DATA SHEET

TZA1048
4-channel BTL driver for CD/DVD drives

Product specification

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4-channel BTL driver for CD/DVD drives TZA1048

1 FEATURES

- Two Bridge-Tied Load (BTL) driver channels for sled and spindle motors and actuators
- Pulse Width Modulation (PWM) input
- Integral thermal shut-down circuit
- Integral mute control
- Two regulated reference voltage outputs for other chips in system; 3.3 V and 1.8 V respectively
- HSOP28 package.

2 APPLICATIONS

- BTL driver for CD and DVD players.

3 GENERAL DESCRIPTION

The TZA1048 is a four-channel BTL driver IC for driving motors and actuators in CD and DVD players.
Two reference voltage outputs are also available for peripheral ICs such as servo and pick-up head drivers.
The spindle motor control inputs to the IC can be either differential or single-ended.

4 ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TZA1048TH	HSOP28	plastic, heatsink small outline package; 28 leads	SOP007

5 BLOCK DIAGRAM

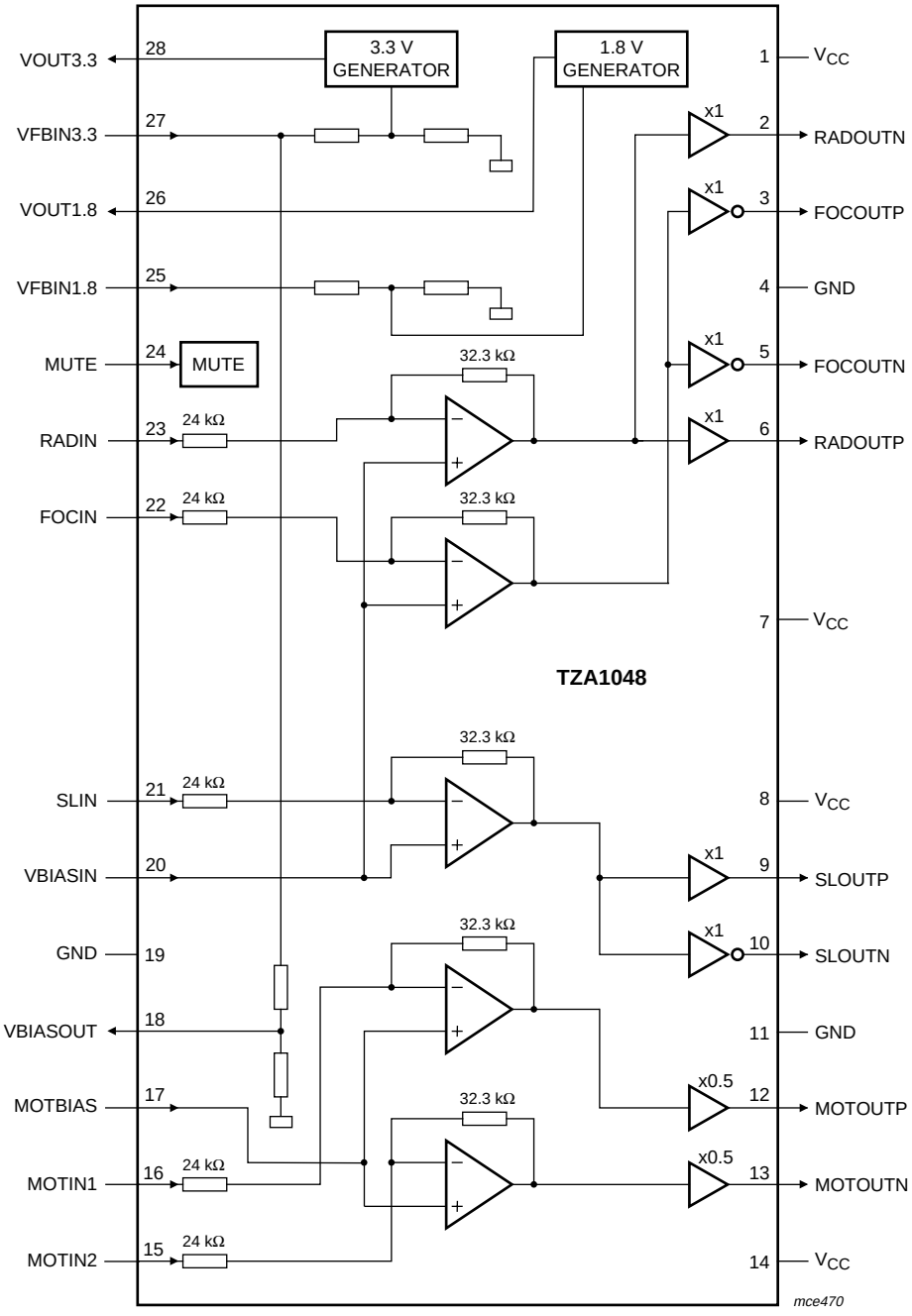


Fig.1 Block diagram.

