

DATA SHEET

TDA3681

**Multiple voltage regulator with
switch and ignition buffer**

Product specification
Supersedes data of 2001 Aug 24

2002 Apr 10

Multiple voltage regulator with switch and ignition buffer

TDA3681

FEATURES

General

- Extremely low noise behaviour and good stability with very small output capacitors
- Second supply pin for regulators 3 and 4 to reduce power dissipation (e.g. via a DC-to-DC converter)
- Three V_P -state controlled regulators (regulators 1, 3 and 4) and a power switch
- Regulator 2, reset and ignition buffer operational during load dump and thermal shutdown
- Combined control pin for switching regulators 1 and 3
- Separate control pins for switching regulator 4 and the power switch
- Supply voltage range from -18 to $+50$ V
- Low quiescent current in standby mode (when regulators 1, 3 and 4 and power switch are switched off and ignition input is low)
- Hold output for low V_P (regulators 1, 3 and 4 and power switch off)
- Hold output when one of regulators 1 and 3 and/or 4 is out of regulation
- Hold output for foldback mode of power switch and regulators 1, 3 and 4
- Hold output for load dump and temperature protection
- Reset (push-pull output stage) for regulator 2 and hold output (open-collector output)
- Adjustable reset delay time
- High supply voltage ripple rejection
- Backup capacitor for regulator 2
- One independent ignition buffer (active HIGH).

Protections

- Reverse polarity safe (down to -18 V without high reverse current)
- Able to withstand voltages up to 18 V at the outputs (supply line may be short-circuited)

- ESD protection on all pins
- Thermal protections
- Load dump protection
- Foldback current limit protection for regulators 1, 2, 3 and 4
- Delayed second current limit protection for the power switch (at short-circuit)
- The regulator outputs and the power switch are DC short-circuit safe to ground and supply (V_P).

GENERAL DESCRIPTION

The TDA3681 is a multiple output voltage regulator with a power switch and an ignition buffer. It is intended for use in car radios with or without a microcontroller. The TDA3681 contains the following:

- Four fixed voltage regulators with a foldback current protection (regulators 1, 2, 3 and 4). Regulator 2, which is intended to supply a microcontroller, also operates during load dump and thermal shutdown
- Regulators 3 and 4 have a second supply pin that can be connected to a lower supply voltage (>6.5 V) to reduce the power dissipation
- A power switch with protection, operated by a control input
- Reset and hold outputs that can be used to interface with the microcontroller; the reset signal can be used to call up the microcontroller
- Both supply pins can withstand load dump pulses and negative supply voltages
- Regulator 2, which is in regulation at a backup voltage above 6.5 V
- A provision for the use of a reserve supply capacitor that will hold enough energy for regulator 2 (5 V continuous) to allow a microcontroller to prepare for loss of voltage
- An ignition input Schmitt trigger with push-pull output stage.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA3681J	DBS17P	plastic DIL-bent-SIL power package; 17 leads (lead length 7.7 mm)	SOT243-3
TDA3681JR	DBS17P	plastic DIL-bent-SIL (special bent) power package; 17 leads (lead length 12 mm)	SOT475-1
TDA3681TH	HSOP20	plastic, heatsink small outline package; 20 leads; low stand-off height	SOT418-2

