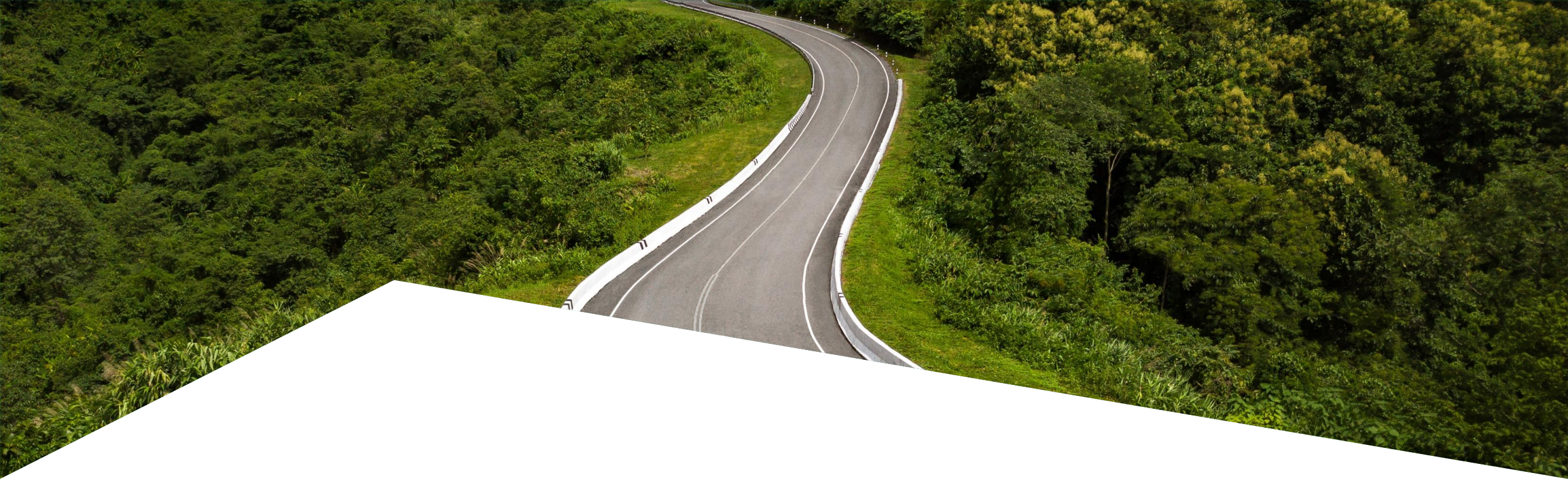


LITIX™ Basic+

Linear current sinks & sources for automotive LED lighting

Feb 2025

public

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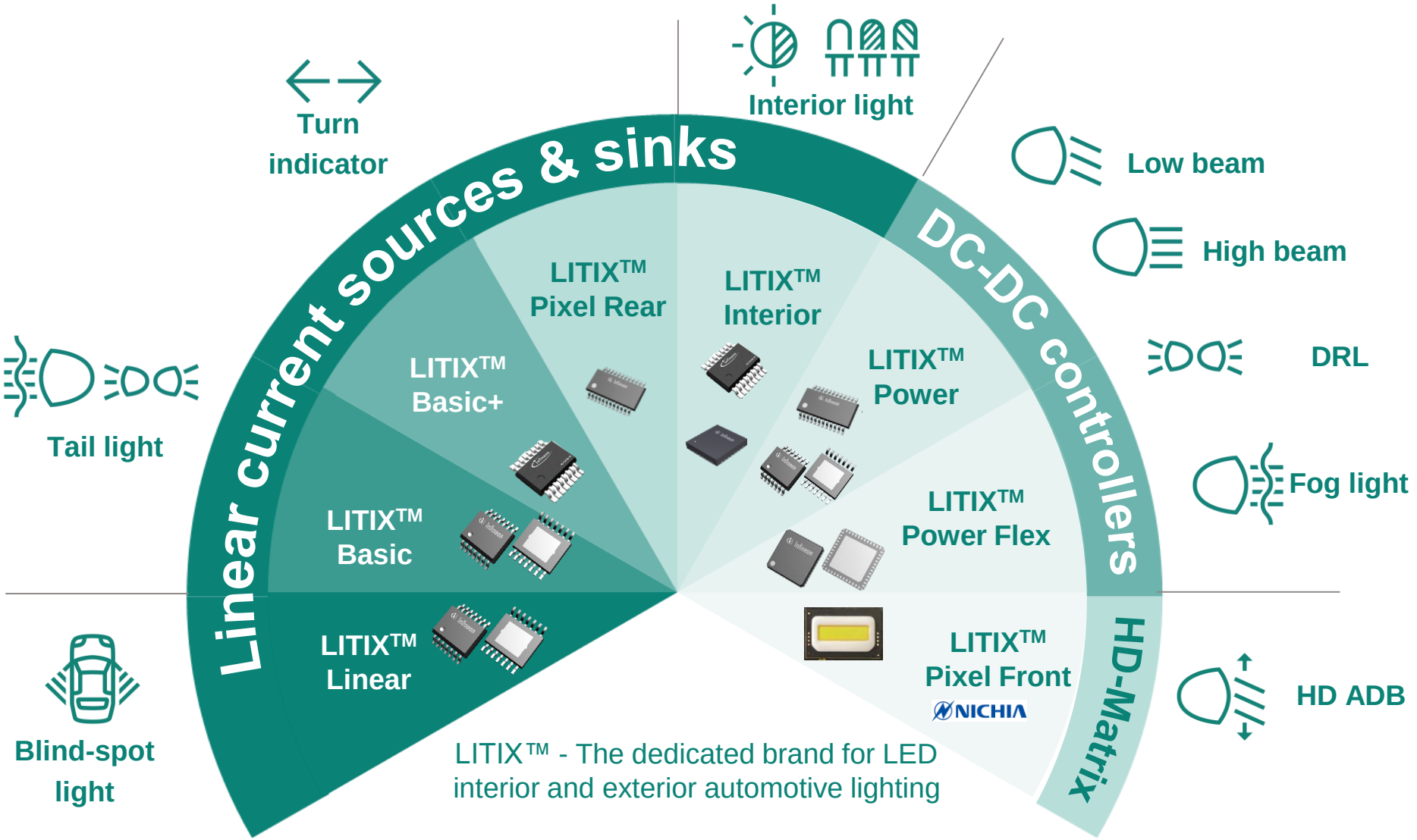
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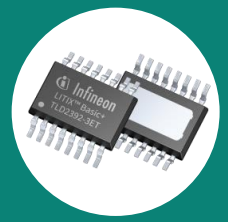
Infineon offers a wide portfolio of LED driver for automotive
All interior & exterior light functions addressed with the right product





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LITIX™ Basic+ – Portfolio of linear current sinks & sources with Power Shift, best-in-class current accuracy, thermal derating, PWM



LITIX™ Basic+



Linear LED driver for exterior lighting

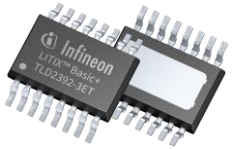
- **PWM engine or input**
  Very precise digital dimming
- **1, 2, 3 Channel drivers**
  Up to 150mA/ch for 3ch, 400mA 1ch
- **Diagnosis & Protection**
  Configurable fault management & thermal derating
- **Power shift feature**
  Via external resistor

Read more*

Broad portfolio helps you minimize external componentry, save PCB space and offers best-in-class brigthness control.