6 PINNING

SYMBOL	PIN	DESCRIPTION
V_{CC}	1	supply voltage
RADOUTN	2	radial coil driver negative output
FOCOUTP	3	focus coil driver positive output
GND	4	ground
FOCOUTN	5	focus coil driver negative output
RADOUTP	6	radial coil driver positive output
V_{CC}	7	supply voltage
V_{CC}	8	supply voltage
SLOUTP	9	sled motor driver positive output
SLOUTN	10	sled motor driver negative output
GND	11	ground
MOTOUTP	12	spindle motor driver positive output
MOTOUTN	13	spindle motor driver negative output
V_{CC}	14	supply voltage
MOTIN2	15	spindle motor driver input 2
MOTIN1	16	spindle motor driver input 1
MOTBIAS	17	spindle motor bias input
VBIASOUT	18	1.65 V bias voltage output
GND	19	ground
VBIASIN	20	bias voltage input
SLIN	21	sled motor driver input
FOCIN	22	focus coil driver input
RADIN	23	radial coil driver input
MUTE	24	mute control input
VFBIN1.8	25	1.8 V generator/regulator feedback voltage input
VOUT1.8	26	1.8 V generator/regulator output
VFBIN3.3	27	3.3 V generator/regulator feedback voltage input
VOUT3.3	28	3.3 V generator/regulator output

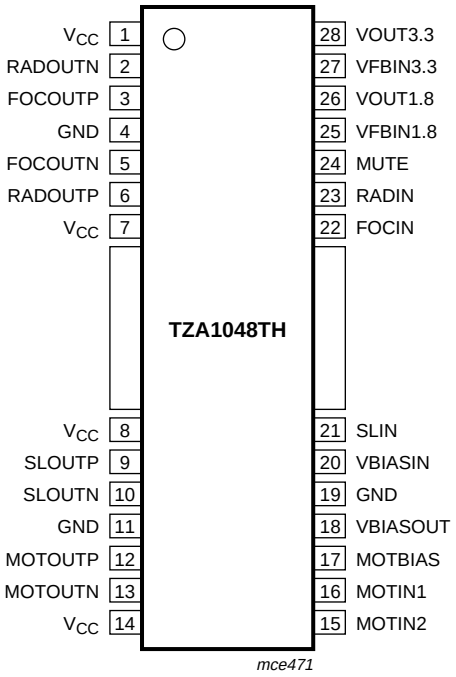


Fig.2 Pin configuration.

7 FUNCTIONAL DESCRIPTION

7.1 General notes

1. The integral thermal shut-down circuit mutes the output current when the chip temperature reaches 175 °C (typical). The hysteresis is set to 25 °C (typical), so the circuit will restart when the chip temperature falls to 150 °C (typical).
2. Mute mode is activated when the voltage at pin MUTE is below 0.5 V, and deactivated when the voltage at pin MUTE is above 1.2 V. In mute mode, both positive and negative output terminals will be at high-impedance state. However, the 3.3 V and 1.8 V outputs are not affected.
3. It is recommended that a 220 μF decoupling capacitor is connected between pins V_{CC} and pin GND and physically located as close as possible to these supply pins.
4. The positive outputs of the focus, radial and sled driver channels are in phase with their respective input signals. The positive output of the spindle driver channel is in phase with the input signal on pin MOTIN1.
5. The values of the resistors connected to each input channel must be equal to, or larger than, 4.7 kΩ to ensure that the gain of each input stage is less than, or equal to 1.
6. The GND pins are internally connected to heat dissipation fins within the package. You must ensure that these pins are connected to an external ground.
7. The 1.65 V bias voltage output from pin VBIASOUT is derived from the internal 3.3 V generator/regulator, and will be affected by any variation in the 3.3 V generator/regulator voltage.