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QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supplies						
V_{P1}	supply voltage 1 operating		9.5	14.4	18	V
	reverse polarity	non-operating	–	–	18	V
	regulator 2 on		4	14.4	50	V
	jump start	$t \leq 10$ minutes	–	–	30	V
	load dump protection	$t \leq 50$ ms; $t_r \geq 2.5$ ms	–	–	50	V
V_{P2}	supply voltage 2 operating		6.5	14.4	18	V
	reverse polarity	non-operating	–	–	18	V
	regulator 2 on		0	–	50	V
	jump start	$t \leq 10$ minutes	–	–	30	V
	load dump protection	$t \leq 50$ ms; $t_r \geq 2.5$ ms	–	–	50	V
$I_{q(\text{tot})}$	total quiescent supply current	standby mode	–	110	150	μA
T_j	junction temperature		–	–	150	$^{\circ}\text{C}$
Voltage regulators						
$V_{o(\text{REG}1)}$	output voltage of regulator 1	$1 \text{ mA} \leq I_{\text{REG}1} \leq 600 \text{ mA}$; $V_P = 14.4 \text{ V}$	8.0	8.5	9.0	V
$V_{o(\text{REG}2)}$	output voltage of regulator 2	$1 \text{ mA} \leq I_{\text{REG}2} \leq 300 \text{ mA}$; $V_P = 14.4 \text{ V}$	4.75	5.0	5.25	V
$V_{o(\text{REG}3)}$	output voltage of regulator 3	$1 \text{ mA} \leq I_{\text{REG}3} \leq 1400 \text{ mA}$; $V_P = 14.4 \text{ V}$	4.75	5.0	5.25	V
$V_{o(\text{REG}4)}$	output voltage of regulator 4	$1 \text{ mA} \leq I_{\text{REG}4} \leq 1 \text{ A}$; $V_P = 14.4 \text{ V}$	3.14	3.3	3.46	V
Power switch						
$V_{\text{drop}(\text{SW})}$	drop-out voltage	$I_{\text{SW}} = 1 \text{ A}$; $V_{P1} = 13.5 \text{ V}$	–	0.45	0.65	V
		$I_{\text{SW}} = 1.8 \text{ A}$; $V_{P1} = 13.5 \text{ V}$	–	1.0	1.8	V
$I_{M(\text{SW})}$	peak current		3	–	–	A

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PINNING

Pin description of TDA3681J and TDA3681JR

SYMBOL	PIN	DESCRIPTION
REG1	1	regulator 1 output
REG3	2	regulator 3 output
V _{P2}	3	second supply voltage
REG4	4	regulator 4 output
IGN _{IN}	5	ignition input
IGN _{OUT}	6	ignition output (active HIGH)
RES	7	reset output (active LOW)
C _{RES}	8	reset delay capacitor
EN4	9	enable input for regulator 4
EN1/3	10	enable input for regulators 1 and 3
ENSW	11	enable input for power switch
HOLD	12	hold output (active LOW)
GND	13	ground
BU	14	backup switch output
REG2	15	regulator 2 output
SW	16	power switch output
V _{P1}	17	supply voltage
heat tab	–	heat tab; it is strongly recommended to connect the heat tab to ground