TSDSO-14
4.9. x 3.9 x 0.95
FP: 5.7 x 4.0



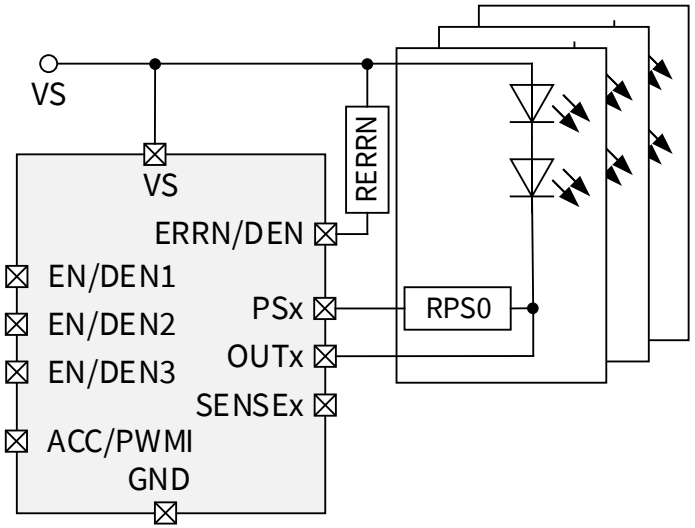
TFDSO-16
4.4 x 2.8 x 0.95
FP: 4.4 x 4.9

Protection & Reporting

Accurate dimming

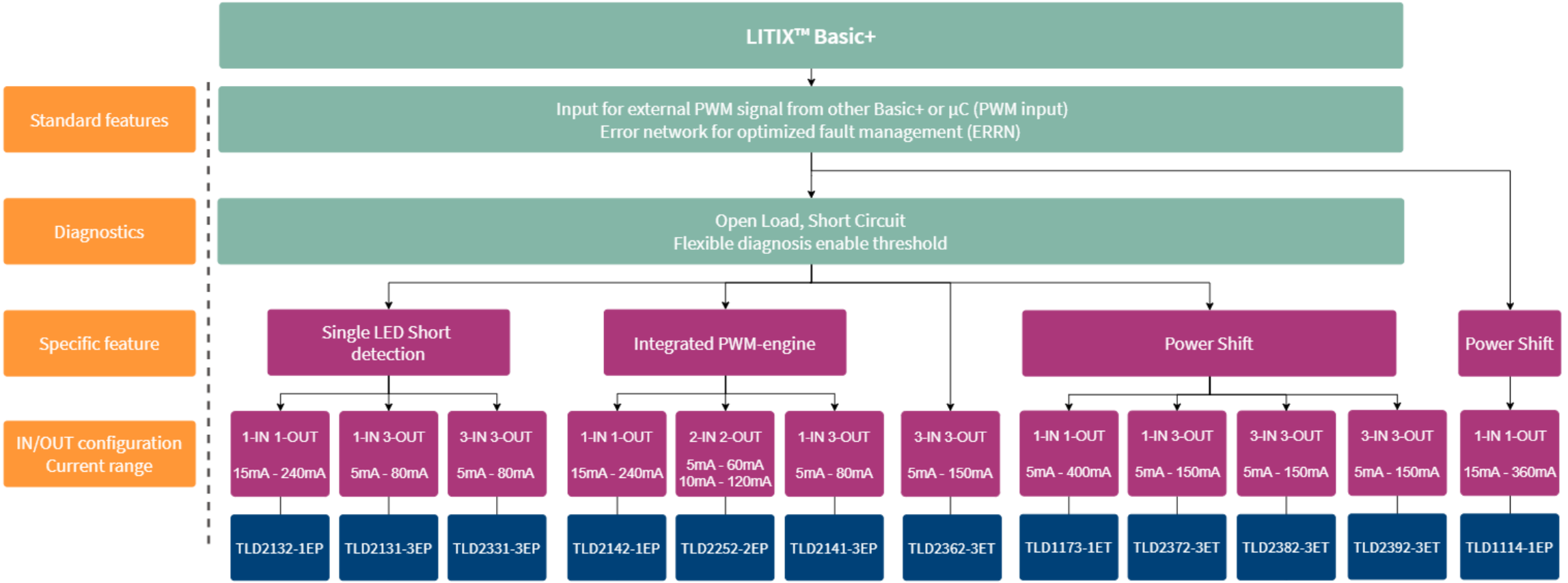
PCB space saving

Component savings



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LITIX™ Basic+ Portfolio Overview



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LITIX™ Basic+
Best-in-class current accuracy, thermal derating, power shift



	Our offer	Your value
Minimize external components	– Up to 10 devices can share the same error network & reuse the same external components – Configurable fault management without external components needed	– Save up to 10 external resistors – Two layers PCB to ensure best cost point and highest thermal performance – Saves additional components, cost
Diagnosis & Protection	– Thermal derating via PTC/NTC resistor – Configurable fault management – Open load, short circuit, over temperature protection	– Thermal protection of LEDs. Fewer external components required compared to competition – Independent fault behavior without design change needed – Protects device from stress & ensures increased lifetime
Current accuracy	– Best in class current accuracy (4%, T_A = -40 to 150°C, V_S = 4.5V to 36V)	– Precise brightness control – Accuracy is ensured under all voltage conditions and up to very high temperature
Excellent EMC robustness	– Conforms with **V_S CISPR25 Class V** with PWM – Conforms with **V_{OUT} emissions** (C_{OUT} = 10nF for both) **passing Class II** (low side Basic+), Class I (high side Basic+)	– Save on additional filter components

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LITIX™ Basic+ Portfolio Overview

	Topology	Input/ Output	Output current/ch	Package	Thermal derating via	PWM Input Error network	Open Load Short Circuit	Single LED Short	PWM engine	Power Shift
TLD2132-1EP	High Side	1/1	15-240mA	TSDSO-14	PTC	✓	✓	✓		
TLD2132-3EP	High Side	1/3	5-80mA	TSDSO-14	PTC	✓	✓	✓		
TLD2331-3EP	High Side	3/3	5-80mA	TSDSO-14	PTC	✓	✓	✓		
TLD2142-1EP	High Side	1/1	15-240mA	TSDSO-14	PTC	✓	✓		✓	
TLD2252-2EP	High Side	2/2	10-120mA	TSDSO-14	PTC	✓	✓		✓	
TLD2141-3EP	High Side	1/3	5-80mA	TSDSO-14	PTC	✓	✓		✓	
TLD1114-1EP	High Side	1/1	15-360mA	TSDSO-14	PTC	✓	✓			✓
TLD1173-1ET New	Low Side	1/1	5-400mA	TFDSO-16	NTC	✓	✓			✓
TLD2372-3ET New	Low Side	1/3	5-150mA	TFDSO-16	NTC	✓	✓			✓
TLD2382-3ET New	Low Side	3/3	5-150mA	TFDSO-16	NTC	✓	✓			✓
TLD2392-3ET New	Low Side	3/3	5-150mA	TFDSO-16	NTC	✓	✓			✓
TLD2362-3ET New	Low Side	3/3	5-150mA	TFDSO-16	NTC	✓	✓			