8 LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{CC}	supply voltage	–	13.5	V
P	power dissipation	–	1.7	W
T_{oper}	operating temperature	0	70	°C
T_{stg}	storage temperature	–55	+150	°C

9 CHARACTERISTICS

T_{amb} = 25 °C; V_{CC} = 9 V; R_L = 8 Ω; unless otherwise specified.

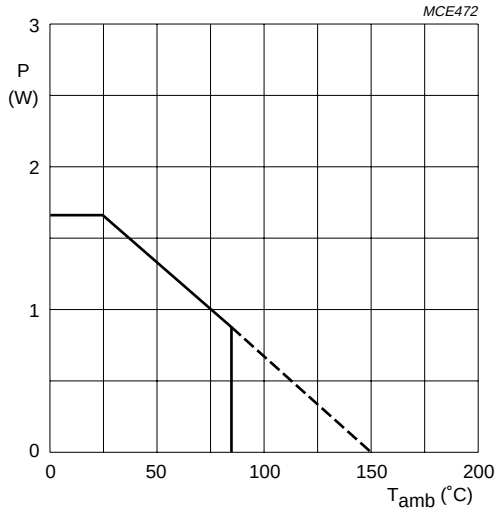
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
B	bandwidth		20	25	100	kHz
V_{CC}	power supply		6	9	13	V
PSRR	power supply rejection ratio	at V_{CC} = 5 V	30	38	–	dB
I_q	quiescent current	unloaded	–	20.3	36	mA
I_{stb}	standby current	mute mode active; unloaded	–	2.1	10	mA
$V_{MUTE(L)}$	low level voltage on pin MUTE; mute mode active		0	–	0.8	V
$V_{MUTE(H)}$	high level voltage on pin MUTE; mute mode inactive		2	–	5	V
Radial coil driver						
$V_{OO(rad)}$	output offset voltage		–	± 20	± 50	mV
$I_{con(rad)}$	maximum constant current	R_L = 8 Ω	250	300	–	mA
$I_{p(max)(rad)}$	maximum peak current	R_L = 8 Ω	250	430	–	mA
G_{rad}	gain	V_{CC} = 9 V; V_i = 700 mV (p-p); R_{ext} = 4.7 kΩ; note 1	6	7	8	dB
Focus coil driver						
$V_{OO(foc)}$	output offset voltage		–	± 20	± 50	mV
$I_{con(foc)}$	maximum constant current	R_L = 8 Ω	250	300	–	mA
$I_{p(max)(foc)}$	maximum peak current	R_L = 8 Ω	370	430	–	mA
G_{foc}	gain	V_{CC} = 9 V; V_i = 700 mV (p-p); R_{ext} = 4.7 kΩ; note 1	6	7	8	dB
Sled motor driver						
$V_{OO(sle)}$	output offset voltage		–	± 20	± 50	mV
$I_{con(sle)}$	maximum constant current	R_L = 8 Ω	200	300	–	mA
$I_{p(sle)}$	maximum peak current	R_L = 8 Ω	370	430	–	mA
G_{sle}	gain	V_{CC} = 9 V; V_i = 700 mV (p-p); R_{ext} = 4.7 kΩ; note 1	6	7	8	V/V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Spindle motor driver						
$V_{OO(spin)}$	output offset voltage		–	±10	±50	mV
$I_{con(spin)}$	maximum constant current	R_L = 4 Ω	400	430	–	mA
$I_{p(spin)}$	maximum peak current	R_L = 4 Ω	560	600	–	mA
G_{spin}	gain	V_{CC} = 9 V; V_i = 700 mV (p-p); R_{ext} = 4.7 kΩ; note 1	1	1.12	1.26	V/V
3.3 V generator						
$V_{fb(3.3)}$	feedback voltage		3.1	3.3	3.5	V
$I_{O(3.3)}$	output current		3	4.4	5	mA
1.8 V generator						
$V_{fb(1.8)}$	feedback voltage		1.7	1.8	1.9	V
$I_{O(1.8)}$	output current		3	4.2	5	mA

Note

1. For gain measurements, only the channel being tested is active, the others are inactive; see Fig.4.

10 TEST AND APPLICATION INFORMATION



$70 \times 70 \times 1.6$ mm glass epoxy board.
At temperatures above T_{amb} = 25 °C, power dissipation is de-rated at 13.6 mW/°C.

