Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

L5952

MULTIPLE MULTIFUNCTION VOLTAGE REGULATOR

- FIVE REGULATED OUTPUTS
  Vo1 5V @500mA
  Vo2 8.3V @ 250mA
  Vo3 7.7V to 8.5V @250mA (I^2C presettable)
  Vo4 5V to 7.3V @0.4A (I^2C presettable)
  Vo5 3.3V to 5V @500mA (I^2C presettable)
  HSDout R_{ON} = 0.6Ω
- I^2C ENABLE & OUT PRESET
- ADJUSTABLE BATTERY DETECTION
  CIRCUIT
- RESET OUTPUT
- BACKUP FACILITY
- LOW QUIESCENT CONSUMPTION
- HIGH RIPPLE REJECTION
- LOAD DUMP
- OVERCURRENT & SHORT CIRCUIT
 PROTECTORS
- THERMAL SHUTDOWN

Flexiwatt 25
ORDERING NUMBER: L5952
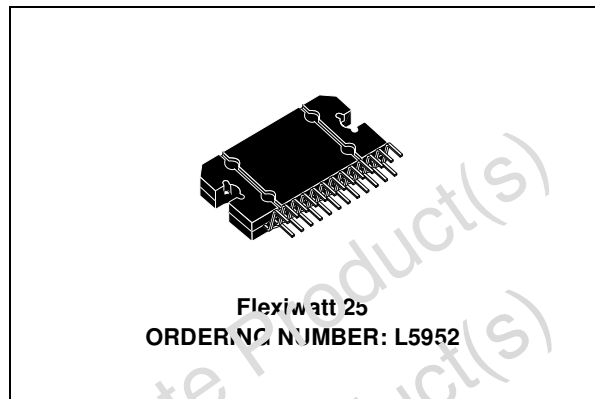
DESCRIPTION

The L5952 is a multifunction 5 output voltage regulator plus a High Side Driver primarily developed for car radio applications
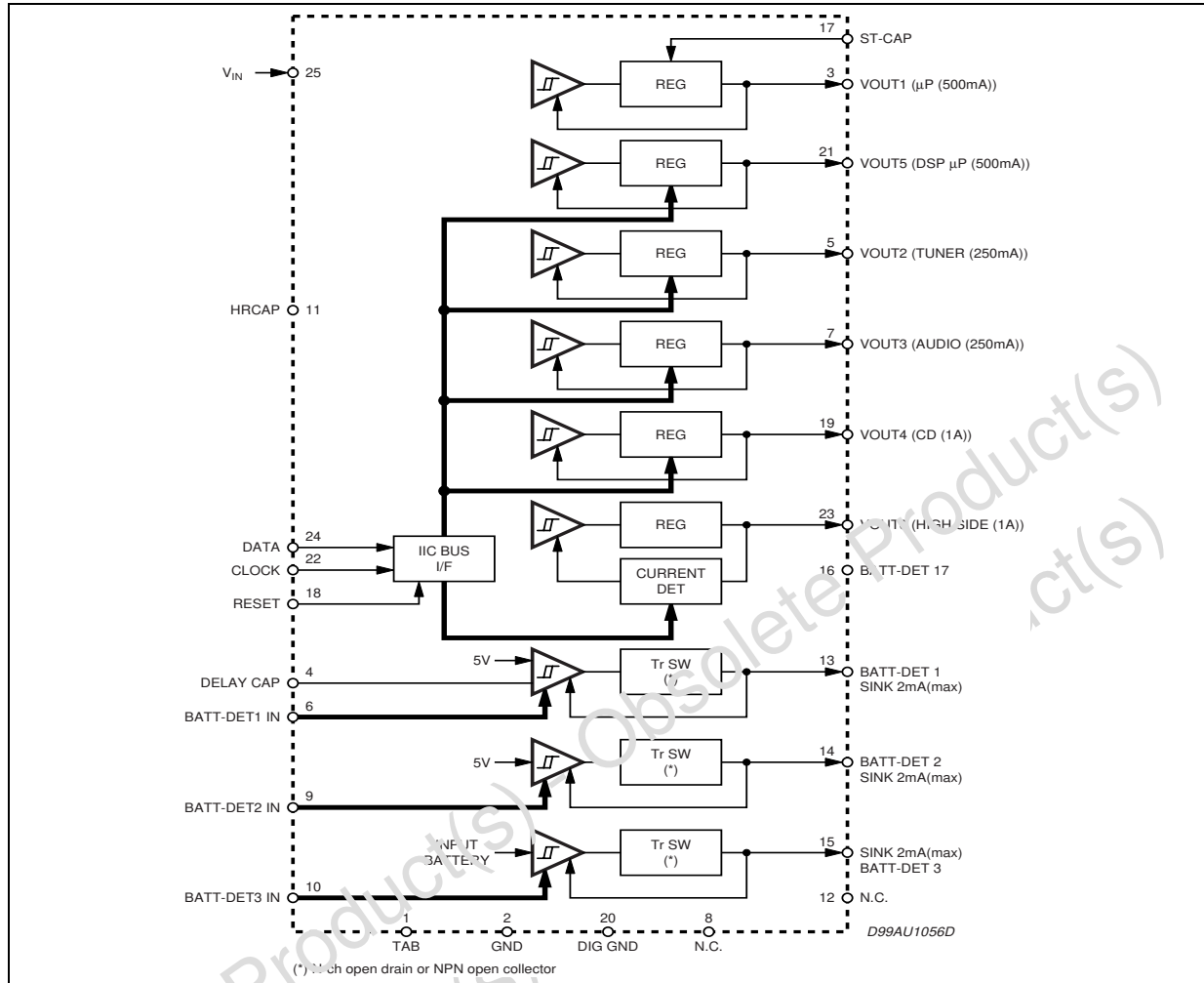
Three outputs are enabled and set via I^2C bus.