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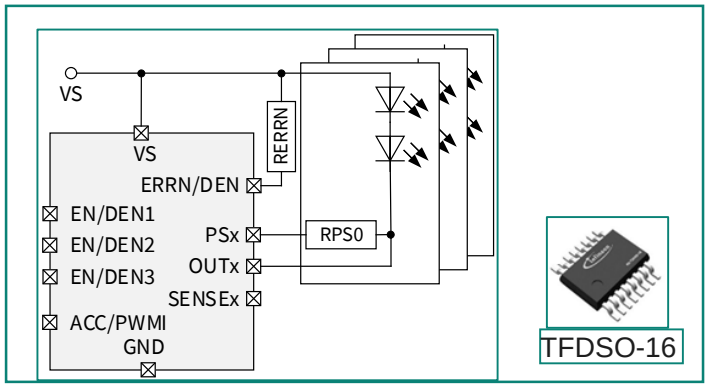
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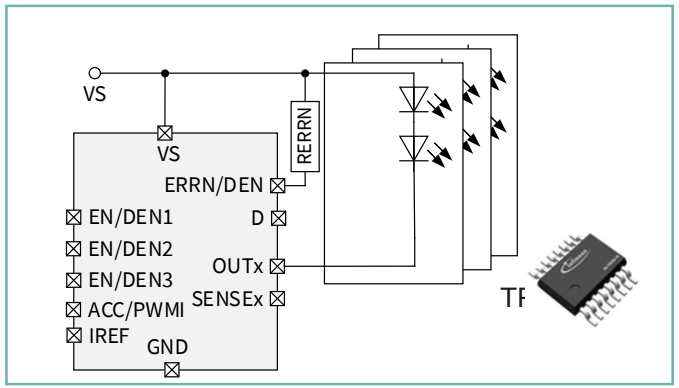
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LITIX™ Basic+ family is extended by five new devices offering power shift to drive higher currents

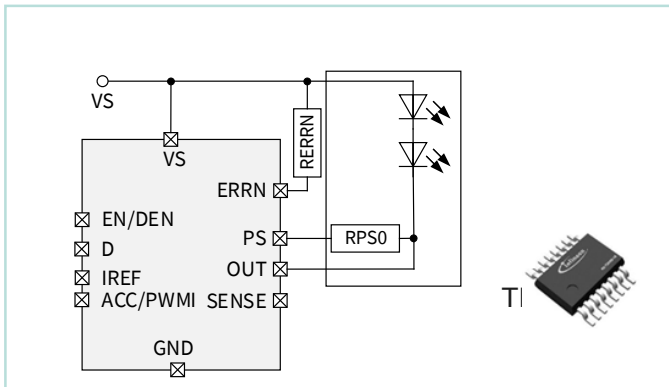
1 3ch w/ offload for up to 150mA



2 3ch w/o offload for up to 100mA



3 1ch w/ offload for up to 400mA



	TLD2382-3ET	TLD2392-3ET	TLD2372-3ET	TLD2362-3ET	TLD1173-1ET
Current capab.[1]	Up to 150mA / channel			Up to 100 mA/ch (150mA w/ preregulator)	Up to 400mA
OL/ SC	Yes			Yes	Yes
Fault mgmt	N-1	report only	flexible	Flexible	flexible
Analog dimming	analog dimming with ext. reference[2]		Yes[2]	Yes	Yes
Animations (3 enable pins)	Yes		No	Yes	
Applications	Turn w/ animations („wiping“ indicator)		Analog dimming, e.g. RCL or thermal derate	Low current, e.g. tail	Fog and reverse

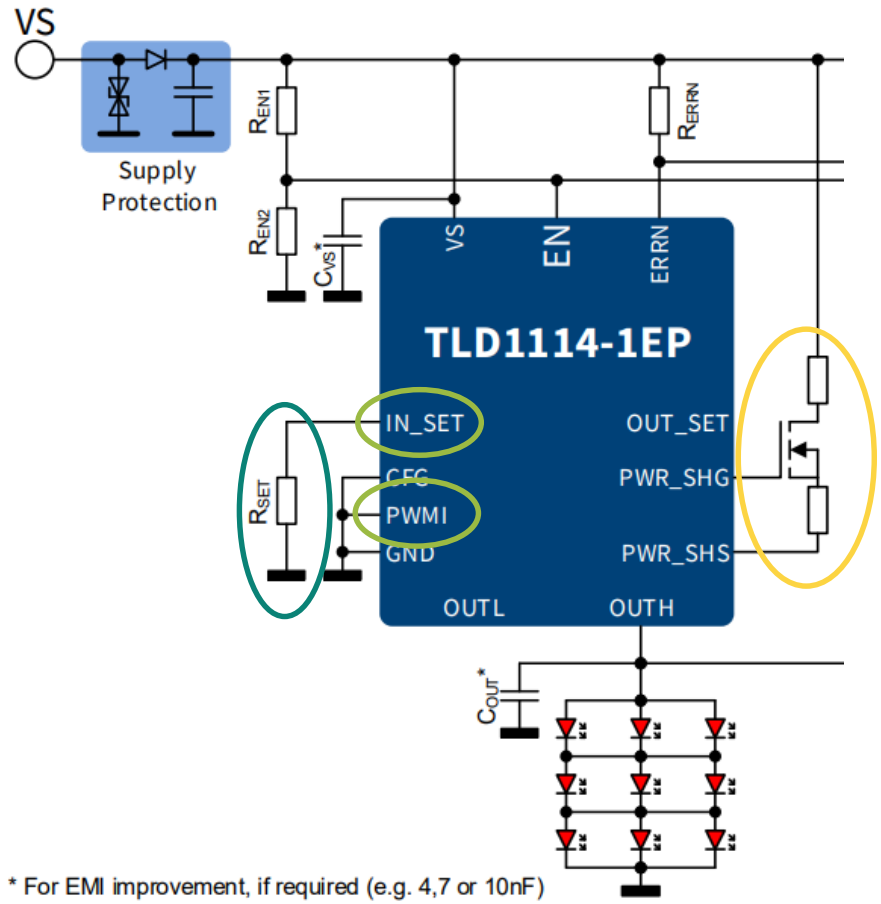
[1]current accuracy: +/-4%

[2] Var 1 andd 2 w/o IREF Pin; Var 3 has an additional IREF Pin for analog dimming, binning and centralized thermal derate (via NTC)