Fig.3 Power dissipation as a function of ambient temperature.

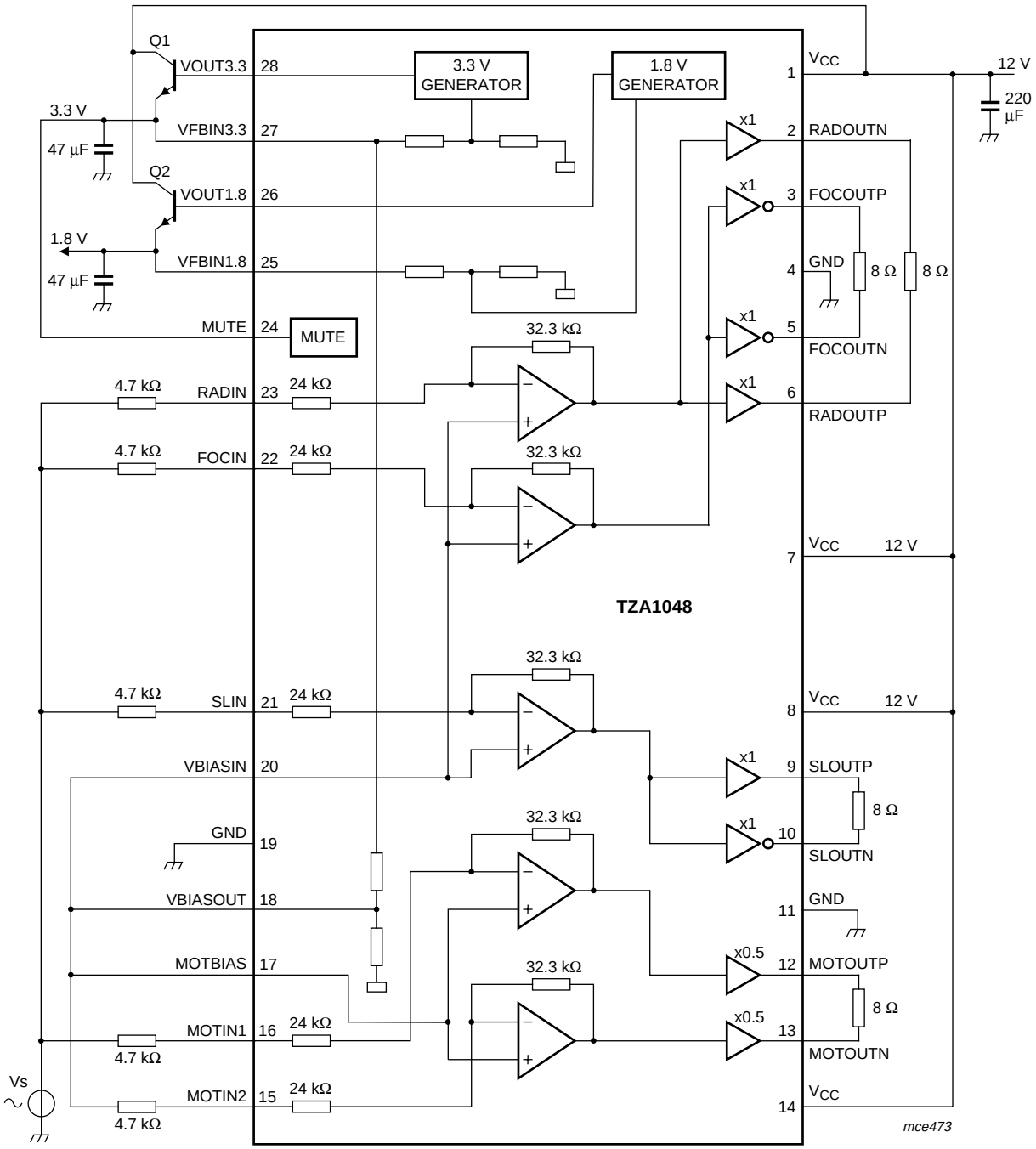


Fig.4 Gain test configuration.

