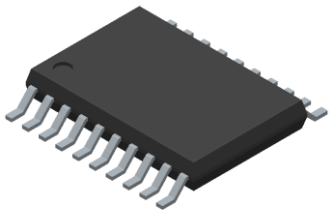
RED6289

RED6289 DALI* controller

Features

- Analogue / digital controller designed to supply all the features necessary for DALI-2 IEC62386-101,102,207 compliance (DT6).
- Dimming down to 0.1% possible
- DALI-2 functionality when combined with RediSem CV or CC control IC's
- Smooth dimming between levels
- Standby power management
- LED failure sensing & reporting
- Overtemperature sensing by NTC
- Mains failure sensing
- Harmonics adjustment when used in PPFC applications
- ISET function with up to 16 settings
- Push Dim Function
- Corridor Dim Function
- Compatible with the RediSem Testing Platform for the development & production of DALI-2 LED drivers
- Programmable over the DALI bus using the RediSem Testing Platform



TSSOP 20 package

Applications

- Linear dimmable flicker-free CC LED drivers with DALI-2
- High Frequency PWM dimmable CV LED drivers with DALI-2
- Low-cost passive PPFC LED drivers or wide range APFC drivers

Order code

Part Number	Package	Packaging
RED6289AT-TR13	TSSOP20	Tape and reel

* DALI & DALI-2 are registered trademarks of the DALI Alliance, www.dali-alliance.org