Very low stand-by current consumption is achieved to specifically comply with entertainment and automotive environments.

PIN CONNECTION (Top View)
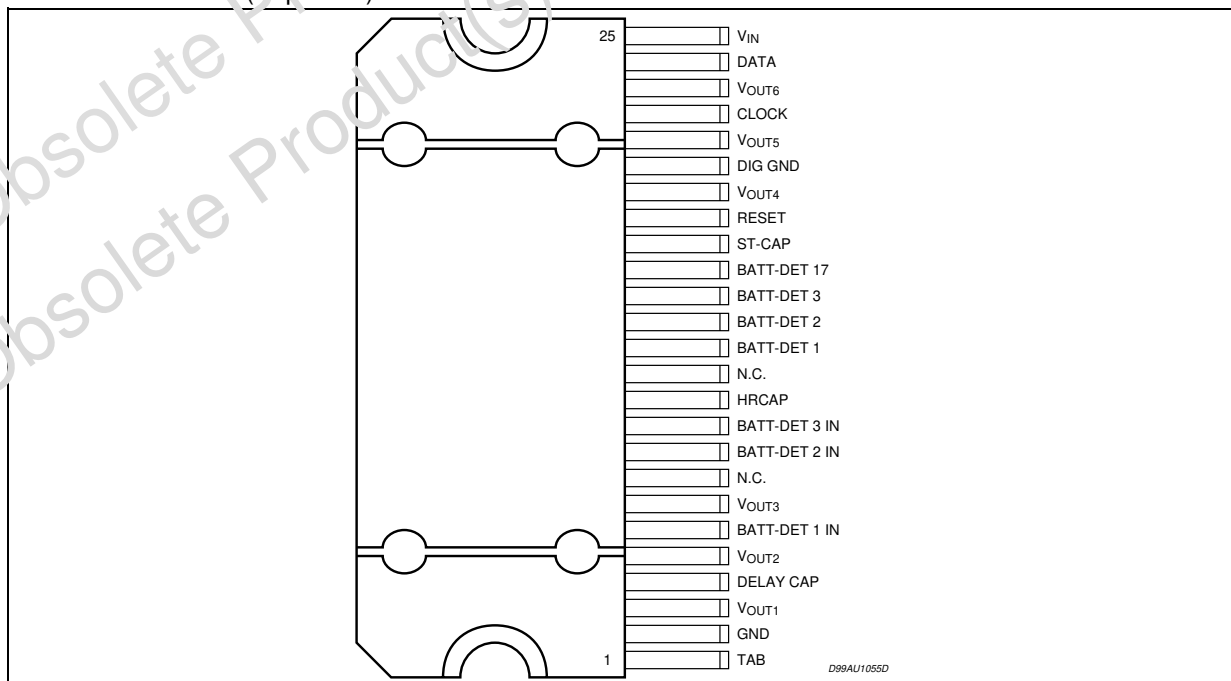
BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{IN}	DC Supply Voltage	-0.6 to 26	V
V_{IN}	Transient Supply Overvoltage (50ms)	50	V
R_{ESR}	Output Capacitor Series Eq. Series Resistors Allowed Range	0.2 to 10	Ω
T_{op}	Operating Temperature Range	-40 to 85	°C
T_{stg}	Storage Temperature Range	-40 to 150	°C

THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	1.3	°C/W

TEST CIRCUIT

D00AU1172B
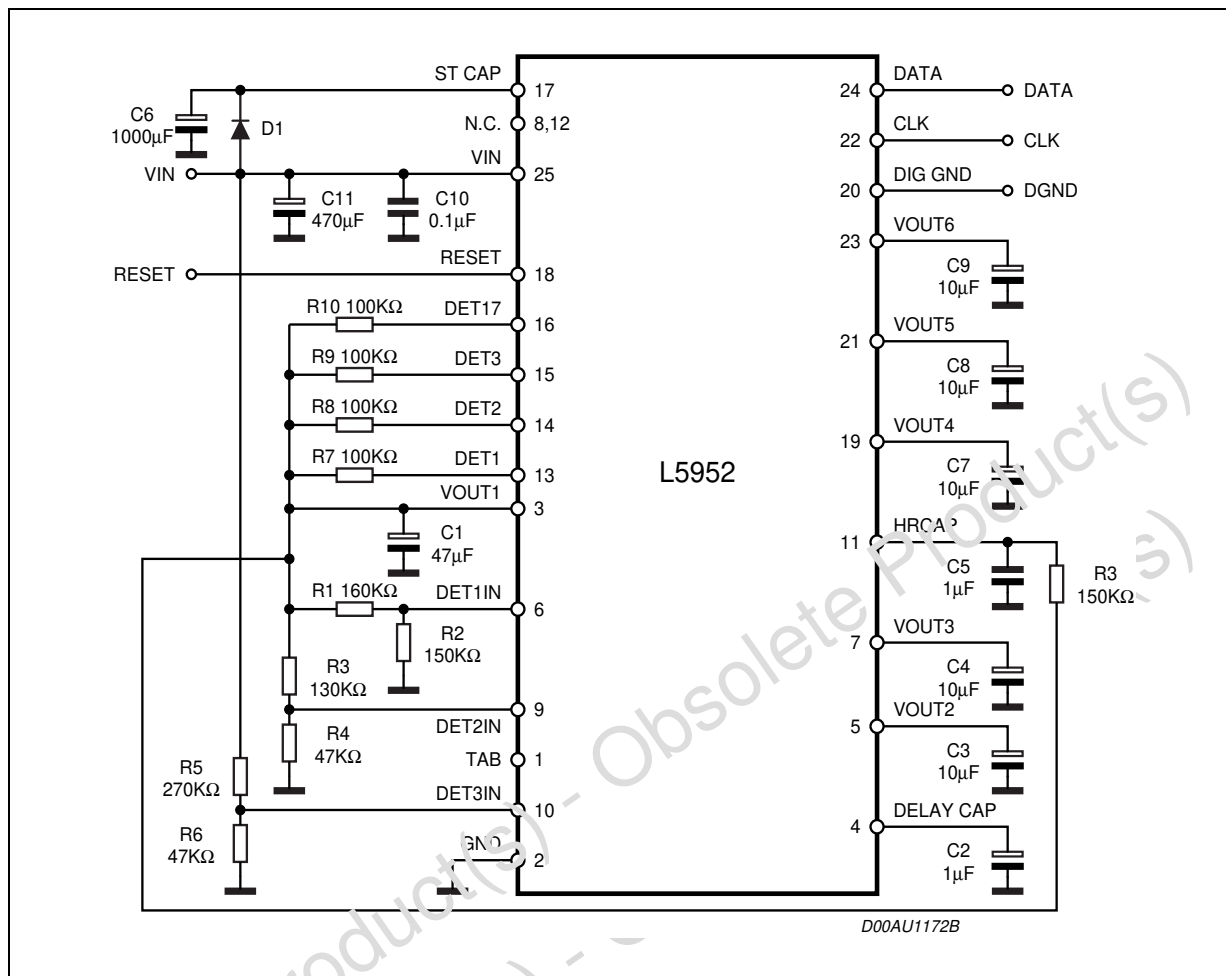
ELECTRICAL CHARACTERISTCS (Ref. to Test Circuit, V_{IN} = 14.4V, T_{case} = 25°C, unless otherwise noted)**.**

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
INPUT						
V_{op}	Operating Voltage		9		16	V
	Jump Start	t< 1min; still in normal operation			27	V
	Load Dump	50V, 50ms; still in normal operation at Vout1, Det 1,2,3			50	V
	Delay Reset	C_2 = 1µF	2	3	4	ms
	System Reset LO	V_{out1}, Det 1,2,3,17 = active			1	V
	System Reset Hi		4			V
I_Q	Quiescent Current	Vout1, Det 1,2,3,17 = active Not including I into R_1 to R_6		80	120	µA
	Hard Reset	C = 1µF; R = 150kΩ	50	100		ms

ELECTRICAL CHARACTERISTCS (Continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit

OUTPUTS:

Output voltage 1 (V_{out1})

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{out}	Output Voltage	$I_{out} < 500mA$; $V_{batt-up\ cap} = 9$ to 16V $I_{out} < 250mA$; $V_{batt-up\ cap} = 7$ to 9V	4.75	5	5.25	V
$I_{max.}$	Maximum Current	current limiter	600	1200		mA
ΔV_{load}	Load Regulation	$I_{out} = 0$ to 500mA		30	50	mV
SVRR	Ripple Rejection	1kHz, $V_{ripple} = 2Vpp$	50	60		dB
V_{drop1}	Voltage Drop	$I_{out} = 500mA$		1.5	2.5	V
V_{drop2}	Voltage Drop	$I_{out} = 250mA$		0.75	1.25	V
ΔV_{lin}	Line Regulation	$I_{OUT} = 0$		0	50	mV

V_{out1} is 5V regulator

Output voltage 2 (V_{out2})

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{out}	Output Voltage	$I_{out} < 250mA$; $V_{in} = 9$ to 16V	8.1	8.3	8.5	V
$I_{max.}$	Maximum Current	current limiter	300	450		mA
ΔV_{load}	Load Regulation	$I_{out} = 0$ to 250mA		20	50	mV
SVRR	Ripple Rejection	1kHz , $V_{ripple} = 2Vpp$	45	55		dB
V_{drop}	Voltage Drop	$I_{out} = 250mA$		0.5	0.6	V
ΔV_{lin}	Line Regulation	$I_{OUT} = 0$		0	50	mV

V_{out2} has On/OFF function by I^2C. Default is OFF.

Output voltage 3 (V_{out3})

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{adj}	Adjustable range	$I_{out} < 250mA$; $V_{in} = 9$ to 16V	7.7		8.5	V
$I_{max.}$	Maximum Current	current limiter	300			mA
ΔV_{load}	Load Regulation	$I_{out} = 0$		20	50	mV
SVRR	Ripple Rejection	1kHz , $V_{ripple} = 2Vpp$	50	60		dB
V_{drop}	Voltage Drop	$I_{out} = 250mA$		0.45	0.6	V
ΔV_{lin}	Line Regulation	$I_{OUT} = 0$		0	50	mV

V_{out3} Voltage configuration

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
	Setting 1	$I_{out} < 250mA$; $V_{in} = 10$ to 16V	8.2	8.5	8.8	V
	Setting 2	$I_{out} < 250mA$; $V_{in} = 10$ to 16V	8	8.3	8.6	V
	Setting 3	$I_{out} < 250mA$; $V_{in} = 10$ to 16V	7.8	8.1	8.4	V
	Setting 4	$I_{out} < 250mA$; $V_{in} = 9$ to 16V	7.6	7.9	8.2	V
	Setting 5	$I_{out} < 250mA$; $V_{in} = 9$ to 16V	7.4	7.7	8.0	V

Select one of above settings as well as ON/OFF control by I^2C. Default is OFF.

