DATA SHEET

PCF1254
Low voltage infrared remote control transmitter

Product specification
Supersedes data of July 1989
File under Integrated Circuits, IC01

January 1994

PHILIPS

Low voltage infrared remote control transmitter

PCF1254

FEATURES

- 22 bits of EEPROM code with automatic 2-bit preamble (over 4×10^6 combinations)
- Guaranteed reprogrammable up to 10 times
- Two operating modes: single or continuous transmission
- Supply voltage 2.5 V to 6.5 V
- High output current drive (typ. 50 mA at 5 V)
- Operating ambient temperature –40 to +85 °C
- Designed for minimum 10 years data retention.

GENERAL DESCRIPTION

The PCF1254 is intended for remote control access, security or identification systems. The circuit can be used to transmit a programmable 22-bit code to a receiver by infrared or other transmission means. The code is stored in an EEPROM which is programmed by the equipment manufacturer.

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
PCF1254P	8	DIL8	plastic	SOT97
PCF1254T	8	SO8	plastic	SOT96A

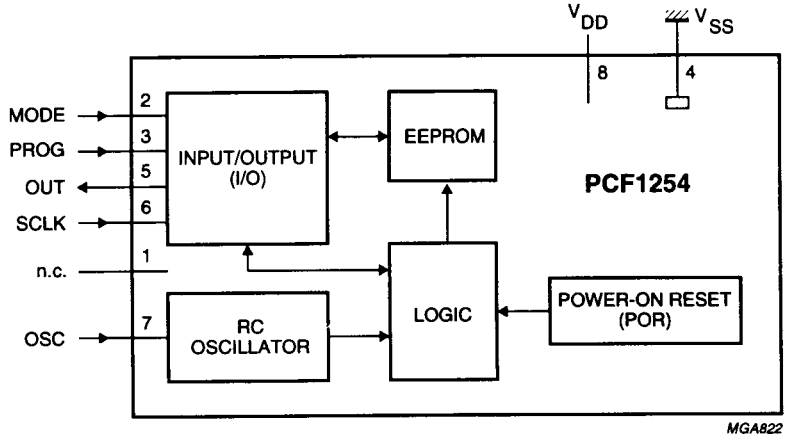


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
n.c.	1	not connected
MODE	2	mode input to select single transmission (LOW), or continuous transmission (HIGH)
PROG	3	programming input for the EEPROM
V_{SS}	4	negative supply
OUT	5	code output
SCLK	6	serial clock input to program the EEPROM
OSC	7	oscillator input and programming input for the EEPROM
V_{DD}	8	positive supply

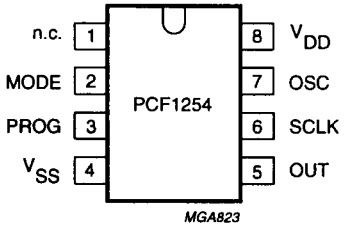
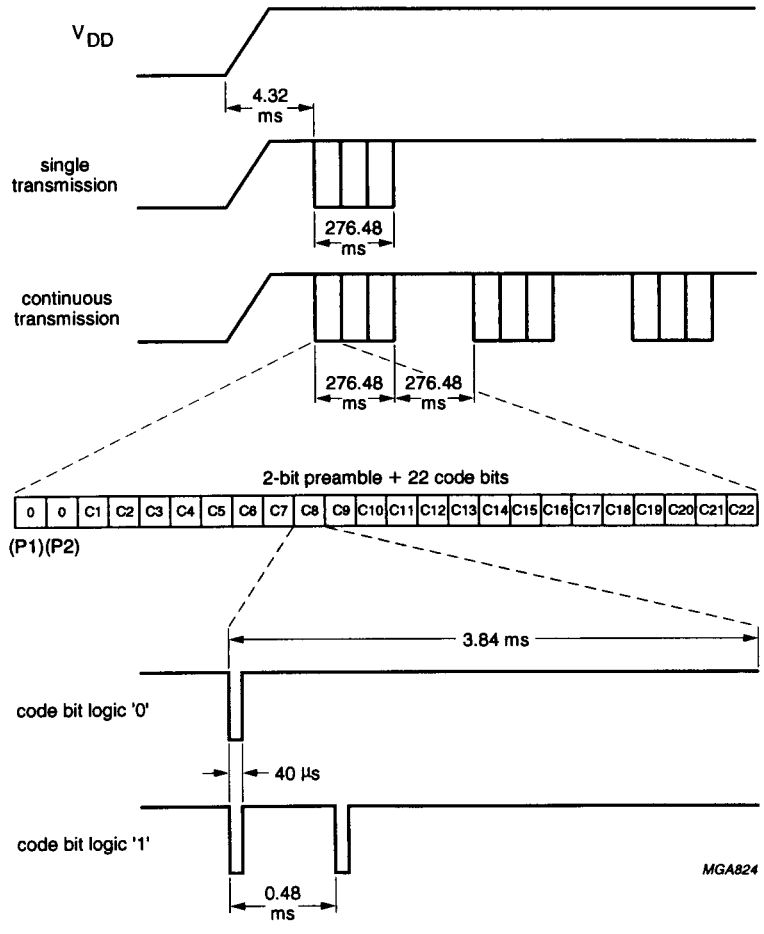