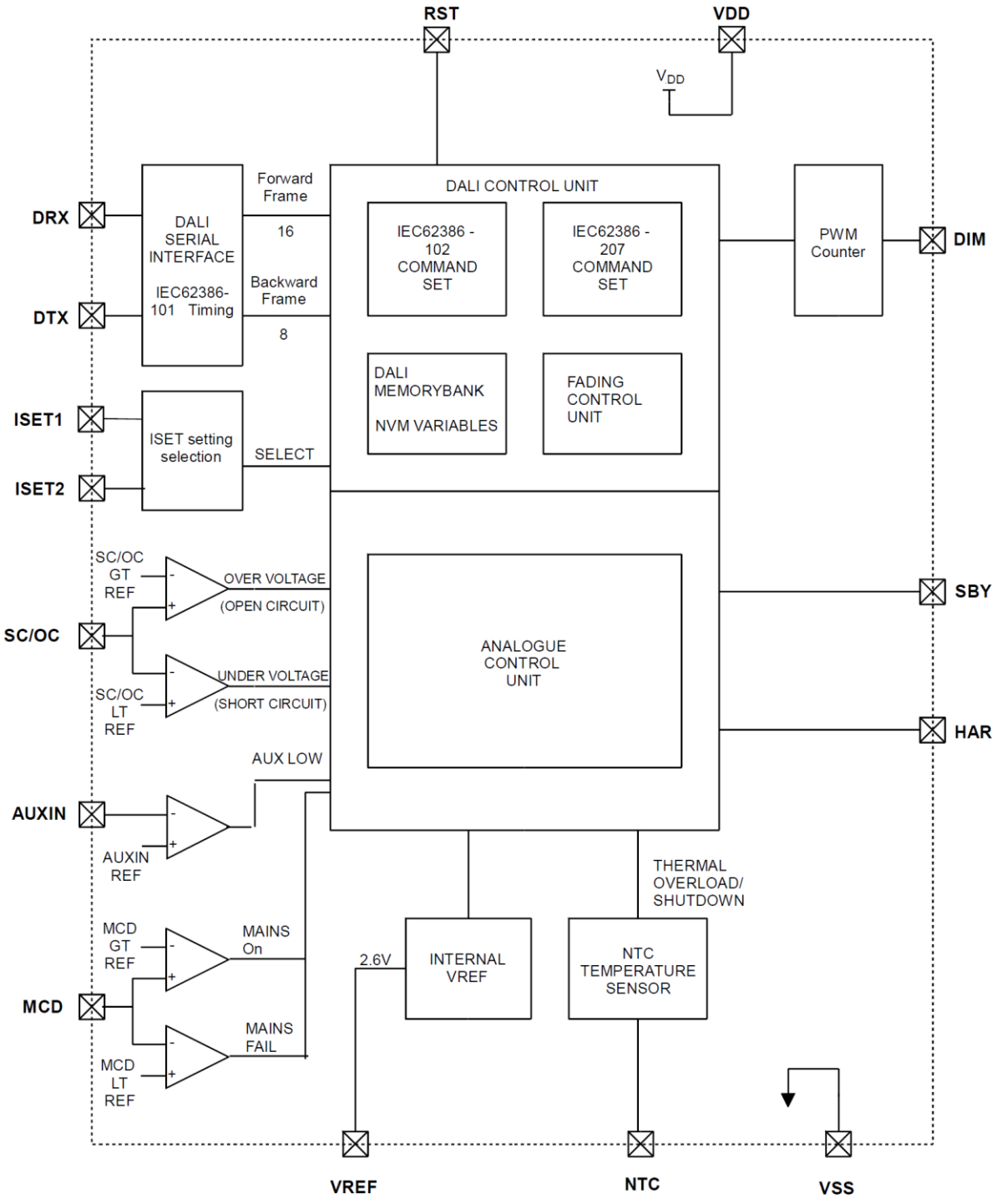


Figure 1: Block diagram

Device Pins

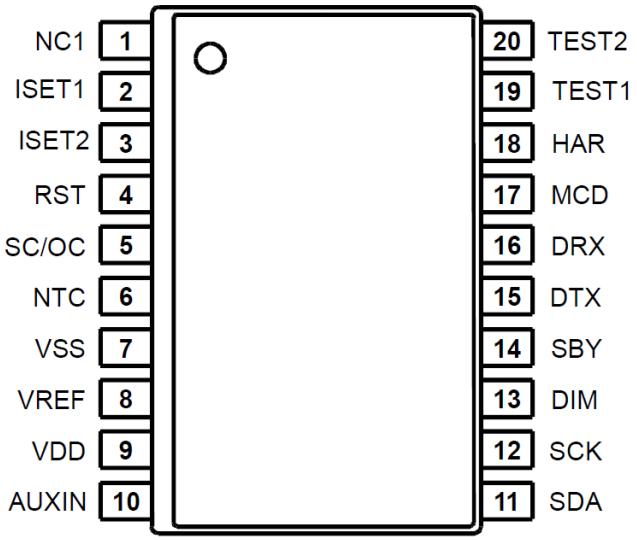


Figure 2: TSSOP 20 pin connections (top view)

Pin Functions

Pin #	Name	Function
1	NC	Do not connect to this pin
2	ISET1	ISET1 pin for output current selection
3	ISET2	ISET2 pin for output current selection
4	RST	Reset Pin
5	SC/OC	Input for detecting short circuit/open circuit
6	NTC	Input for detecting the NTC voltage for thermal protection
7	GND	IC Ground
8	VREF	Internal reference voltage
9	VDD	IC Power Supply pin
10	AUXIN	Aux voltage sensing pin for maintaining the VDD supply
11	SDA	Do not connect to this pin
12	SCK	Do not connect to this pin
13	DIM	PWM output
14	SBY	Output to force driver going into Standby
15	DTX	DALI transmit data pin
16	DRX	DALI receive data pin
17	MCD	Input for detecting mains
18	HAR	Output for PPFC switch
19	TEST1	Do not connect to this pin
20	TEST2	Do not connect to this pin