ELECTRICAL CHARACTERISTCS (Continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit

Output 4: (V_{out4})

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{adj}	Adjustable range	I_{out} = 400mA	5		7.3	V
I_{max}	Max. Current	Current limiter	1.2	2.4		A
SVRR	Ripple rejection	1kHz, V_{ripple} = 2Vpp	50	60		dB
V_{drop}	Voltage Drop	I_{out} = 400mA		0.6	0.75	V
ΔV_{load}	Load Regulation	I_{out} = 0 to 400mA		20	50	mV
ΔV_{lin}	Line Regulation	I_{OUT} = 0		0	50	mV

V_{out4} Voltage configuration

		Test Condition	Min	Typ	Max	Unit
	Setting 1	I_{out} < 400mA; V_{in} = 9 to 16V	7	7.3	7.6	V
	Setting 2		6.7	7	7.3	V
	Setting 3		6.3	6.6	6.9	V
	Setting 4		6	6.3	6.6	V
	Setting 5		5.7	6	6.3	V
	Setting 6		5.3	5.5	5.7	V
	Setting 7		4.75	5	5.25	V

Select one of above settings as well as ON/OFF control by I2C. Default is OFF

Output 5 (V_{out5})

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{adj}	Adjustable range	I_{out} < 500mA	3.3		5	V
I_{max}	Max. Current	Current limiter	600	1000		mA
ΔV_{load}	Load Regulation	I_{out} = 0 to 500mA		30	50	mV
SVRR	Ripple Rejection	1kHz, V_{ripple} = 2Vvpp	50	60		dB
V_{drop}	Voltage Drop	I_{out} = 500mA		2.4	3.6	V
ΔV_{lin}	Line Regulation	I_{OUT} = 0		0	50	mV

V_{out5} Voltage configuration

		Test Condition	Min	Typ	Max	Unit
	Setting 1	I_{out} < 500mA; V_{in} = 9 to 16V	3.1	3.3	3.5	V
	Setting 2		4.75	5.0	5.25	V

Select one of above settings as well as ON/OFF control by I2C. Default is OFF

Output 6 (V_{out6})

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{out}	Output Voltage	I_{out} < 800mA; V_{in} = 9 to 16V	8.4		15.4	V

ELECTRICAL CHARACTERISTCS (Continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
I_{max}	Maximum Current	Current limiter	1.2			A
V_{drop}	Dropout Voltage	$I_{out} < 800mA$		0.45	0.6	V

Vout6 has On/OFF function by I²C. Default is OFF

Battery Detection1 (Det1)

	Vthreshold	ST-CAP rising	7	7.3	8	V
V_{adj}	Adjustable Range Th2 with ext. resistor	V_{out1} falling	2.4	2.55	2.7	V
V_{OL}	L Output Voltage	$I_{out} = 2mA$		0.5	0.8	V

Note: 1µF is recommended for delay Cap (min: 100nF)

Battery Detection2 (Det2)

V_{adj}	Adjustable Range with ext. resistor		4.5	4.65	4.8	V
	Hysteresis		30	60	120	mV
V_{OL}	L Output Voltage	$I_{out} = 2mA$		0.5	0.8	V

Battery Detection3 (Det3)

V_{adj}	Adjustable Range with external resistor		7.25	8.35	8.55	V
	Hysteresis		50	100	150	mV
V_{OL}	L Output Voltage	$I_{out} = 2mA$		0.5	0.8	V

Battery Detection17 (Det17)

	Vthreshold	ST-CAP	16.5	17	18	V
V_{OL}	L Output Voltage	$I_{out} = 2mA$		0.5	0.8	V

I²C bus

F_{ck}	Clock Frequency				400	kHz
t_R	Rising Time				300	ns
t_F	Falling Time				300	ns
V_{IL}	Low Input Voltage				1	V
V_{IH}	High Input Voltage		3			V