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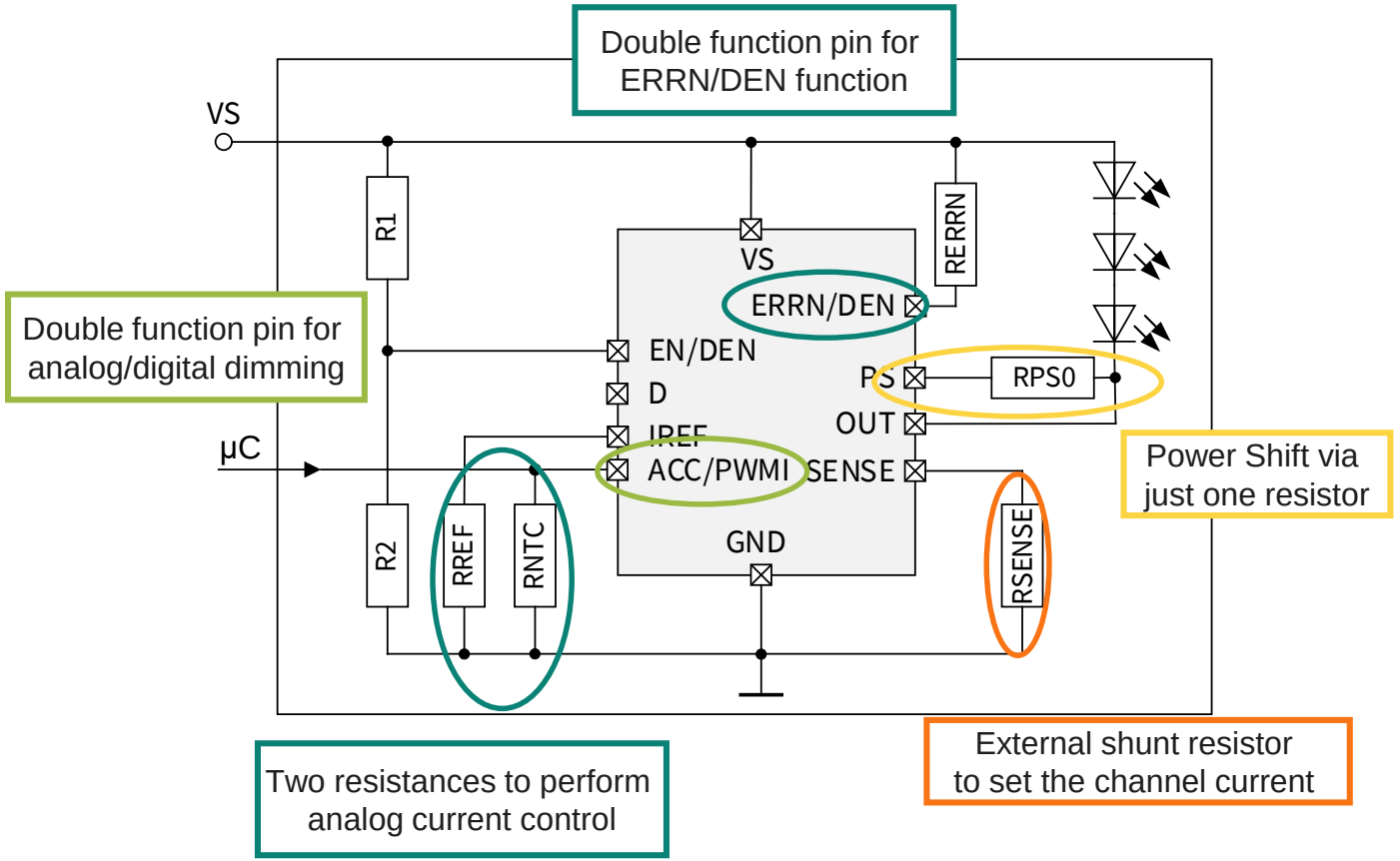
Main differences between Basic+ with Power Shift vs. rest of Basic, Basic+ families

Existing Basic+ family



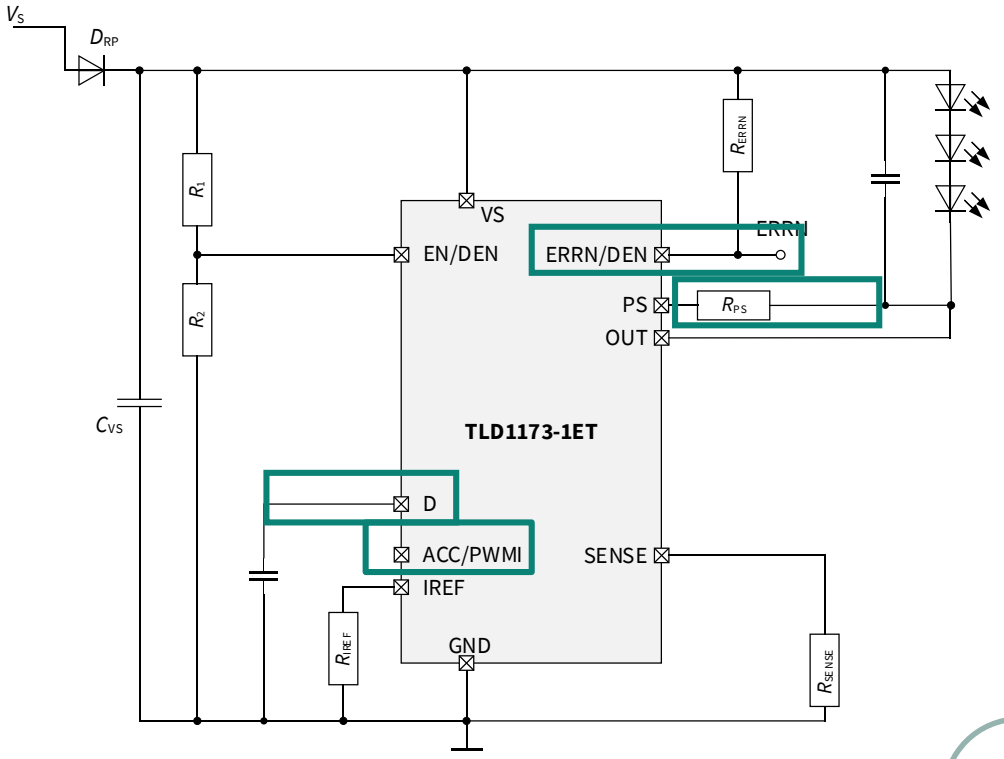
* For EMI improvement, if required (e.g. 4,7 or 10nF)

Upcoming Basic+ extension family



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We enable…



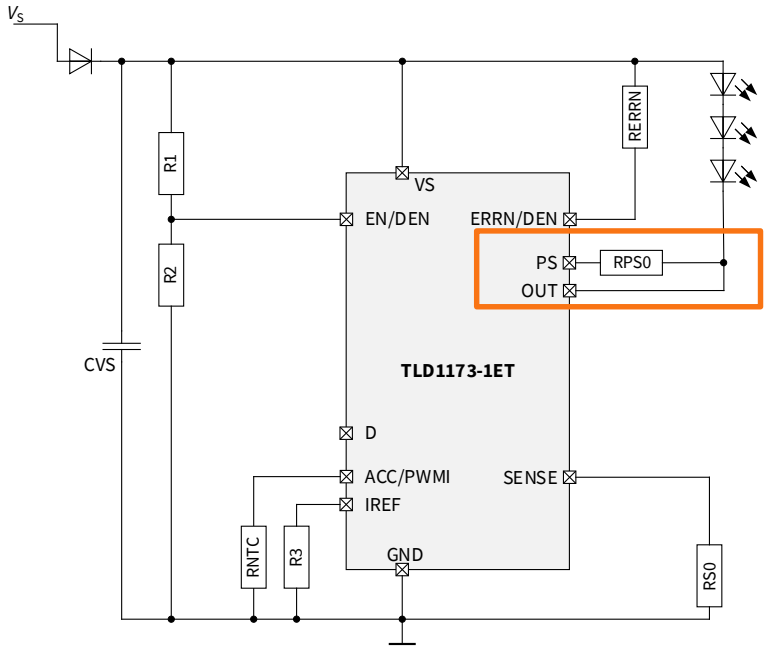
- High current demand up to 400mA (1ch) and 150mA (3ch)
- Needed configurable fault management and thermal derating
- Limited space design
- Low-cost solution to implement simple TAIL/STOP design
- Implement simple animated light functions
- Compatibility with legacy BCM