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

The PCF1254 uses fixed frequency data coding and a 22-bit EEPROM code. A few milliseconds after application of the power supply, the circuit outputs the 22-bit pre-programmed EEPROM code three times in succession (one burst) at OUT (pin 5) in a pulse-width modulated format (see Fig.3). A sequence of two zeroes is automatically transmitted preceding the 22-bit code (preamble). The MODE input (pin 2) selects either a single burst (MODE = V_{SS}) or continuous transmission of bursts (MODE = V_{DD}).



f_{osc} = 50 kHz.

Fig.3 Output signal timing for single and continuous transmission.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{DD}	supply voltage (pin 8)	−0.3	+7.0	V
V_I	input voltage			
	any input except pin 3	−0.8	V_{DD} + 0.8	V
	pin 3	−0.8	V_{DD} + 3.0	V
T_{amb}	operating ambient temperature	−40	+85	°C
$T_{stg(u)}$	unprogrammed storage temperature	−65	+150	°C
$T_{stg(p)}$	programmed storage temperature	−65	+85	°C

CHARACTERISTICS

V_{DD} = 2.5 to 6.5 V; f_{OSC} = 50 kHz; T_{amb} = −40 to +85 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_{DD}	operating supply voltage		2.5	–	6.5	V
I_{DD}	operating supply current	V_{DD} = 5 V; T_{amb} = −25 to +85 °C	–	–	500	µA
Inputs (pins 2 and 6)						
V_{IL}	LOW level input voltage		−0.8	–	$0.3V_{DD}$	V
V_{IH}	HIGH level input voltage		$0.7V_{DD}$	–	V_{DD} + 0.8	V
I_{IL}	input leakage current	input pin at V_{DD} or V_{SS}	–	–	1	µA
Input (pin 7)						
V_{IL}	LOW level input voltage	programming	−0.8	–	0	V
V_{IH}	HIGH level input voltage	programming	V_{DD}	–	V_{DD} + 0.8	V
I_{IL}	input leakage current	input pin at V_{SS}	−1	–	+1	µA
Input (pin 3)						
I_I	input current	V_{DD} = 5 V; V_{PROG} = 7.5 V	–	–	3	mA
Output (pin 5)						
I_{OL}	output sink current	V_{DD} = 5 V; V_{OL} = 4 V	25	50	–	mA
I_{OH}	output source current	V_{DD} = 5 V; V_{OH} = 0 V	−400	–	–	µA
Oscillator (pin 7)						
f_{OSC}	frequency range	V_{DD} = 3.5 V; R_{OSC} = 51 kΩ; C_{OSC} = 560 pF	40	–	60	kHz
f_{OSC}	maximum frequency		–	–	500	kHz
Input (pin 6)						
R_{SCLK}	SCLK resistor to V_{SS}		10	–	150	kΩ
EEPROM						
t_{RET}	data retention time		10	–	–	years
t_{CY}	endurance		10	–	–	cycles