Hard Reset

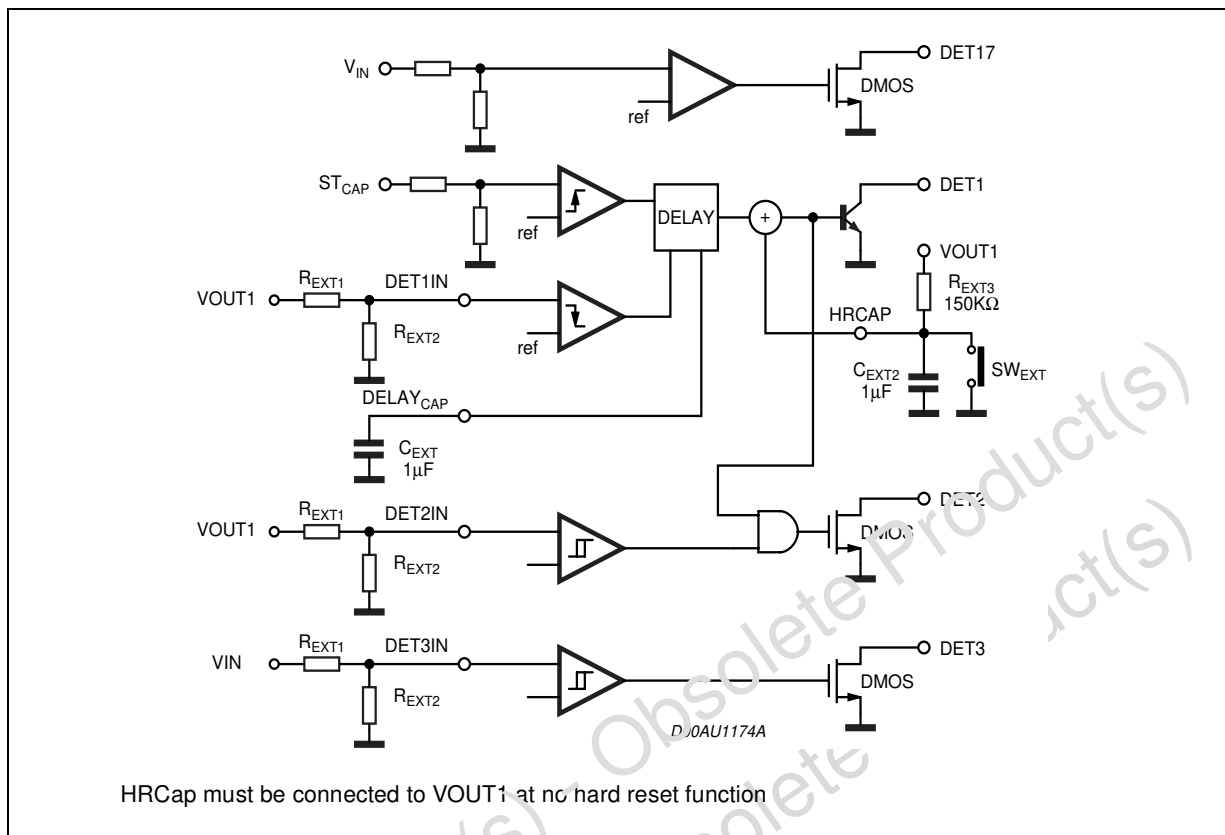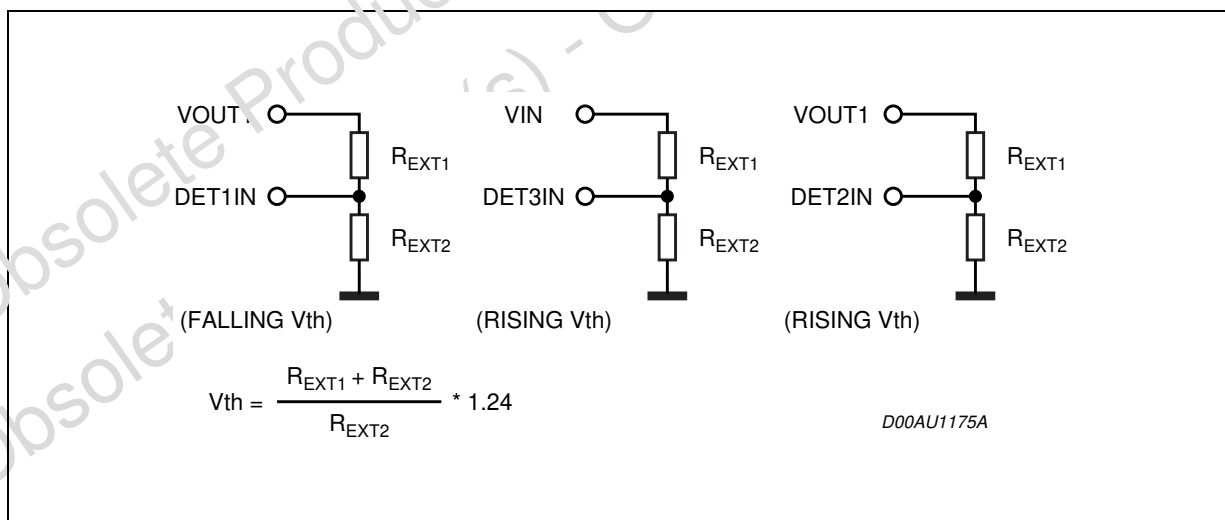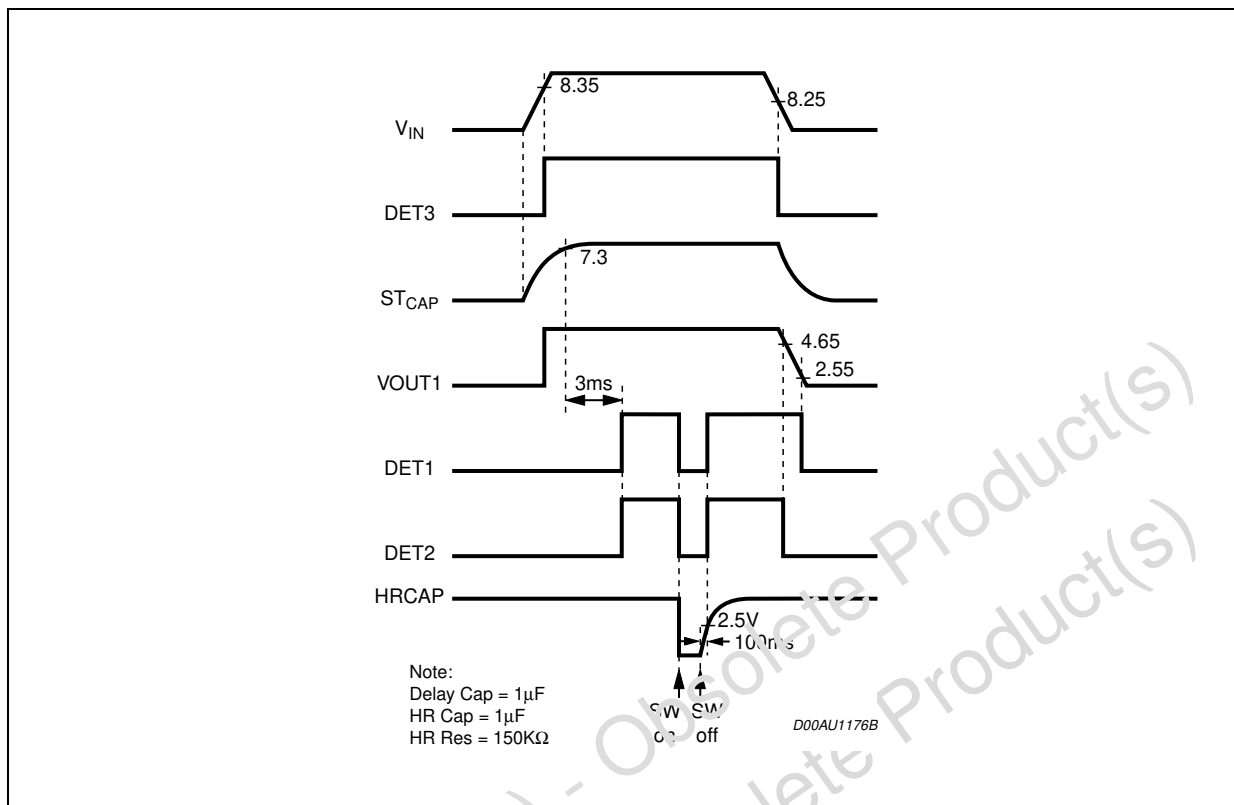|						
V_{IL}	Low Input Voltage				2	V
V_{IH}	High Input Voltage		3			V