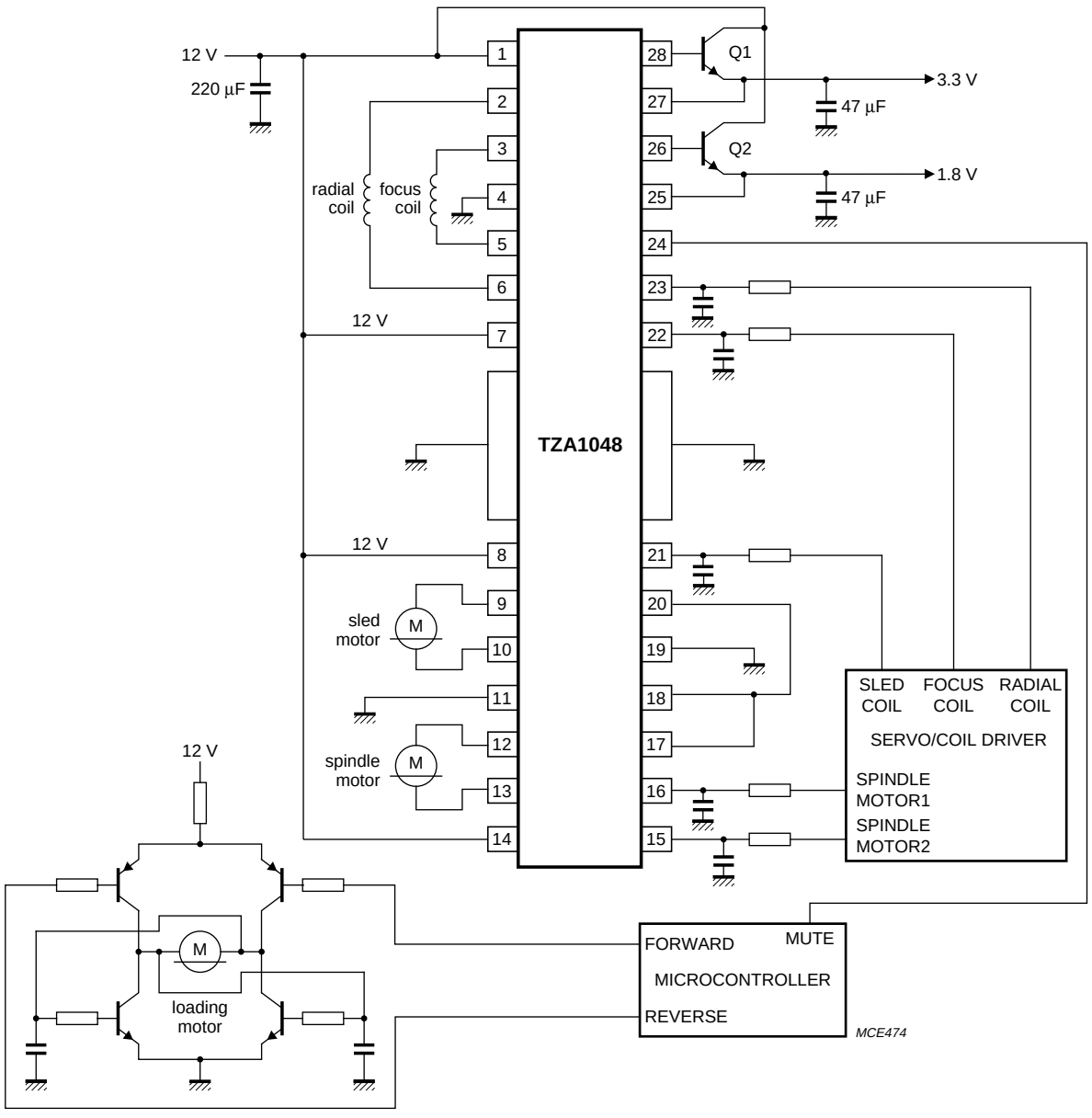


Fig.5 Spindle motor differential control application.