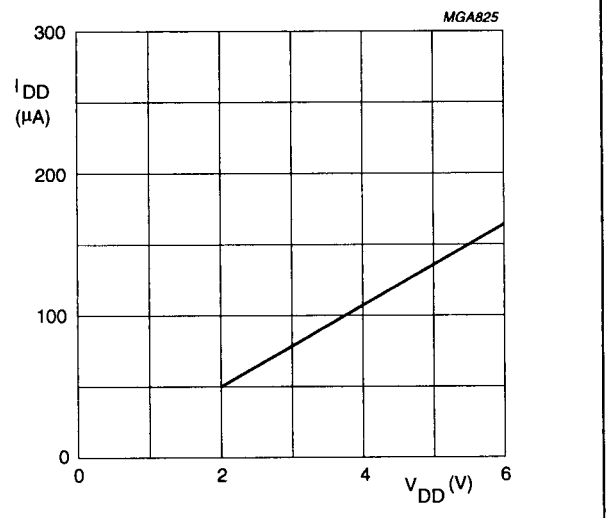
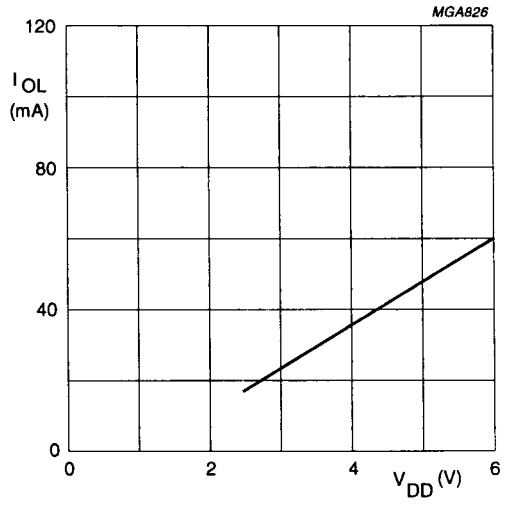


Fig.4 Typical supply current (I_{DD}) as a function of supply voltage (V_{DD}) with 50 kHz oscillator.



$V_{OL} = V_{DD} - 1$ V.

Fig.5 Typical output sink current (I_{OL}) as a function of supply voltage.

APPLICATION INFORMATION

A typical application for an oscillator frequency of 50 kHz is shown in Fig.6. Other frequencies may be obtained using the equation $f \approx 1 / (0.7 \times RC)$. For correct operation the following limits apply:

- Minimum resistance = 10 kΩ
- Maximum capacitance = 560 pF
- Maximum frequency = 500 kHz.

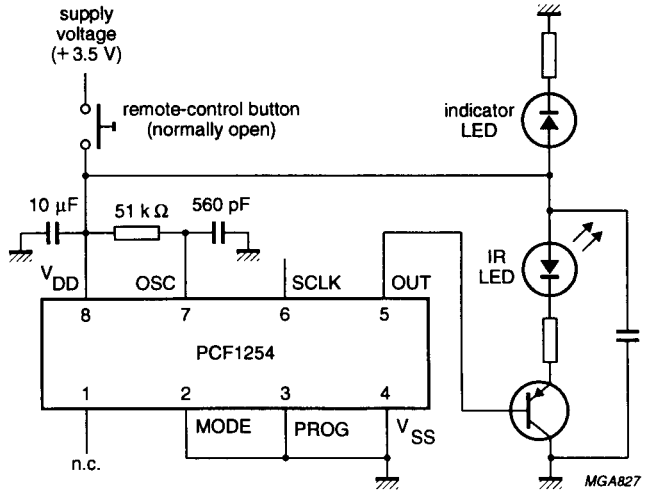


Fig.6 Typical application diagram for single-burst IR code transmission.

EEPROM PROGRAMMING (see Fig.7 and Table 1)

The code is programmed in the EEPROM by the manufacturer. The circuit may be reprogrammed up to a maximum of 10 times. The circuit is delivered with the code all zeroes.

To program the EEPROM the following procedure must be carried out:

- Connect V_{DD} to 5 V; connect pin 3 (PROG) to V_{DD}.

The circuit is now in programming mode. Pin 5 (OUT) is disabled and the oscillator is disabled.

- Apply a 5 V, 2 MHz signal to pin 7 (OSC) and input signals to pin 3 (PROG) and pin 6 (SCLK) as shown in Fig.7.
- Disconnect PROG from V_{DD}.

Erase

PROG is taken to 7.5 V for a time t_P.