Figure 1. Comparator Part

HRCap must be connected to VOUT1 at no hard reset function

Figure 2. Reset Function

$$Vth = \frac{R_{EXT1} + R_{EXT2}}{R_{EXT2}} * 1.24$$

D00AU1175A

DET1,2 Delay Time: T = 3000 x C <sec>

Hard Reset Time: T = –CR ln 0.7 <sec>
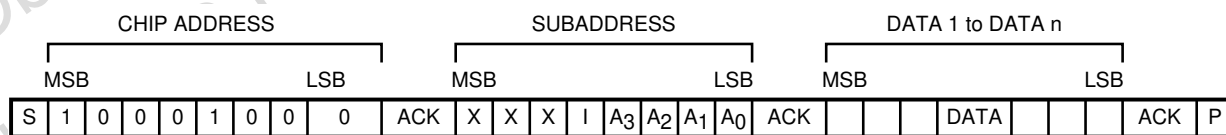
Figure 3. Timing Chart (typical values)

SOFTWARE SPECIFICATION

Interface Protocol

The interface protocol comprises:

■ A start condition (s)

■ A chip address byte,(LSB bit = 0 for write mode)

■ A subaddress byte.

■ A sequence of data (N-bytes + acknowledge)

■ A stop condition (P)

CHIP ADDRESS									SUBADDRESS								DATA 1 to DATA n							
MSB							LSB		MSB							LSB		MSB					LSB		
S	1	0	0	0	1	0	0	0	ACK	X	X	X	I	A_3	A_2	A_1	A_0	ACK			DATA				ACK	P

ACK = Acknowledge

S = Start

P = Stop

I = Auto Increment

X = Not used

MAX CLOCK SPEED 500kbits/s

CHIP ADDRESS = 10001000 (88 Hex)

AUTO INCREMENT

If bit I in the subaddress byte is set to "1", the autoincrement of the subaddress is enabled, if bit I = 0 no auto-increment.

SUBADDRESS

MSB							LSB	FUNCTION
0	0	0	I	A_3	A_2	A_1	A_0	
				0	0	0	0	OUT 2
				0	0	0	1	OUT 3
				0	0	1	0	OUT 4
				0	0	1	1	OUT 5
				0	1	0	0	OUT 6

DATA BYTE SPECIFICATION

OUT 2

MSB							LSB	FUNCTION
D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
							0	<u>OFF</u>
							1	ON

OUT 3

MSB							LSB	FUNCTION
D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
							0	<u>OFF</u>
							1	ON
				0	0	0		OUT VOLTAGE 8.5V
				0	0	1		OUT VOLTAGE 8.3V
				0	1	0		OUT VOLTAGE 8.1V
				0	1	1		OUT VOLTAGE 7.9V
				1	X	X		OUT VOLTAGE 7.7V

X = don't care

OUT 4

MSB							LSB	FUNCTION
D₇	D₆	D₅	D₄	D₃	D₂	D₁	D₀	
							0	<u>OFF</u>
							1	ON
				0	0	0		OUT VOLTAGE 7.3V
				0	0	1		OUT VOLTAGE 7.0V
				0	1	0		OUT VOLTAGE 6.6V
				0	1	1		OUT VOLTAGE 6.3V
				1	0	0		OUT VOLTAGE 6.0V
				1	0	1		OUT VOLTAGE 5.5V
				1	1	X		OUT VOLTAGE 5.0V

OUT 5

MSB							LSB	FUNCTION
D₇	D₆	D₅	D₄	D₃	D₂	D₁	D₀	
							0	<u>OFF</u>
							1	ON
						0		OUT VOLTAGE 3.3V
						1		OUT VOLTAGE 5.0V

OUT 6

MSB							LSB	FUNCTION
D₇	D₆	D₅	D₄	D₃	D₂	D₁	D₀	
					0	0	0	<u>OFF</u>
					0	0	1	ON

Note: Default setting indicated with underline.