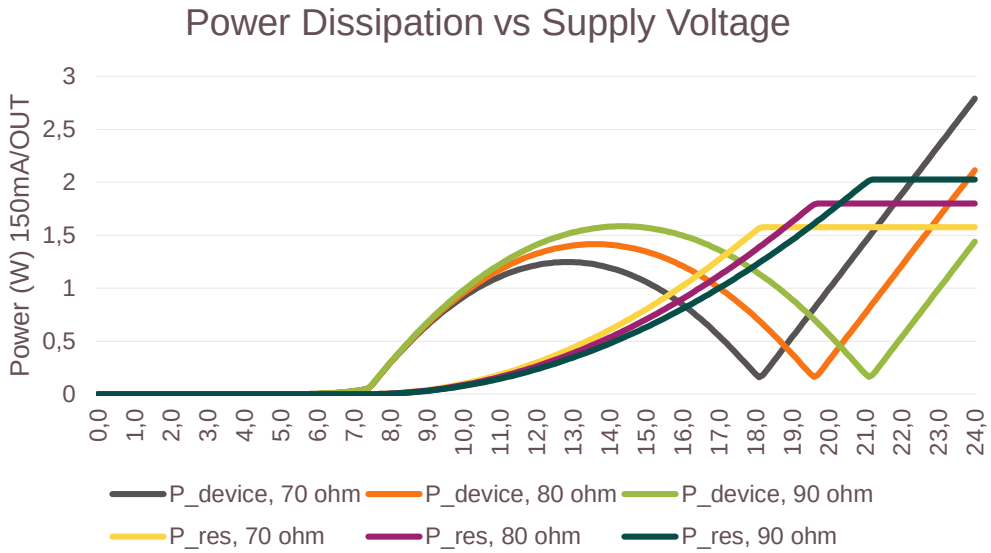
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Key1: Increase the channel current via the Power Shift feature: up to 400mA for the 1ch, 150mA for the 3ch devices

High current demand up to 400mA: Fog, Reverse, Turn…

- Implement a “low cost high power” solution by including a power shift function to dissipate externally the extra power:
  - One channel up to 400mA
  - Three channels up to 150mA/ch





Benefit:
Maximum **total power < 1.5 W** inside the device with 3ch ON at 150mA for all VIN range.

For the 1ch at 400mA the total power dissipation is even lower.

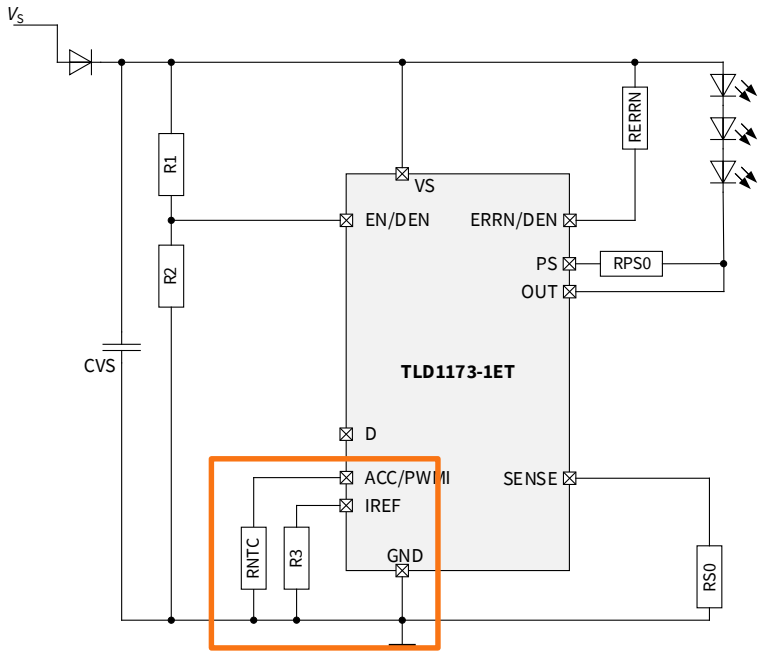
	max	Conditions
Drop out (V_{OUT} - V_{SENSE})	0.6 V	@400 mA (1ch) / @150 mA (3ch)
Drop out (V_{PS} - V_{SENSE})	0.9 V	@400 mA (1ch) / @150 mA (3ch)

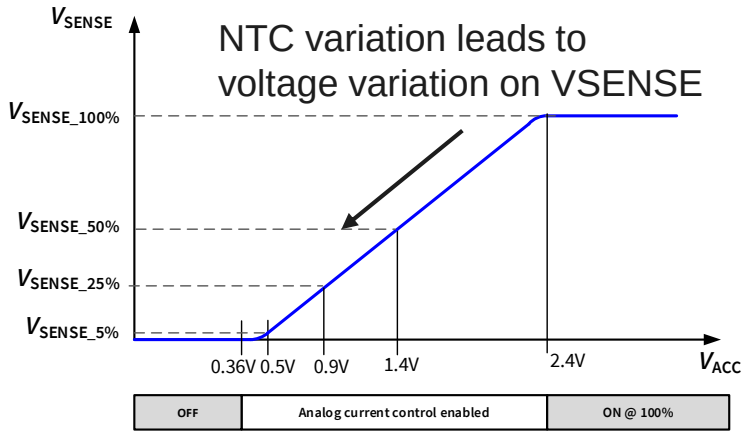
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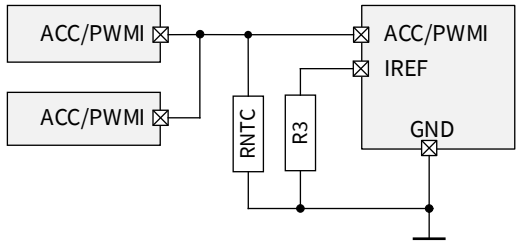
Key2: thermal derating for high LEDs temperature

Thermal derating for high LEDs temperature

- Implement analog output current control (ACC) to apply an external NTC to adjust the output current based on the LEDs temperature







	min
VSENSE	20mV (5%)

Benefit:
Possibility to decrease the current down to 5% of the ideal one by just placing a NTC

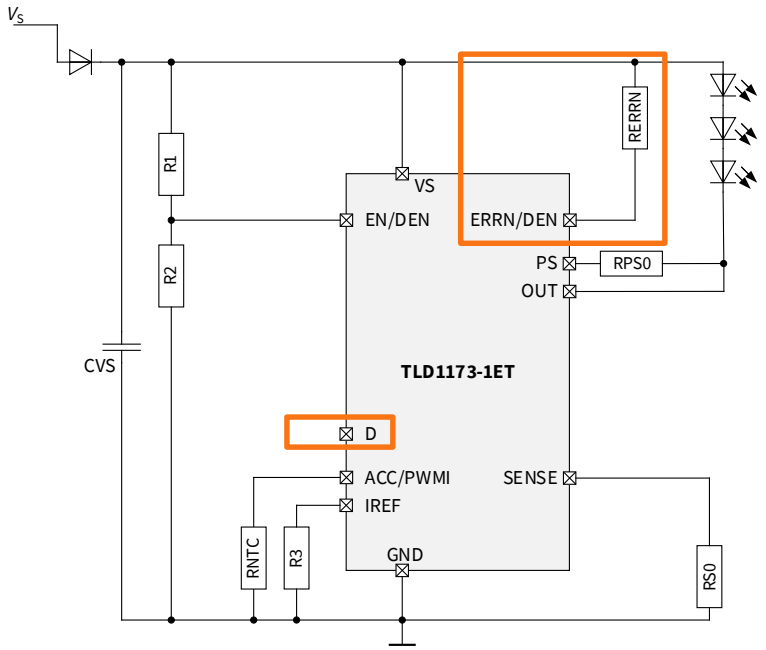
Central thermal derating:
Possibility to decrease the current on all the channels by monitoring the system hot spot

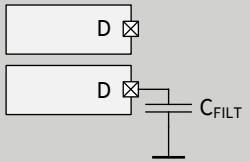
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Key3: diagnosis with configurable fault management