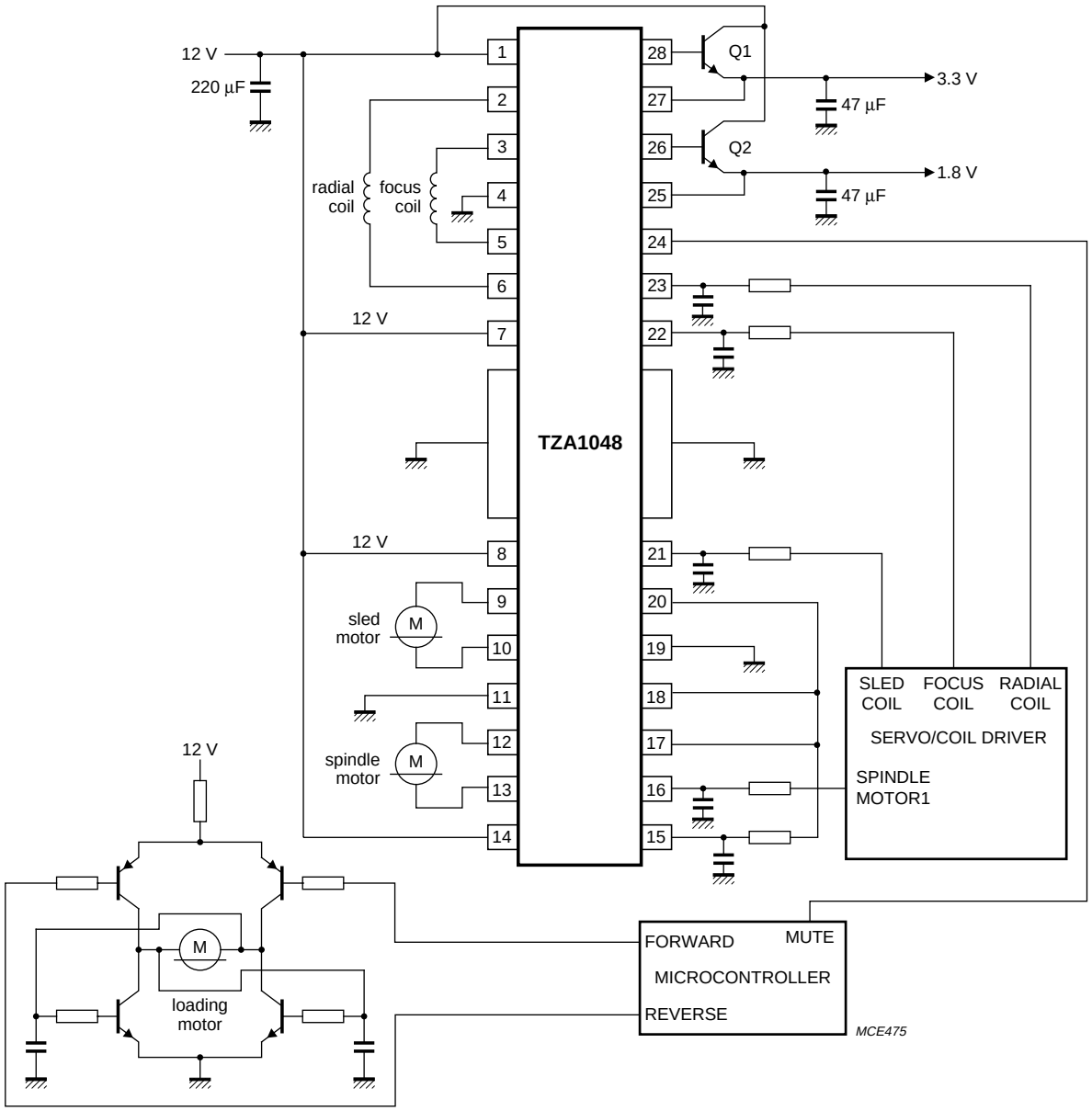
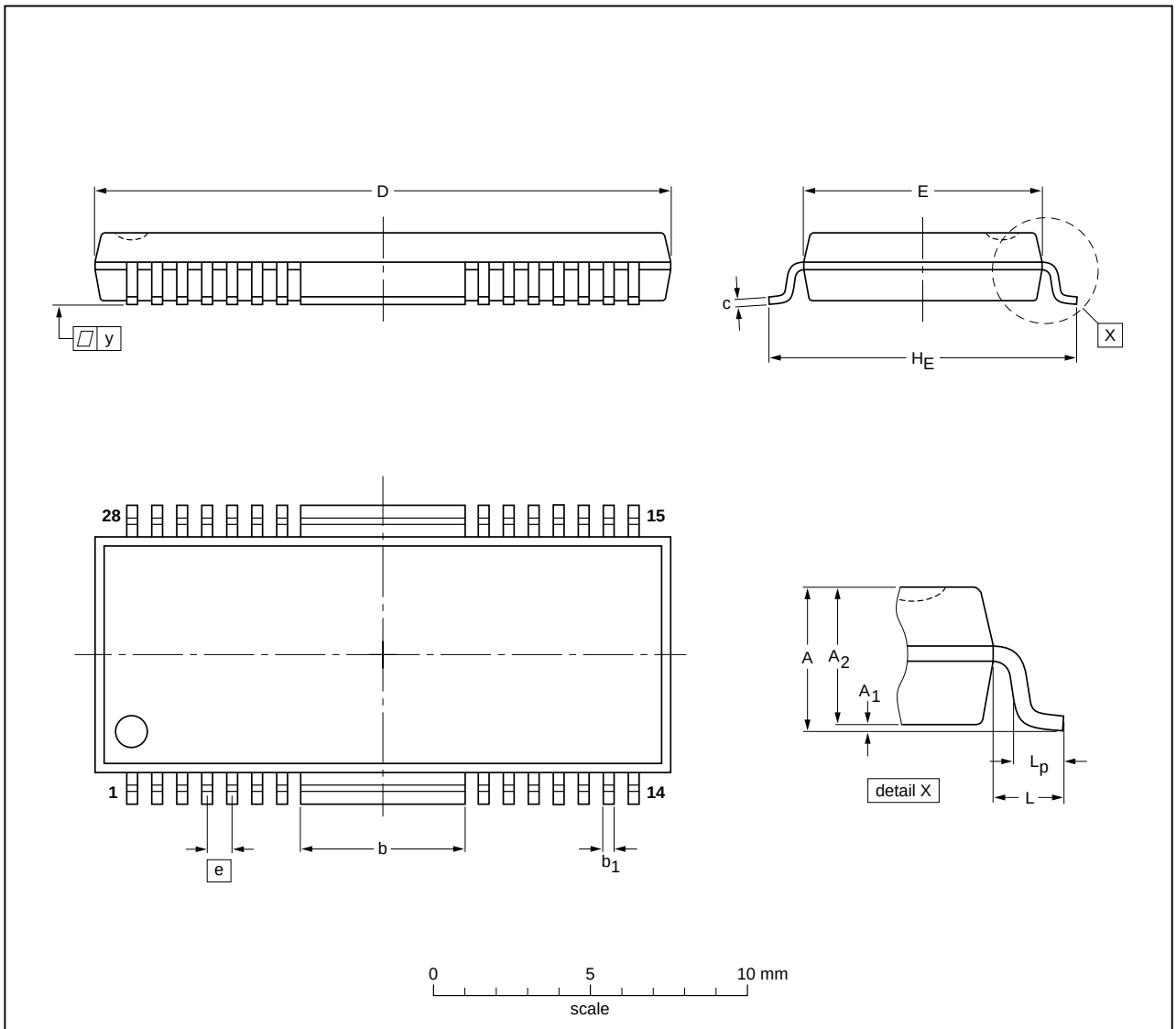