Data input

With PROG at 7.5 V, a 5 V pulse on SCLK inputs a logic 1, and with PROG at 5 V, a 5 V pulse on SCLK inputs a logic 0. The data must be valid for a time t_S before and after the negative edge of SCLK. PROG must not be at 7.5 V for longer than time t_H but can remain at 5 V indefinitely. PROG must return to 5 V for a time t_L. 24 SCLK pulses must be given, the code is input on pulses 3 to 24. PROG must be 5 V during the other SCLK pulse(s). The data bits are input in the same order as they are transmitted.

Write

PROG is taken to 7.5 v for a time t_P.

In normal operation PROG must be connected to V_{SS}. The SCLK input has a 50 kΩ pull-down resistor and can be left open-circuit. Programming can be checked by taking V_{DD} to 0 V and back to 5 V and monitoring OUT. For fast checking a 5 V, 500 kHz signal (0.5 µs HIGH; 1.5 µs LOW) can be input at pin 7 (OSC), speeding up the output signal by a factor of 10.

Table 1 Timing values.

PARAMETER	MIN.	TYP.	MAX.	UNIT
t_P	4	5	10	ms
t_S	0.5	1.0	–	µs
t_H	–	2	4	µs
t_L	10	–	–	µs

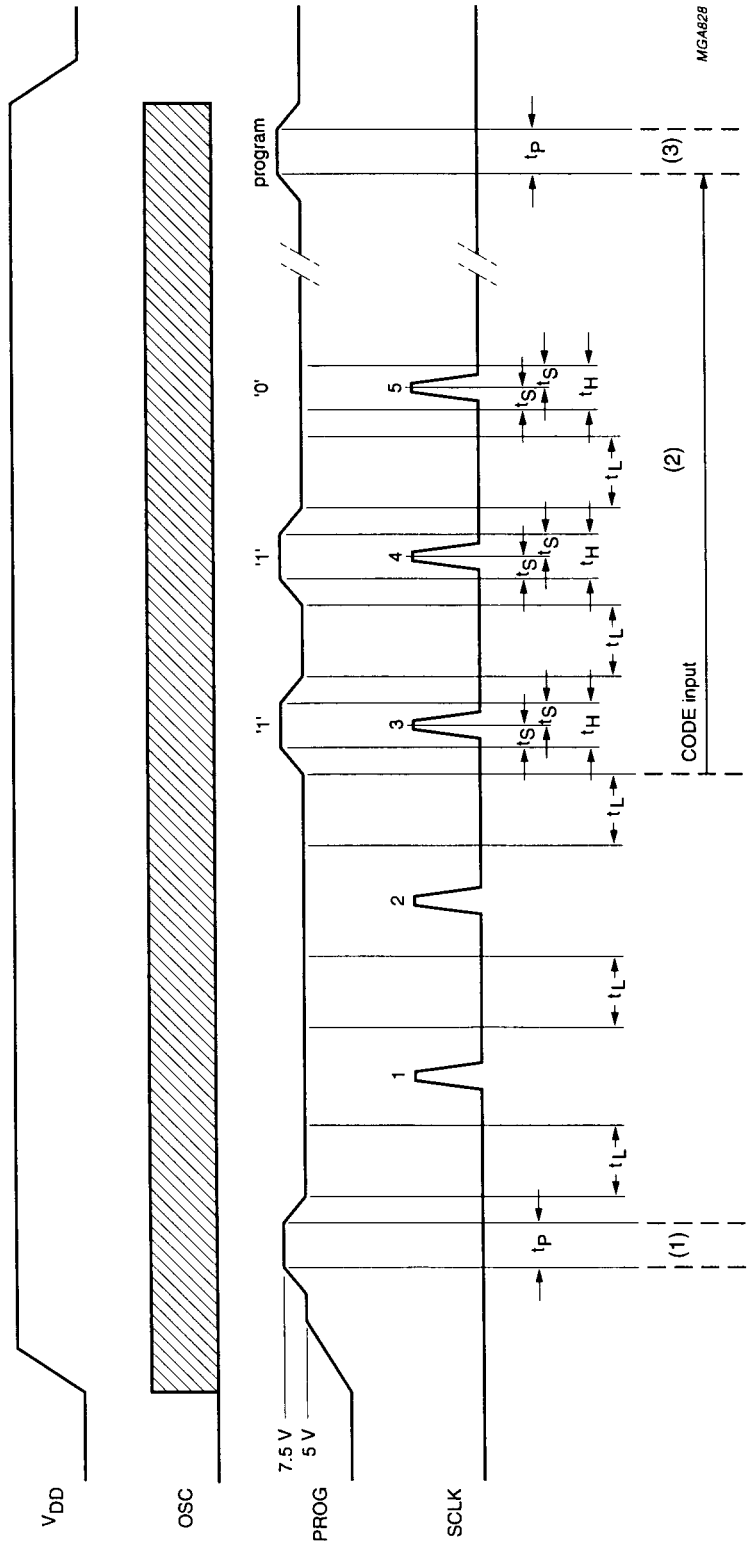
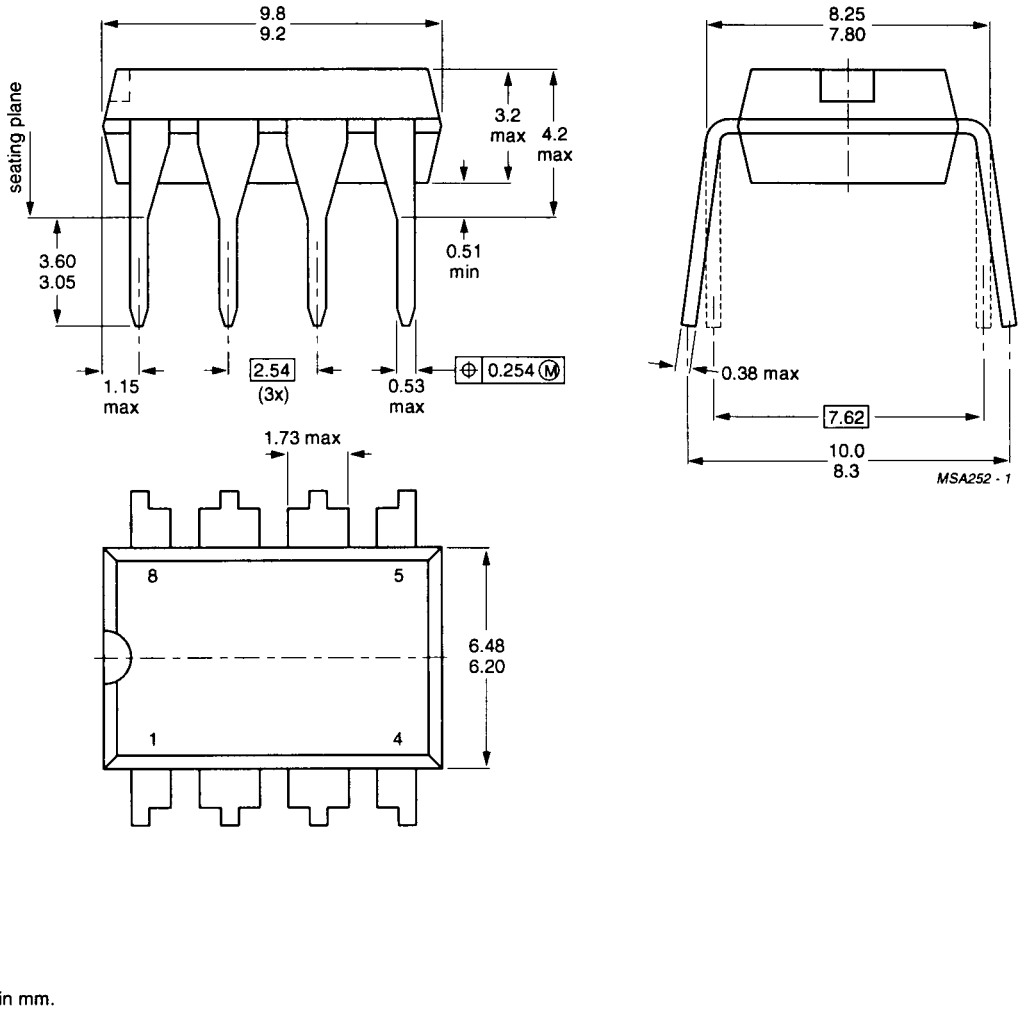


Fig.7 Timing diagram.