Different requirements of fault reaction from different regions

- Implement a configurable fault reaction based on D setting:
  - One fail all off (N-1)
  - Report only
- Implement a shared error network reporting ERRN



Fault mode	Configuration	Benefit
One fail all off		The use of C_{FILT} adds a filter time to avoid detection of false fault conditions due to noise avoiding light function off
Report only		

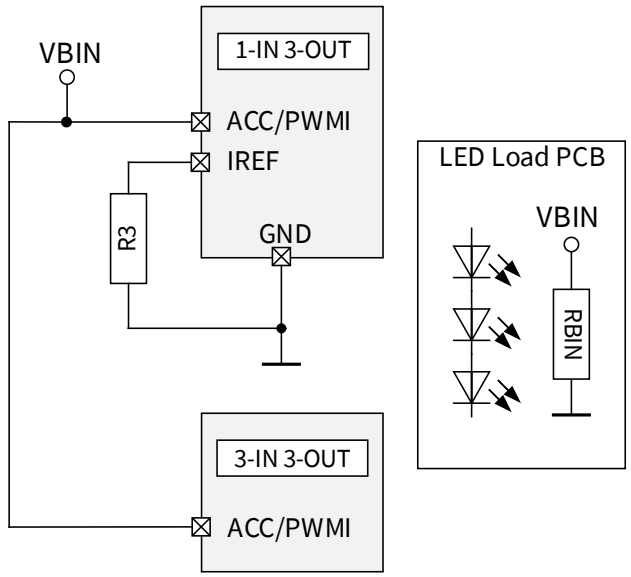
ERRN:
Reporting a fault condition
Monitoring external fault conditions in case of shared network

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Key4: output current control to enable limited space design via binning resistors

Small PCB space allowed to implement rear lamp design

- Implement analog output current control (ACC) to apply an external binning resistor
- Small TFDSO-16 package with 0.5mm pitch to minimize space for the LED driver



› The voltage on ACC pin is controlling the output current via V_{SENSE}
› IREF can be used to generate a voltage on the pin ACC based on the binning resistor RBIN
› ACC is present on the 1-IN/3-OUT version and can be shared with the 3-IN/3OUT version

	min	max
V_{IREF}	1.16 V	1.24 V

› $I_{ACC} = 5 * I_{IREF} = 5 * \frac{V_{IREF}}{R_3}$

› $V_{ACC} = R_{BIN} * I_{ACC}$



RoHS

AEC Qualified

› TFDSO-16, 0.5mm pitch, exposed pad
› Small size: 4.4mm x 2.8mm
› EP size: 3.5 x 1.67mm
› Grade1 (Ta up to 125°C)
› Max Tj of 150°C

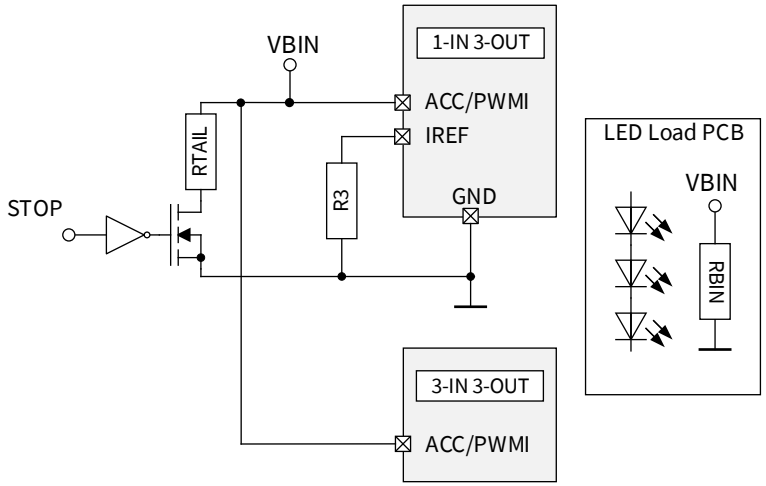
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Key5: output current control to enable low cost TAIL/STOP implementation

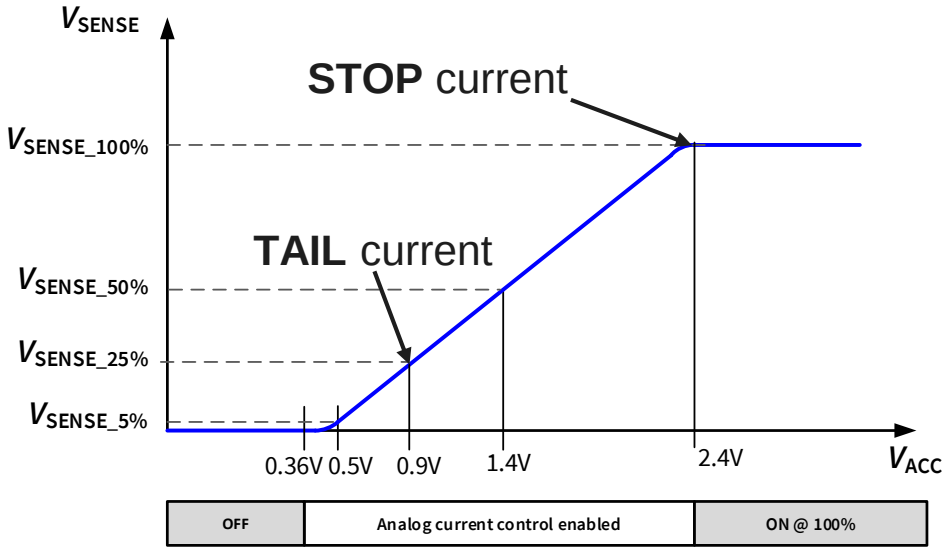
RCL: reuse the same LEDs to implement STOP and TAIL functions

- Implement analog output current control (ACC) to adjust the output current

1. Implement analog output current control ACC via adding a RTAIL resistor:



- $V_{ACC} = R_{BIN} * I_{ACC}$ when STOP
- $V_{ACC} = (R_{BIN} || R_{TAIL}) * I_{ACC}$ when TAIL



	Accuracy
VSENSE_100% (400 mV)	±4%
VSENSE_25% (100 mV)	±5%
VSENSE_15% (60 mV)	±10%
VSENSE_5% (20 mV)	±30%

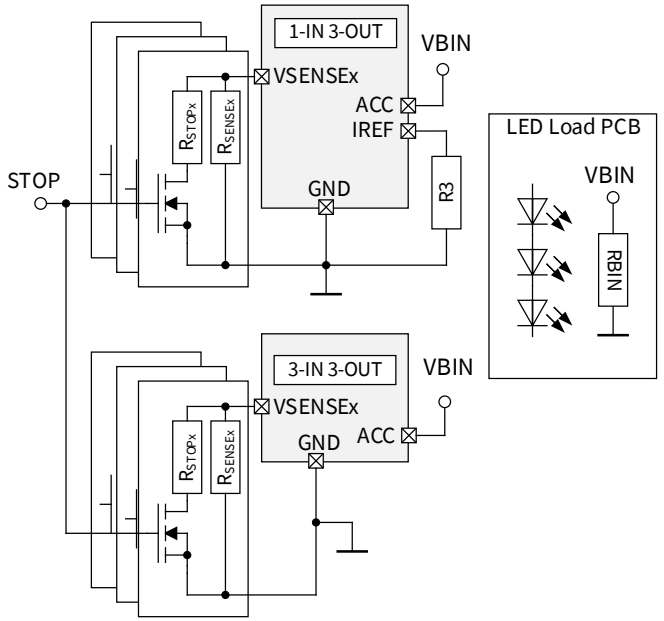
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Key6: external sensing resistors to enable low cost TAIL/STOP implementation