Fig.6 Spindle motor single-ended application.

11 PACKAGE OUTLINE

HSOP28: plastic, heatsink small outline package; 28 leads **SOP007**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2 max	b	b_1	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	y
mm	2.31	0.20 0.05	2.2	5.25 5.05	0.45 0.30	0.30 0.23	18.67 18.41	7.75 7.49	0.8	10.02 9.62	1.1	1.0 0.4	0.089

Note

1. Plastic or metal protrusions are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOP007						03-07-28

12 SOLDERING

12.1 Introduction to soldering surface mount packages

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"Data Handbook IC26; Integrated Circuit Packages"* (document order number 9398 652 90011).

There is no soldering method that is ideal for all surface mount IC packages. Wave soldering can still be used for certain surface mount ICs, but it is not suitable for fine pitch SMDs. In these situations reflow soldering is recommended.

12.2 Reflow soldering

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement. Driven by legislation and environmental forces the worldwide use of lead-free solder pastes is increasing.

Several methods exist for reflowing; for example, convection or convection/infrared heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 100 and 200 seconds depending on heating method.

Typical reflow peak temperatures range from 215 to 270 °C depending on solder paste material. The top-surface temperature of the packages should preferably be kept:

- below 225 °C (SnPb process) or below 245 °C (Pb-free process)
  - for all BGA, HTSSON-T and SSOP-T packages
  - for packages with a thickness ≥ 2.5 mm
  - for packages with a thickness < 2.5 mm and a volume ≥ 350 mm^3 so called thick/large packages.
- below 240 °C (SnPb process) or below 260 °C (Pb-free process) for packages with a thickness < 2.5 mm and a volume < 350 mm^3 so called small/thin packages.