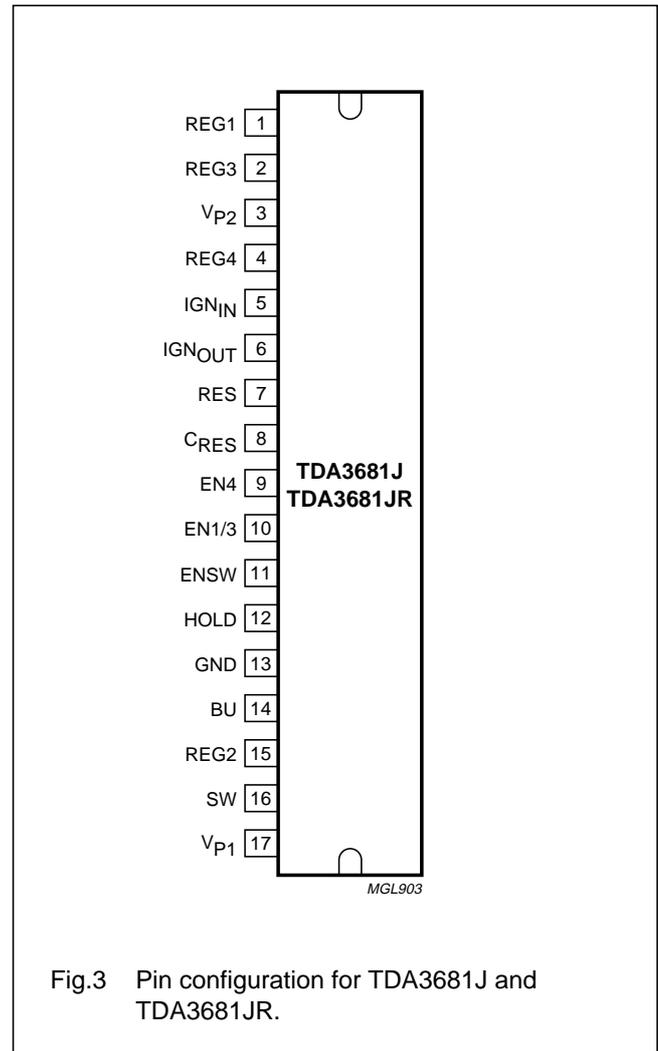


Fig.3 Pin configuration for TDA3681J and TDA3681JR.

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Pin description of TDA3681TH

SYMBOL	PIN	DESCRIPTION
REG4	1	regulator 4 output
IGN _{IN}	2	ignition input
IGN _{OUT}	3	ignition output (active HIGH)
RES	4	reset output (active LOW)
C _{RES}	5	reset delay capacitor
EN4	6	enable input for regulator 4
EN1/3	7	enable input for regulators 1 and 3
ENSW	8	enable input for power switch
HOLD	9	hold output (active LOW)
GND	10	ground
HEATTAB	11	heat tab connection; note 1
REG2	12	regulator 2 output
BU	13	backup switch output
V _{P1}	14	supply voltage
n.c.	15	not connected
SW	16	power switch output
REG1	17	regulator 1 output
n.c.	18	not connected
REG3	19	regulator 3 output
V _{P2}	20	second supply voltage

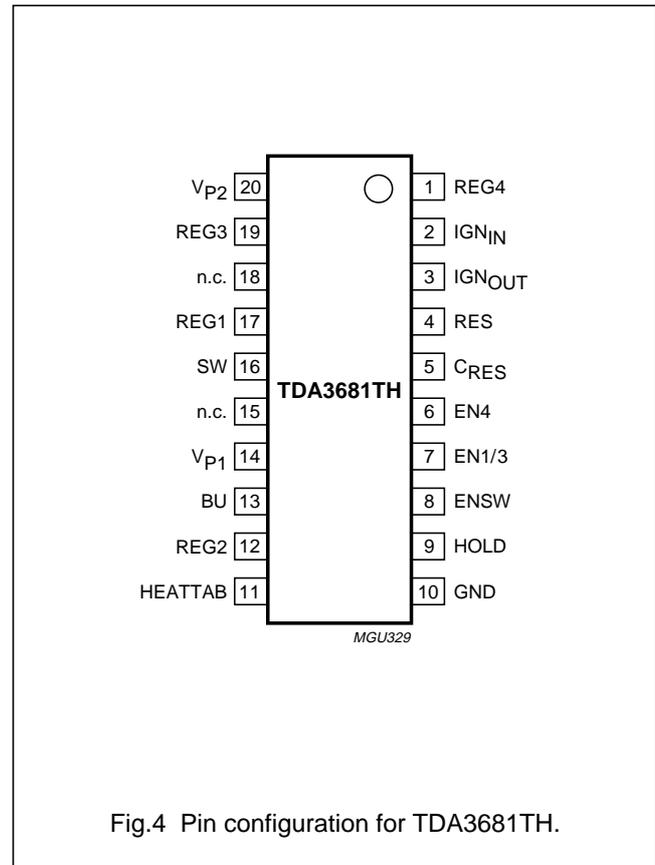


Fig.4 Pin configuration for TDA3681TH.

Note

1. The pin is used for final test purposes. In the application it should be connected directly to ground.