RCL: reuse the same LEDs to implement STOP and TAIL functions

- Resistor parallelization on the current sense possible

2. Resistor parallelization on the current sense:



- The voltage on ACC is used just for binning
- Output current is changed by changing the SENSE resistors:
  - PRO: High accuracy can be kept vs analog control approach via ACC pin voltage variation
  - CON: A «mosfet + resistor» block is needed for each channel implementing the light function

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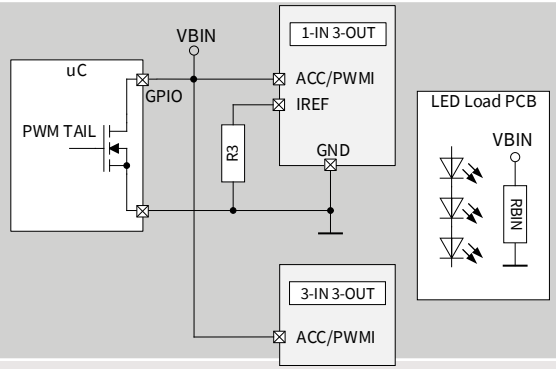
Key7: digital dimming to enable low cost TAIL/STOP implementation

RCL: reuse the same LEDs to implement STOP and TAIL functions

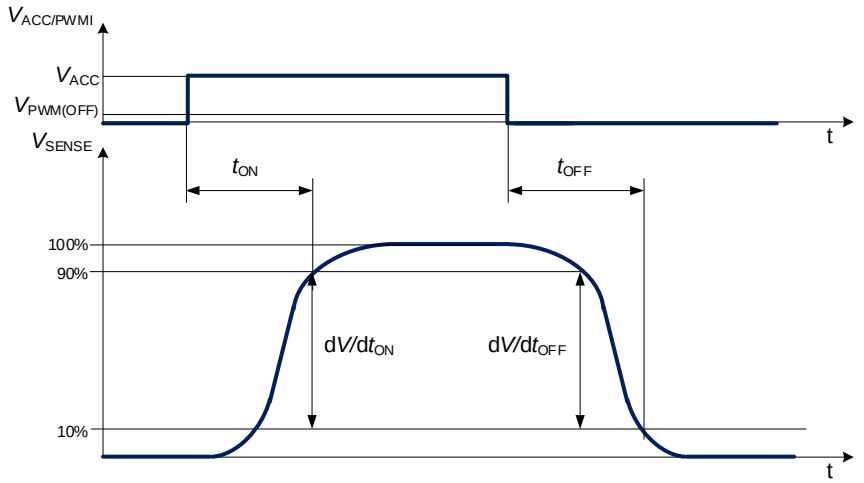
- Digital dimming via uC possible on ACC/PWMI pin

3. Digital dimming via uC on ACC/PWMI pin:

Dimming via ACC/PWMI



› An open drain GPIO is needed to drive the ACC/PWMI pin
› TAIL function is implemented apply a PWM signal on the output current
› All the 3 output channels of a device apply the same PWM signal



	min	max
ton		16µs
toff		16µs
dV/dton	24 mV/µs	46 mV/µs
dV/dtoff	-46 mV/µs	-24 mV/µs

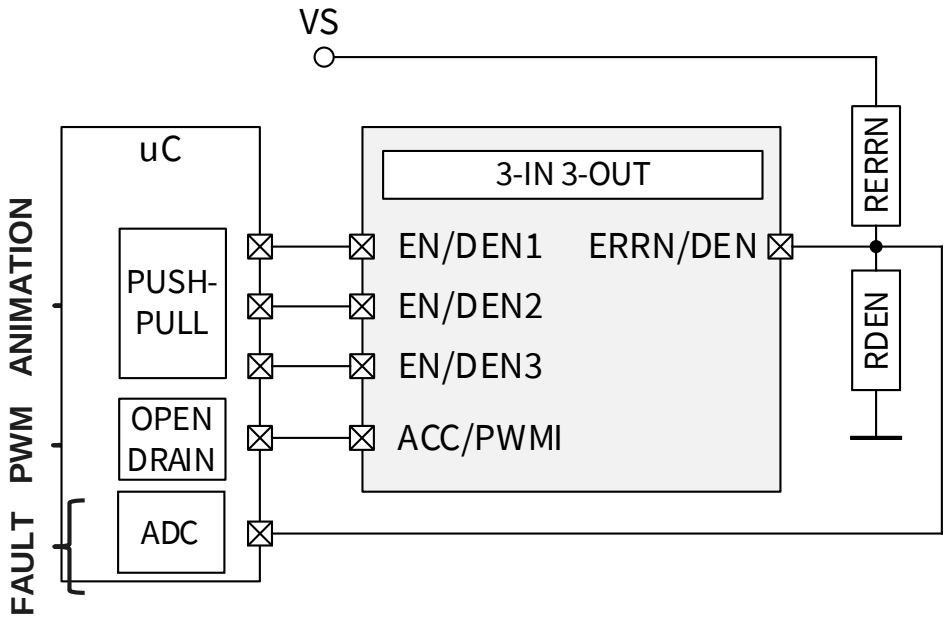
Slope control implemented:
To avoid EMC related issues due to fast switching a slope control is integrated

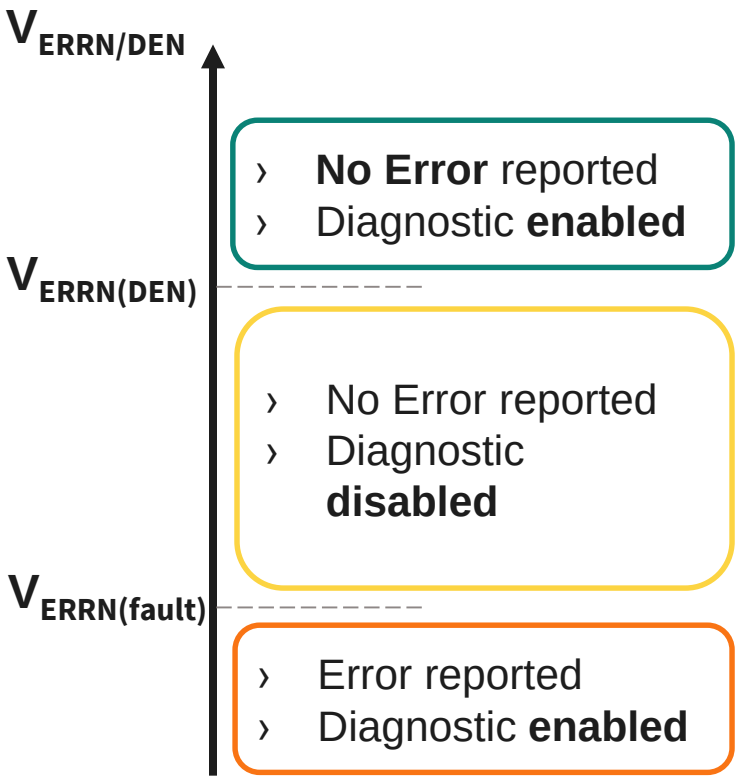
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Key8: 3IN-3OUT variant to implement animations

Possibility to have animated light function via uC

- Implement a 3IN-3OUT variants
- Implement a double function pin ERRN/DEN to give the possibility to connect a low voltage GPIO on the EN/DEN pin
- Implement digital dimming on ACC/PWMI pin