Moisture sensitivity precautions, as indicated on packing, must be respected at all times.

12.3 Wave soldering

Conventional single wave soldering is not recommended for surface mount devices (SMDs) or printed-circuit boards with a high component density, as solder bridging and non-wetting can present major problems.

To overcome these problems the double-wave soldering method was specifically developed.

If wave soldering is used the following conditions must be observed for optimal results:

- Use a double-wave soldering method comprising a turbulent wave with high upward pressure followed by a smooth laminar wave.
- For packages with leads on two sides and a pitch (e):
  - larger than or equal to 1.27 mm, the footprint longitudinal axis is **preferred** to be parallel to the transport direction of the printed-circuit board;
  - smaller than 1.27 mm, the footprint longitudinal axis **must** be parallel to the transport direction of the printed-circuit board.

  The footprint must incorporate solder thieves at the downstream end.
- For packages with leads on four sides, the footprint must be placed at a 45° angle to the transport direction of the printed-circuit board. The footprint must incorporate solder thieves downstream and at the side corners.

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

Typical dwell time of the leads in the wave ranges from 3 to 4 seconds at 250 °C or 265 °C, depending on solder material applied, SnPb or Pb-free respectively.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

12.4 Manual soldering

Fix the component by first soldering two diagonally-opposite end leads. Use a low voltage (24 V or less) soldering iron applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C.

When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

12.5 Suitability of surface mount IC packages for wave and reflow soldering methods

PACKAGE[1]	SOLDERING METHOD	
	WAVE	REFLOW[2]
BGA, HTSSON..T[3], LBGA, LFBGA, SQFP, SSOP..T[3], TFBGA, USON, VFBGA	not suitable	suitable
DHVQFN, HBCC, HBGA, HLQFP, HSO, HSOP, HSQFP, HSSON, HTQFP, HTSSOP, HVQFN, HVSON, SMS	not suitable[4]	suitable
PLCC[5], SO, SOJ	suitable	suitable
LQFP, QFP, TQFP	not recommended[5][6]	suitable
SSOP, TSSOP, VSO, VSSOP	not recommended[7]	suitable
CWQCCN..L[8], PMFP[9], WQCCN..L[8]	not suitable	not suitable

Notes

1. For more detailed information on the BGA packages refer to the *"(LF)BGA Application Note*" (AN01026); order a copy from your Philips Semiconductors sales office.
2. All surface mount (SMD) packages are moisture sensitive. Depending upon the moisture content, the maximum temperature (with respect to time) and body size of the package, there is a risk that internal or external package cracks may occur due to vaporization of the moisture in them (the so called popcorn effect). For details, refer to the Drypack information in the *"Data Handbook IC26; Integrated Circuit Packages; Section: Packing Methods"*.
3. These transparent plastic packages are extremely sensitive to reflow soldering conditions and must on no account be processed through more than one soldering cycle or subjected to infrared reflow soldering with peak temperature exceeding 217 °C ± 10 °C measured in the atmosphere of the reflow oven. The package body peak temperature must be kept as low as possible.
4. These packages are not suitable for wave soldering. On versions with the heatsink on the bottom side, the solder cannot penetrate between the printed-circuit board and the heatsink. On versions with the heatsink on the top side, the solder might be deposited on the heatsink surface.
5. If wave soldering is considered, then the package must be placed at a 45° angle to the solder wave direction. The package footprint must incorporate solder thieves downstream and at the side corners.
6. Wave soldering is suitable for LQFP, TQFP and QFP packages with a pitch (e) larger than 0.8 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.65 mm.
7. Wave soldering is suitable for SSOP, TSSOP, VSO and VSSOP packages with a pitch (e) equal to or larger than 0.65 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.5 mm.
8. Image sensor packages in principle should not be soldered. They are mounted in sockets or delivered pre-mounted on flex foil. However, the image sensor package can be mounted by the client on a flex foil by using a hot bar soldering process. The appropriate soldering profile can be provided on request.
9. Hot bar or manual soldering is suitable for PMFP packages.

13 DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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Notes

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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

14 DEFINITIONS

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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