Typical Application

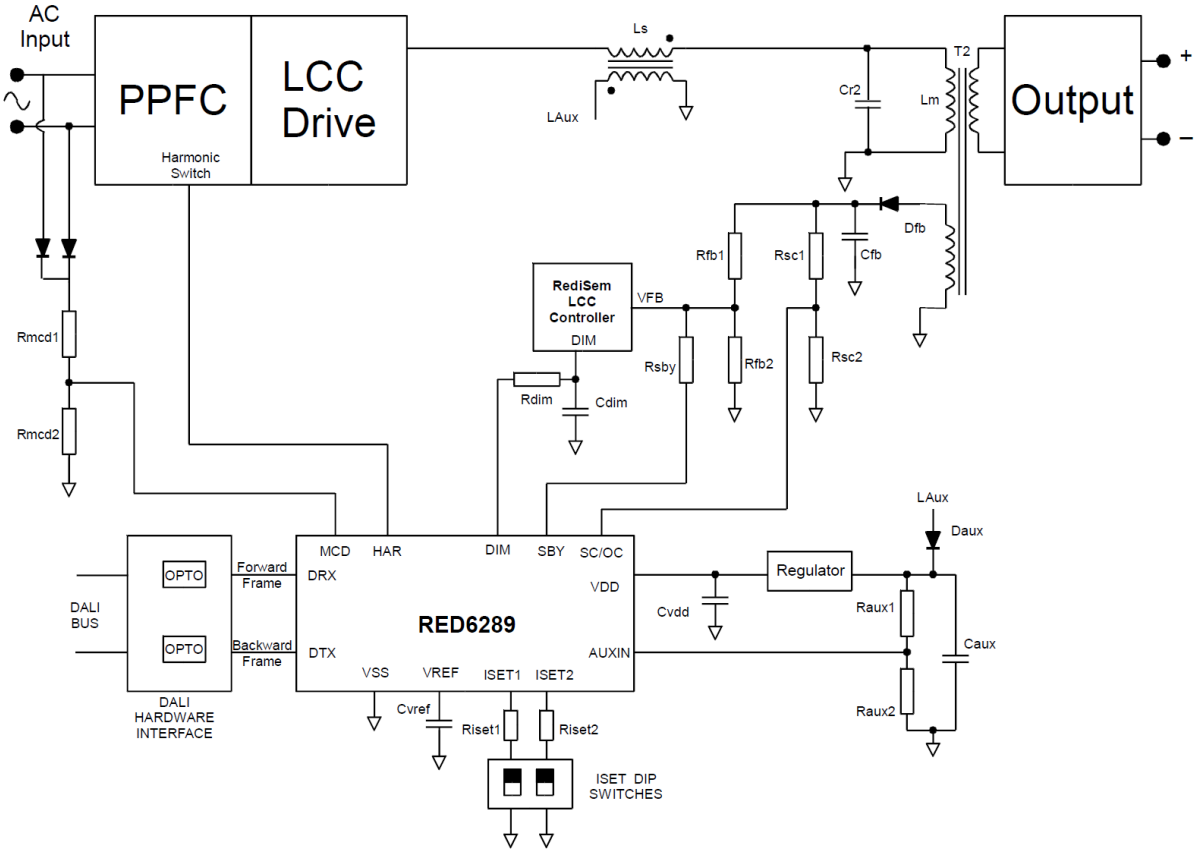


Figure 3: Typical Application:

LED driver using RED6289 *LCC controller with DALI input*

Features

RED6289 is an advanced CMOS control IC containing analogue & digital circuits necessary to implement a DALI-2 controller. When the IC is used in conjunction with RediSem's resonant controller ICs, a DALI-2 enabled LED driver is easily implemented.

DALI-2 compatibility

The RED6289 supports the instruction set of IEC62386-102 & IEC62386-207 and the interface timing requirement of IEC62386-101, provided that the LED driver has been designed according to RediSem's guidelines. In particular it can:

- Support extended fade time
- Sensing of analogue parameters
- Store data according to IEC standards
- Control whilst maintaining power during sudden power off

Protection Features

RED6289 can detect and report a number of fault conditions that cause the IC to enter a control/fault mode:

- Dim to OFF
- Output Open Circuit
- Output Short Circuit
- Mains OFF
- Over-temperature

During these control/fault conditions, the IC will maintain functional so that it can report the fault using the DALI protocol.

For DIM to off, RED6289 will limit the output voltage by controlling RediSem CSOC to turn off the LED and remain functional.

If the output is open-circuit, RED6289 detects this and stops. It then retries, checking to see whether the open circuit condition remains. If the output is short circuit, the IC detects these bursts,

checking to see if the short-circuit remains. If the fault is removed, the IC will automatically return to the output level set by the DIM input.

Over-temperature Protection & Shutdown

The over-temperature protection using NTC to reduce the output level of the controller if the temperature exceeds the thermal overload threshold. The output level will resume normal operation when the NTC temperature reduces. If the temperature exceeds the thermal shutdown threshold, the controller will shut the driver down.

IC Operation

VDD and GND pins

A VDD of 3.3V must be supplied to the RED6289 through an LDO to the VDD and GND pins. For accurate control use a 1% accuracy LDO and fit a 1uF capacitor close to the GND and VDD pins of the IC.

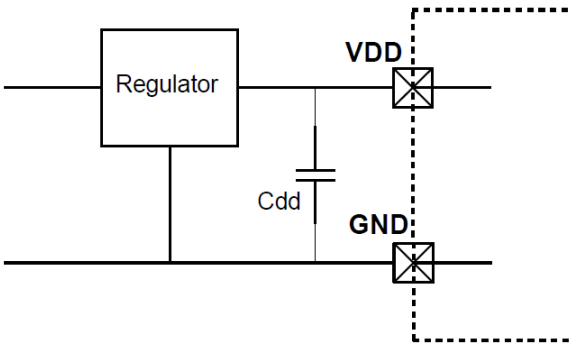


Figure 4: VDD & GND connections

DRX and DTX pins

A diagram of the DALI serial interface module is shown in Figure 5. The DRX pin receives serial commands from the master and initially checks whether the timing is within the requirement. The Manchester decoder unit will decode the opcode and through the data forward frame path to the DALI control unit. Any reply from the DALI control unit will follow the backward frame path. It is encode using Manchester coding and send back by the DTX pin.