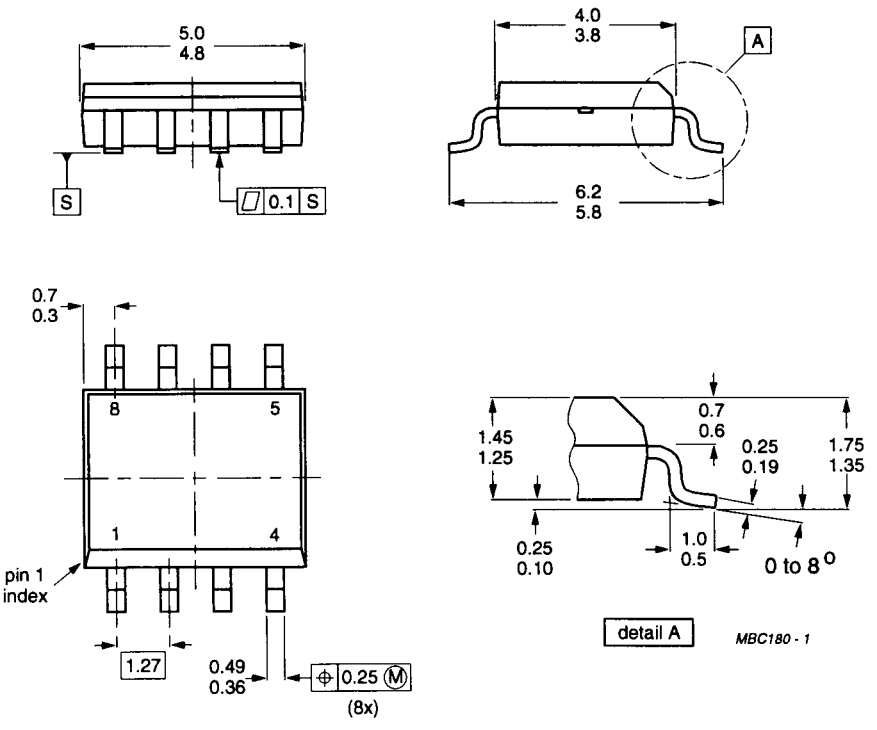
(1) Step 1 erase.
(2) Step 2 data input.
(3) Step 3 write.

PACKAGE OUTLINES



Dimensions in mm.

Fig.8 8-lead dual in-line; plastic (SOT97).



Dimensions in mm.

Fig.9 8-lead mini-pack; plastic (SO8; SOT96A).

SOLDERING

Plastic dual in-line packages

BY DIP OR WAVE

The maximum permissible temperature of the solder is 260 °C; this temperature must not be in contact with the joint for more than 5 s. The total contact time of successive solder waves must not exceed 5 s.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified storage maximum. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

REPAIRING SOLDERED JOINTS

Apply the soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C, it must not be in contact for more than 10 s; if between 300 and 400 °C, for not more than 5 s.

Plastic mini-packs

BY WAVE

During placement and before soldering, the component must be fixed with a droplet of adhesive. After curing the adhesive, the component can be soldered. The adhesive can be applied by screen printing, pin transfer or syringe dispensing.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder bath is 10 s, if allowed to cool to less than 150 °C within 6 s. Typical dwell time is 4 s at 250 °C.

A modified wave soldering technique is recommended using two solder waves (dual-wave), in which a turbulent wave with high upward pressure is followed by a smooth laminar wave. Using a mildly-activated flux eliminates the need for removal of corrosive residues in most applications.

BY SOLDER PASTE REFLOW

Reflow soldering requires the solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the substrate by screen printing, stencilling or pressure-syringe dispensing before device placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt, infrared, and vapour-phase reflow. Dwell times vary between 50 and 300 s according to method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 min at 45 °C.

REPAIRING SOLDERED JOINTS (BY HAND-HELD SOLDERING IRON OR PULSE-HEATED SOLDER TOOL)

Fix the component by first soldering two, diagonally opposite, end pins. Apply the heating tool to the flat part of the pin only. Contact time must be limited to 10 s at up to 300 °C. When using proper tools, all other pins can be soldered in one operation within 2 to 5 s at between 270 and 320 °C. (Pulse-heated soldering is not recommended for SO packages.)

For pulse-heated solder tool (resistance) soldering of VSO packages, solder is applied to the substrate by dipping or by an extra thick tin/lead plating before package placement.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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