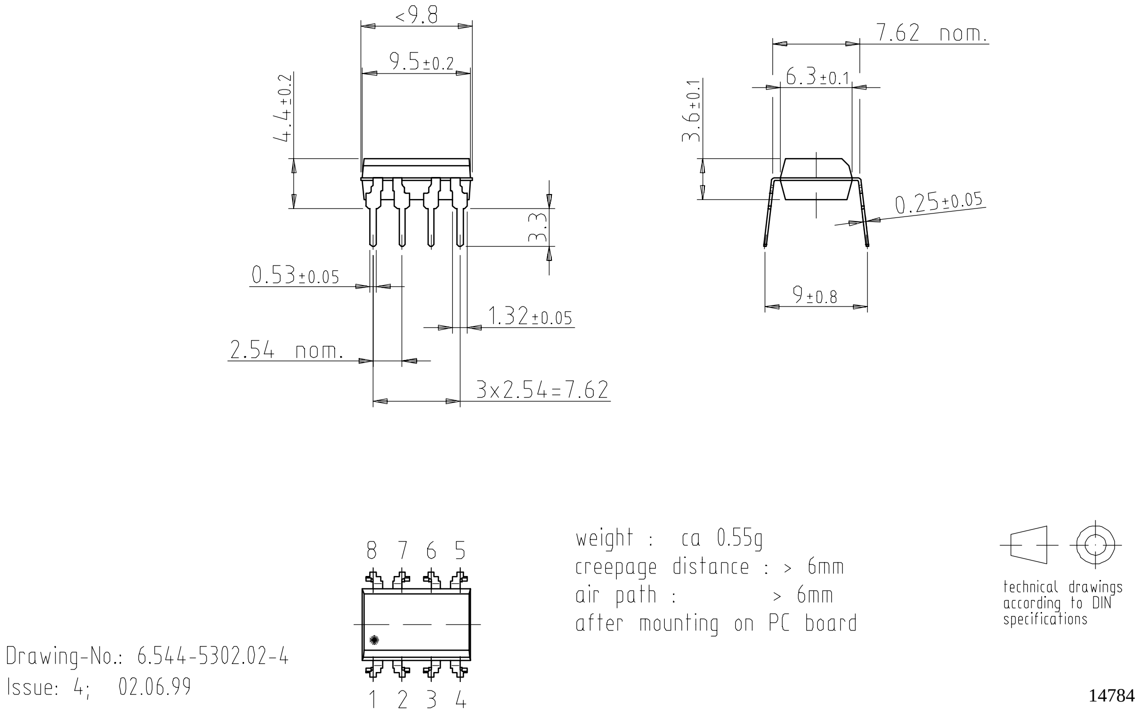
Dimensions of K827PH in mm



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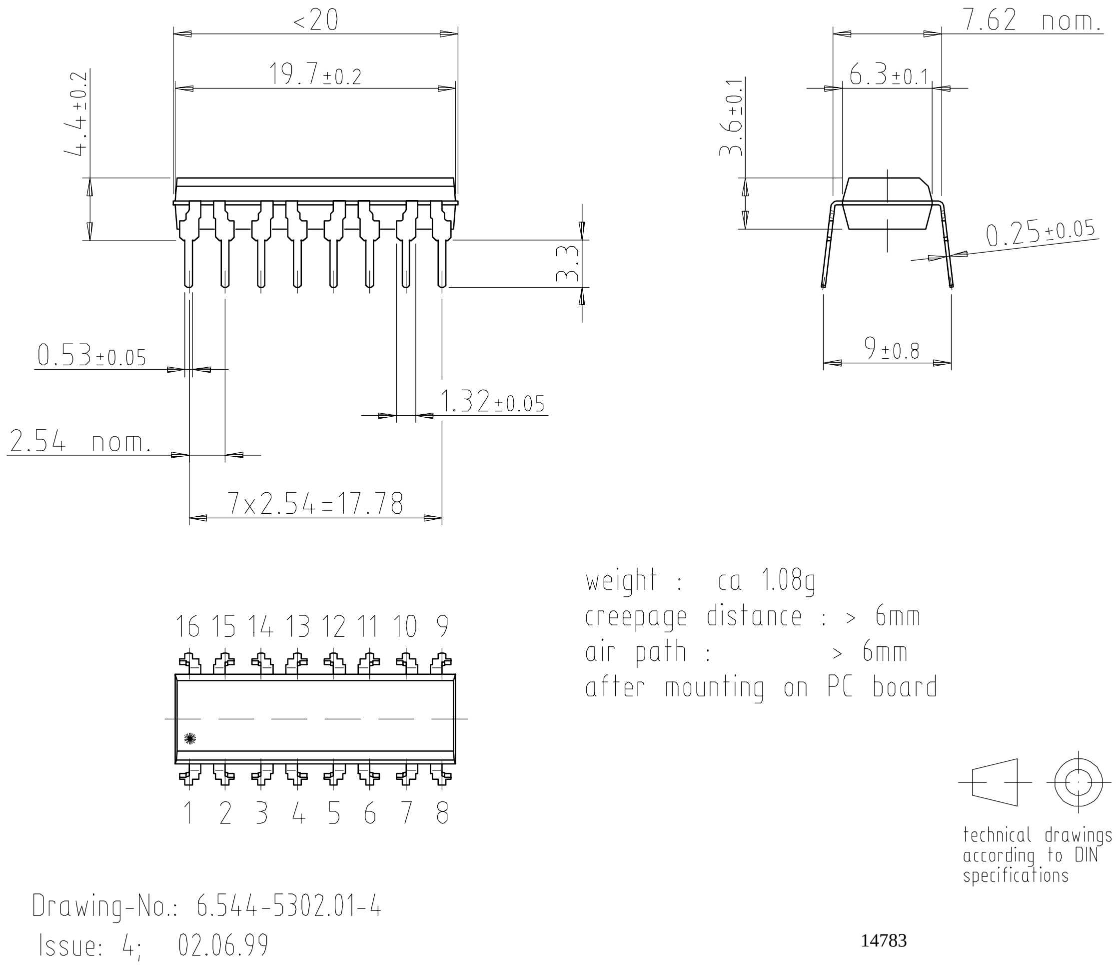
Dimensions of K847PH in mm



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Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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