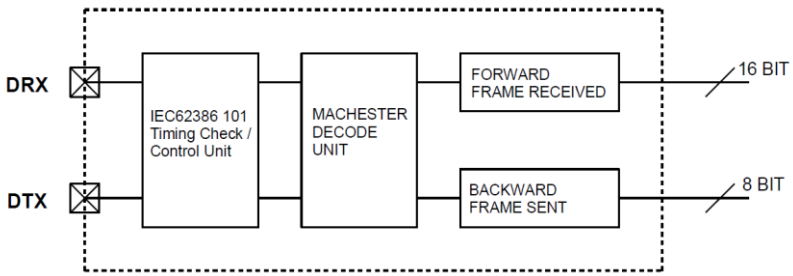


Figure 5: DRX and DTX pins

SC/OC pin

SC/OC pin is used to detect output open & short, through a winding on the output transformer. When the SC/OC voltage is higher than SC/OC GT REF for a certain period, RED6289 will shut the controller down. The controller will then restart the converter again to check whether the open or short circuit condition remains. When the SC/OC voltage drops below the SC/OC LT REF, RED6289 will go to standby mode to maintain the communication function. When the short circuit condition has been removed, it will resume normal operation once more. Figure 6 shows the function diagram of the SC/OC pin.

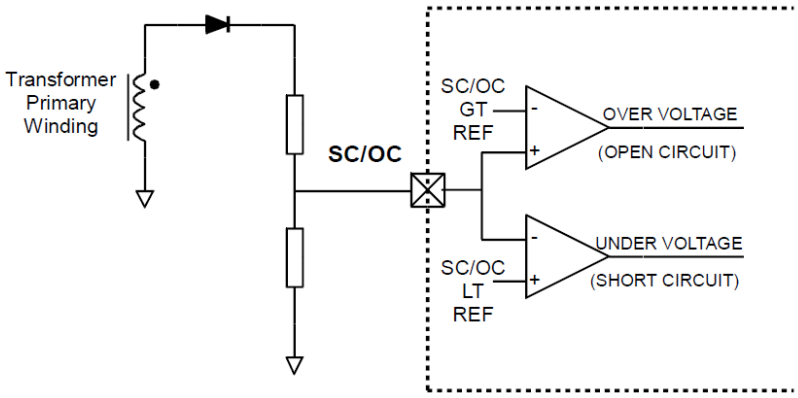


Figure 6: SC_IN connections

AUXIN pin

AUXIN pin is used to detect the auxiliary supply winding voltage, that is used to power the RED6289. If the pin voltage is less than AUXIN REF, the AUX_LOW output will force the converter to re-start in order to maintain the AUX supply by controlling the RediSem CSOC controller. Figure 7 shows the connection of the AUXIN pin.

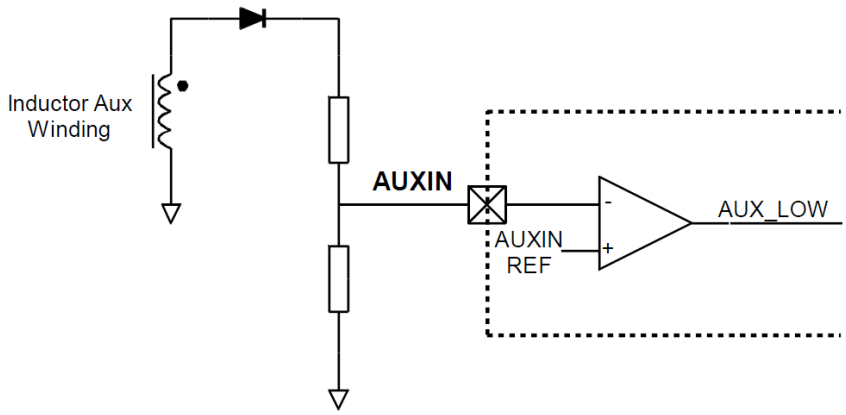


Figure 7: AUXIN pin connection

MCD pin

The primary function of the MCD pin is to detect whether the input mains is correct or not. It detects the rectified AC m-shape wave. If the pin voltage periodically rises higher than the MCD level, RED6289 will consider that the mains supply is healthy. When the mains fails dues to a power off or mains glitch, RED6289 detects that the MCD pin voltage is less than MCD LT REF and goes to mains off mode. Figure 8 shows the connections of the MCD pin.