EXAMPLES

< Example 1 - no autoincrement mode - >
power on V_{in} = ON All output OFF (at RESET = "L")
release reset RESET = "H". Send sequence:

Initial Set

start I²C

    1000 1000 Chip address
    0000 0001 OUT3 subaddress
    0000 0010 OUT3 data (8.3V, OFF)

stop I²C
start I²C

    1000 1000 Chip address
    0000 0010 OUT4 subaddress
    0000 0010 OUT4 data (7.0V, OFF)

stop I²C
start I²C

    1000 1000 Chip address
    0000 0011 OUT5 subaddress
    0000 0000 OUT5 data (3.3V, OFF)

stop I²C

Set Turn-On

start I²C

    1000 1000 Chip address
    0000 0000 OUT2 subaddress
    0000 0001 OUT2 data (ON)

stop I²C
start I²C

    1000 1000 Chip address
    0000 0001 OUT3 subaddress
    0000 0011 OUT3 data (8.3V, ON)

stop I²C
start I²C

    1000 1000 Chip address
    0000 0010 OUT4 subaddress
    0000 0011 OUT4 data (7.0V, ON)

stop I²C
start I²C

    1000 1000 Chip address
    0000 0011 OUT5 subaddress
    0000 0001 OUT5 data (3.3V, ON)

stop I²C
start I²C

    1000 1000 Chip address
    0000 0100 OUT6 subaddress
    0000 0001 OUT6 data (ON)

stop I²C

EXAMPLES

< Example 1 - no autoincrement mode - >
power on V_{in} = ON All output OFF (at RESET = "L")
release reset RESET = "H". Send sequence:

Initial Set

start I²C

        1000 1000   Chip address
        0000 0001   OUT3 subaddress
        0000 0010   OUT3 data (8.3V, OFF)
        0000 0010   OUT4 subaddress
        0000 0010   OUT4 data (7.0V, OFF)
        0000 0011   OUT5 subaddress
        0000 0000   OUT5 data (3.3V, OFF)

stop I²C

Set Turn-On

start I²C

        1000 1000   Chip address
        0000 0000   OUT2 subaddress
        0000 0001   OUT2 data (ON)
        0000 0001   OUT3 subaddress
        0000 0011   OUT3 data (8.3V, ON)
        0000 0010   OUT4 subaddress
        0000 0011   OUT4 data (7.0V, ON)
        0000 0011   OUT5 subaddress
        0000 0001   OUT5 data (3.3V, ON)
        0000 0100   OUT6 subaddress
        0000 0001   OUT6 data (ON)

stop I²C

< Example 2A - autoincrement mode - >
power on V_{in} = ON All output OFF (at RESET = "L")
release reset RESET = "H"

start I²C

initial set   1000 1000   Chip address
        0001 0001   OUT3 subaddress, autoincrement ON
        0000 0010   OUT3 data (8.3V, OFF)
        0000 0010   OUT4 data (7.0V, OFF)
        0000 0000   OUT5 data (3.3V, OFF)

stop I²C
start I²C

set turn-on   1000 1000   Chip address
        0001 0000   OUT2 subaddress, autoincrement ON
        0000 0001   OUT2 data (ON)
        0000 0011   OUT3 data (8.3V, ON)
        0000 0011   OUT4 data (7.0V, ON)
        0000 0001   OUT5 data (3.3V, ON)
        0000 0001   OUT6 data (ON)

stop I²C

Before turning on (set turn on procedure), the output voltage should be fixed, as it is done in the initial set procedure. Do not change the bits of "turn on" and "output voltage" at the same time, otherwise the correct output

voltage may not be present.

Note - example 1 & 2 don't use the OUT2 and OUT6 bytes in the initial set procedure, since these two bytes are not related to the setting of output voltages

< Example 2B - autoincrement mode - >
power on V_{in} = ON All output OFF (at RESET = "L")
release reset RESET = "H"

start I^{2}C

initial set	1000 1000	Chip address
	0001 0001	OUT3 subaddress, autoincrement ON
	0000 0010	OUT3 data (8.3V, OFF)
	0000 0010	OUT4 data (7.0V, OFF)
	0000 0000	OUT5 data (3.3V, OFF)

stop I^{2}C

start I^{2}C

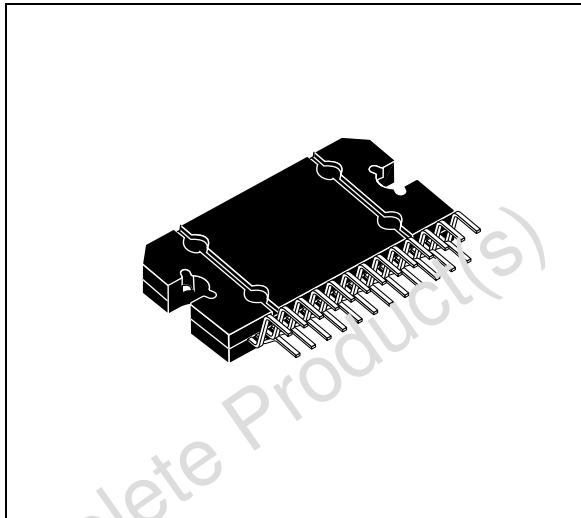| set turn-on	1000 1000	Chip address
	0001 0010	OUT4 subaddress, autoincrement ON
	0000 0011	OUT4 data (7.0V, ON)
	0000 0001	OUT5 data (3.3V, ON)
	0000 0001	OUT6 data (ON)
	0000 0001	OUT2 data (ON)
	0000 0011	OUT3 data (8.3V, ON)

stop I^{2}C

The autoincrement implements a counter by 5, this means that during autoincrement the next date after out 6 byte will be OUT2 date byte.