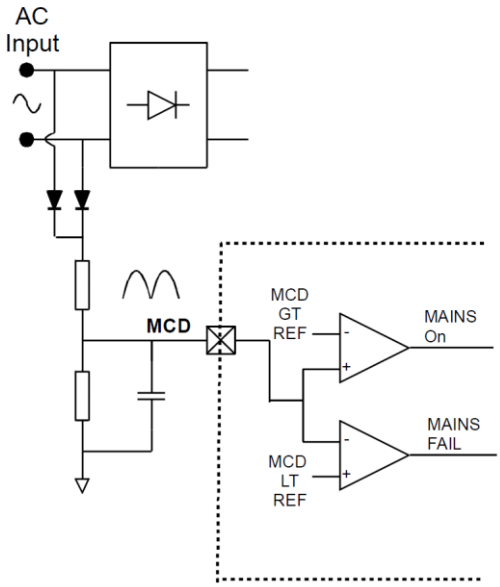


Figure 8*: MCD Pin connection*

DIM pin

RED6289 has a PWM output at the DIM pin for controlling the output current level of the LED driver.

The duty cycle of the output of DIM pin is decided by the DALI light level (0-254). 254 is 100% and 0 is 0%. The PWM output should be passed through a low pass RC filter to the DIM pin of the RediSem Controller.

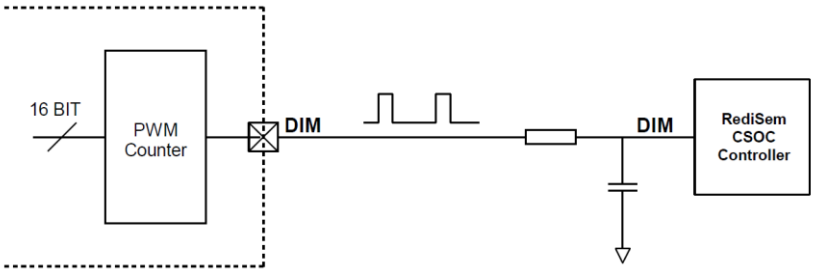


Figure 9*: RED6289 DIM pin circuit*

HAR pin

The HAR pin is used to control the switch in the driver in order to change the boost setting to cope with the mains harmonics requirements at different operating points in RediSem's patented PPFC converters. This will enable the IEC harmonics requirement to be fulfilled over a wider range of output requirements.

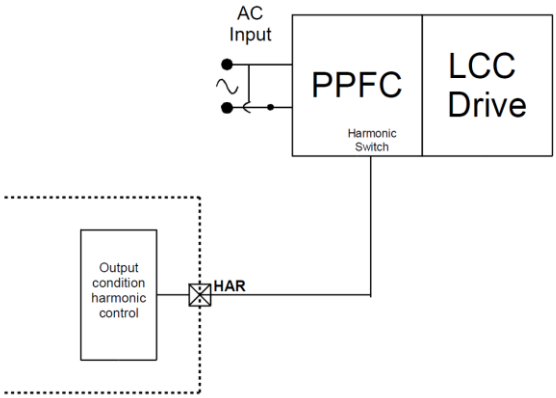


Figure 10*: RED6289 HAR pin connection*

NTC pin

The NTC pin is used to detect the voltage level of the external NTC. When the voltage is higher than the Thermal Overload Ref, thermal overload is tiggered and the output current will be reduced to 15% (software adjustable). If the voltage of the NTC pin further increases to a level higher than the thermal shutdown Ref, thermal shutdown will be triggered and the driver will go to dim to off mode.

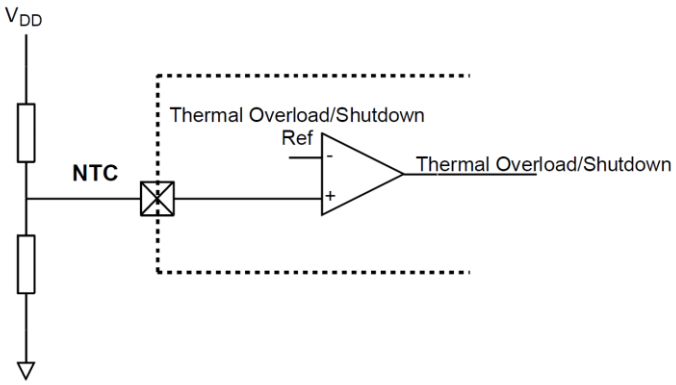


Figure 11*: RED6289 NTC pin connection*

ISET1 and ISET2 pins

The ISET1 and ISET2 pin are used to select the 100% output current level of the driver as the stored value. There are two different modes: digital and analog modes. For digital mode, each pin represents 2 selections (0 or 1) and total 4 ISET settings can be selected. For analog mode: 4 voltage sections are defined by 3 ISET analog levels: top, middle, bottom. Total 16 ISET settings can be selected.