In the example are refreshed in sequence the bytes: OUT4 - OUT5 - OUT6 - OUT2 - OUT3
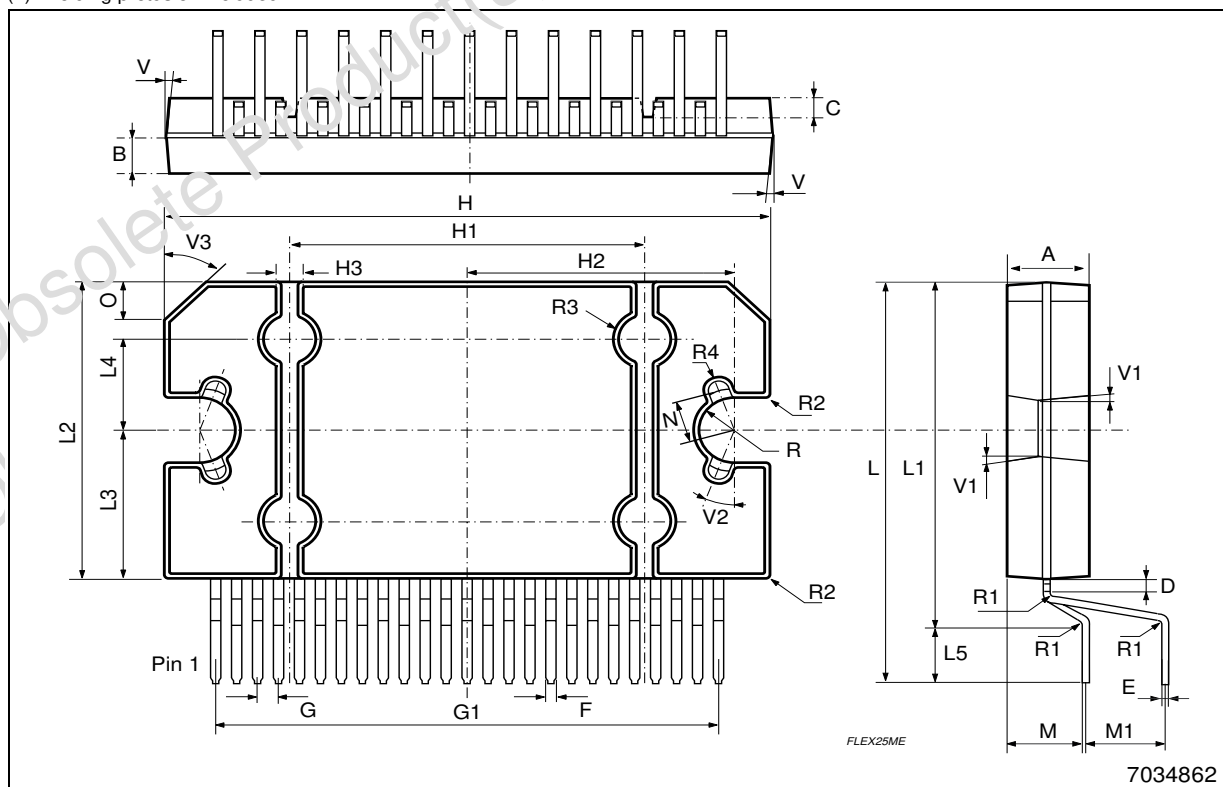
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.45	4.50	4.65	0.175	0.177	0.183
B	1.80	1.90	2.00	0.070	0.074	0.079
C		1.40			0.055	
D	0.75	0.90	1.05	0.029	0.035	0.041
E	0.37	0.39	0.42	0.014	0.015	0.016
F (1)			0.57			0.022
G	0.80	1.00	1.20	0.031	0.040	0.047
G1	23.75	24.00	24.25	0.935	0.945	0.955
H (2)	28.90	29.23	29.30	1.139	1.150	1.153
H1		17.00			0.669	
H2		12.80			0.503	
H3		0.80			0.031	
L (2)	22.07	22.47	22.87	0.869	0.884	0.904
L1	18.57	18.97	19.37	0.731	0.747	0.762
L2 (2)	15.50	15.70	15.90	0.610	0.618	0.626
L3	7.70	7.85	7.95	0.303	0.309	0.313
L4		5			0.197	
L5		3.5			0.138	
M	3.70	4.00	4.30	0.145	0.157	0.169
M1	3.60	4.00	4.40	0.142	0.157	0.173
N		2.20			0.086	
O		2			0.079	
R		1.70			0.067	
R1		0.5			0.02	
R2		0.3			0.12	
R3		1.25			0.049	
R4		0.50			0.019	
V		5˚ (T p.)				
V1		3˚ (Typ.)				
V2		20˚ (Typ.)				
V3		45˚ (Typ.)				

(1): dam-bar protusion not included
(2): molding protusion included

OUTLINE AND MECHANICAL DATA

Flexiwatt25 (vertical)

FLEX25ME

7034862

STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States

www.st.com