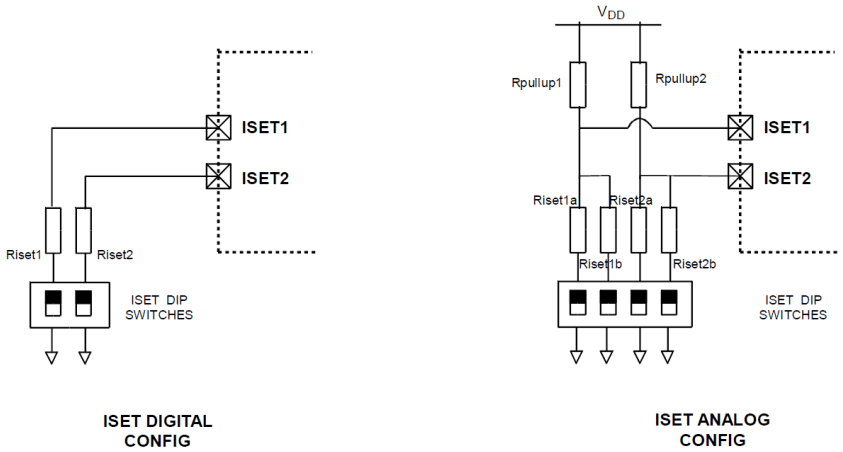


Figure 12*: RED6289 ISET1 and ISET2 pins connection*

VREF pin

The VREF pin is the 2.6V voltage reference of RED6289 for internal use.

SBY pin

The SBY pin is the standby pin output from RED6289 to make the RediSem CSOC to go to standby mode.

Push DIM

DALI port supports push dim function that allow users to control the output just a press switch button connecting to AC mains. The driver will check the length of the press to decide whether to turn on or off; alternatively it can dim the lamp up or down. Here is the table:

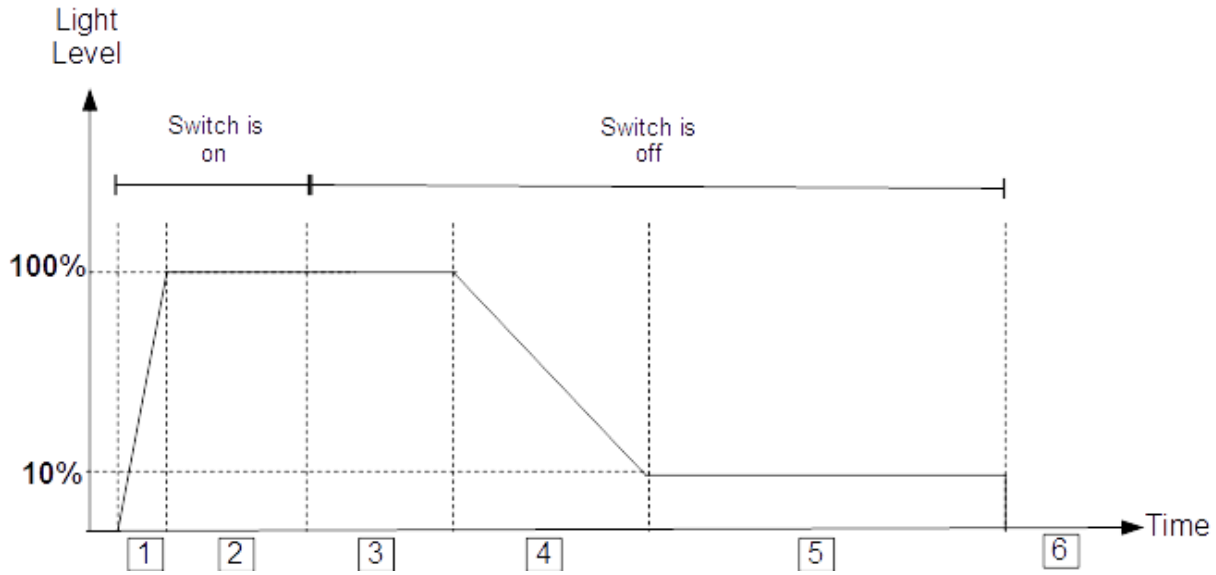
Default values:

User Action	Press Length	Function
Short Press	<0.6s	Turn on/off
Long Press	>0.6s and <10s	Dim up/down
Sync Press	>10s	Sync to 50% level

- Press length less than 0.04s will be ignored.
- All Press Length, on/off fade rate and dim up/down fade rate can be configured by the RediSem Testing Platform. It can suit different user requirements.
- The minimum dimming depth follows the physical limit of the DALI setting. It can be changed through the RediSem Testing Platform.
- The last dim level and status of on/off is memorized so that it can resume when the mains is cycled.

Corridor DIM

A corridor DIM function allows users to connect the driver to a motion sensing switch. Once people pass by, the light can turn on with a pre-programmed sequence of turning on with a on fade rate. It will then maintain light for a while before gradually dimming to a lower level. It then stays for a period at a low level before turning off. Below is the timing diagram:



1: Fade Up When the Switch on

2: Maintain max level while the switch remains on

3: Remain at max level for a period after the switch turns off

4: Fade down to min level (10%)

5: Maintain min level (10%) for a period.

6: Turn off

- The time for the stay on during period 3 and the stay low period 5, fade up rate and the fade down rate are configurable by the RediSem Testing Platform.
- Turning off after period 6 is configurable. The user can disable it so that it can stay on at the minimum level.
- The Max and Min levels are also configurable by the RediSem Testing Platform.

To enter the Corridor Dim function from DALI mode, the switch should be pressed for a long time (default 1 min, configurable) in order to enter the corridor DIM mode. Once it enters the corridor dim function, it can memorise it and stay in Corridor Dim mode when the mains is cycled. It can be cleared by 3 consecutive DALI commands to return it to DALI mode; or 3 consecutive switch on/off then back to push dim mode.

ABSOLUTE MAXIMUM RATINGS

CAUTION: Permanent damage may result if a device is subjected to operating conditions at or in excess of absolute maximum ratings.

Parameter	Symbol	Condition	Min	Max	Unit
Supply voltage	V_{DD}		-0.3	3.8	V
Input voltage	V_{IN}		-0.3	V_{DD} + 0.3	V
Output Current High	I_{OH}	One pin	-18		mA
		Total pin current	-60		mA
Output Current Low	I_{OL}	One pin		+30	mA
		Total pin current		+100	mA
Junction temperature	T_J		-25	+105	°C
Storage temperature	T_P		-25	+105	°C

NORMAL OPERATING CONDITIONS

Unless otherwise stated, electrical characteristics are defined over the range of normal operating conditions. Functionality and performance are not defined when a device is subjected to conditions outside this range and device reliability may be compromised.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Minimum supply current	I_{DD}			6.0		mA
Junction temperature	T_J		-25	25	105	°C

ELECTRICAL CHARACTERISTICS

Unless otherwise stated:

- Min and Max electrical characteristics apply over normal operating conditions.
- Typical electrical characteristics apply at $T_J = T_{J(Typ)}$.
- The chip is operating in RUN mode.
- Voltages are specified relative to the GND pin.

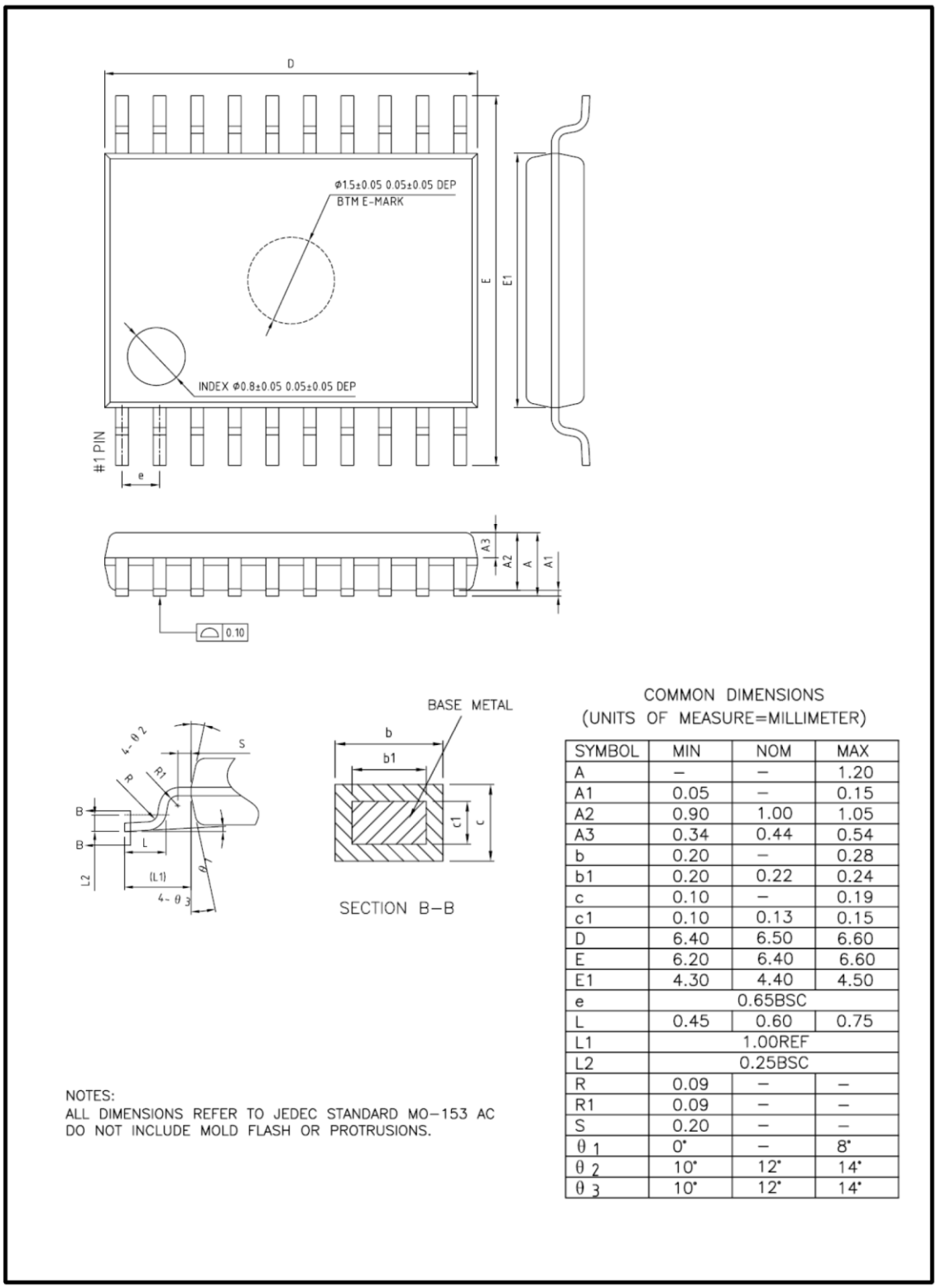
VDD Pin

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage	V_{DD}		1.6	3.3	3.6	V
Supply current	I_{DD}	V_{DD} = 3.3V		6		mA

PACKAGE INFORMATION

Package Dimensions

TSSOP 20 package dimensions are shown below. All units are in mm.



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

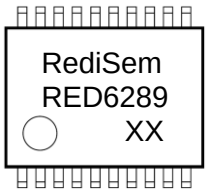
SYMBOL	MIN	NOM	MAX
A	–	–	1.20
A1	0.05	–	0.15
A2	0.90	1.00	1.05
A3	0.34	0.44	0.54
b	0.20	–	0.28
b1	0.20	0.22	0.24
c	0.10	–	0.19
c1	0.10	0.13	0.15
D	6.40	6.50	6.60
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00REF		
L2	0.25BSC		
R	0.09	–	–
R1	0.09	–	–
S	0.20	–	–
θ 1	0°	–	8°
θ 2	10°	12°	14°
θ 3	10°	12°	14°

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD MO–153 AC
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Available packages

Package type	Part number	JEDEC	Packaging	Thermal Resistances		
TSSOP 20	RED6289AT-TR13	JESD51-2	Tape and reel 4000pcs/13” reel	Junction - Ambient	θ_{JA}	50°C/W

Package Marking



TSSOP20 top-side marking for RED6289

RED6289= Part Number

XX= Lot Code, e.g. AA, AB

Status

The status of this Datasheet is shown in the footer.

Datasheet Status	Product Status	Definition
Preview	In development	The Datasheet contains target specifications relating to design and development of the described IC product.
Preliminary	In qualification	The Datasheet contains preliminary specifications relating to functionality and performance of the described IC product.
Production	In production	The Datasheet contains specifications relating to functionality and performance of the described IC product which are supported by testing during development and production.

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