› Normal operation without error reporting

	min	max
$V_{ERRN(DEN)}$	2.1 V	2.3 V

› Open load & short LEDs protections disabled
› ERRN reporting disabled including thermal shutdown

	min	max
$V_{ERRN(fault)}$	0.7 V	0.9 V

› Normal operation with error reporting

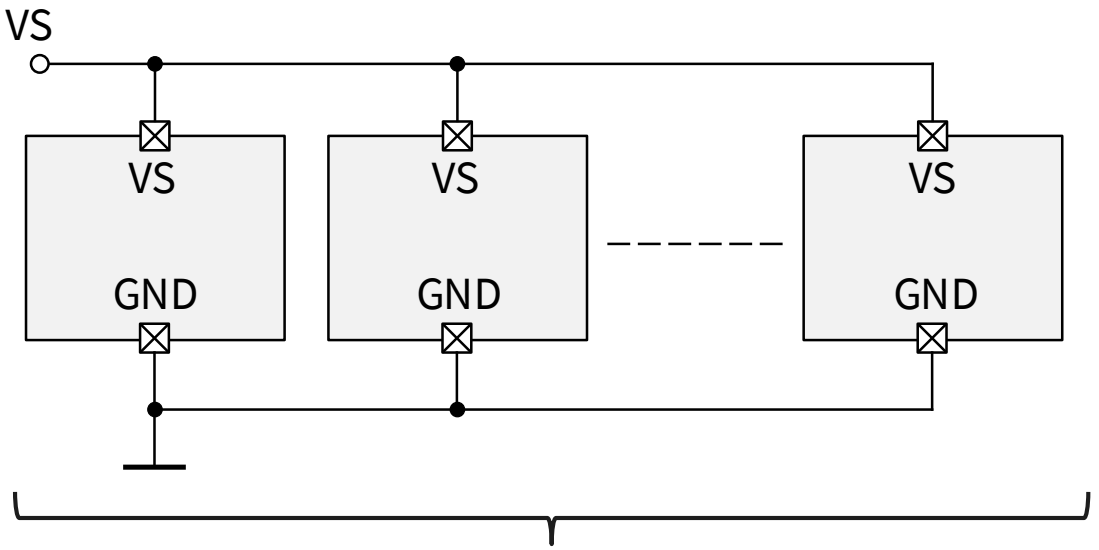
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Key9: Low fault current consumption to enable compatibility with legacy BCM

Use the current consumption on the battery line to diagnose the light function

- Implement a low current consumption in fault mode to allow up to 10 devices (30chs) on the same ERRN network

Total current consumption **< 10mA** in case of fault in a “one fail all off” network



Up to **10 devices (30 chs)** attached on the same supply line

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LITIX™ Basic+ is designed for all Rear Lighting applications and is also a good fit for functional interior illumination



- Reverse Light
- Fog Light
- Animated Turn Indicator
- Stop & Tail Light
- Rear Combination Lamp

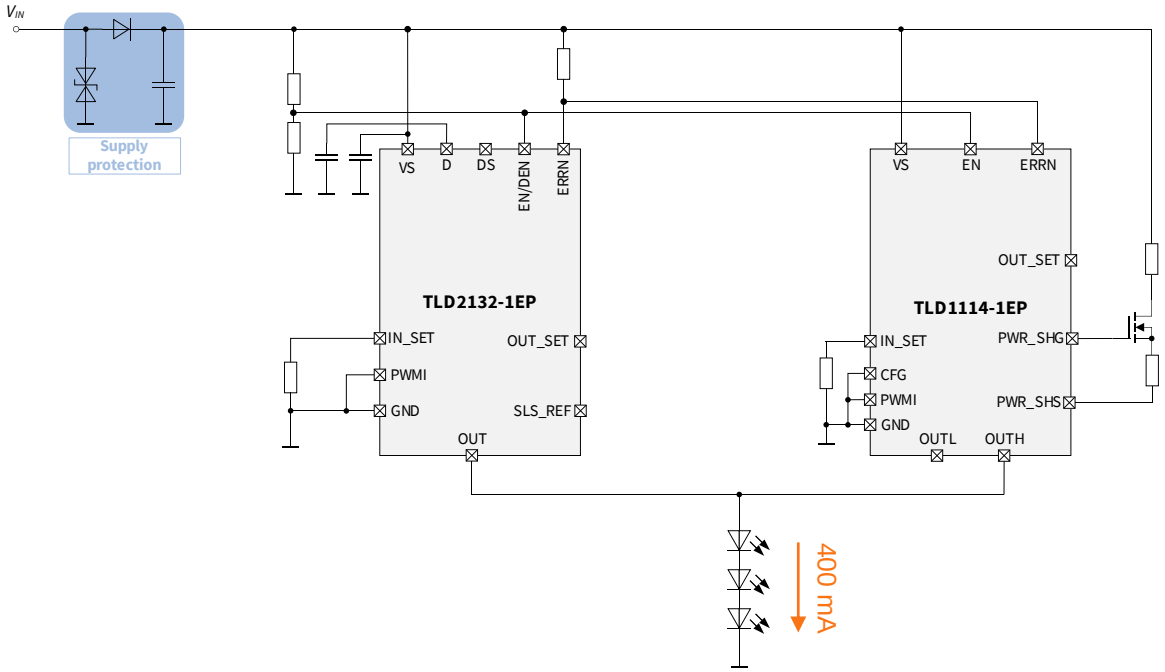


Roof consoles & Interior Lighting

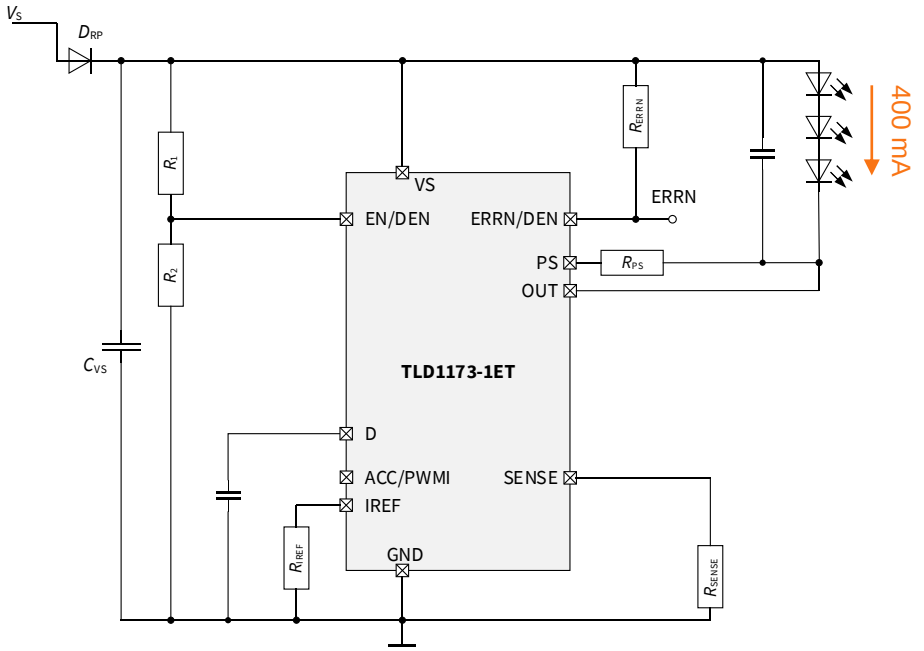
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Cost-effective solution for high current functions such as fog or reverse with up to 400 mA with minimal BOM

LITIX Basic+



New LITIX Basic+



Features in both configuration

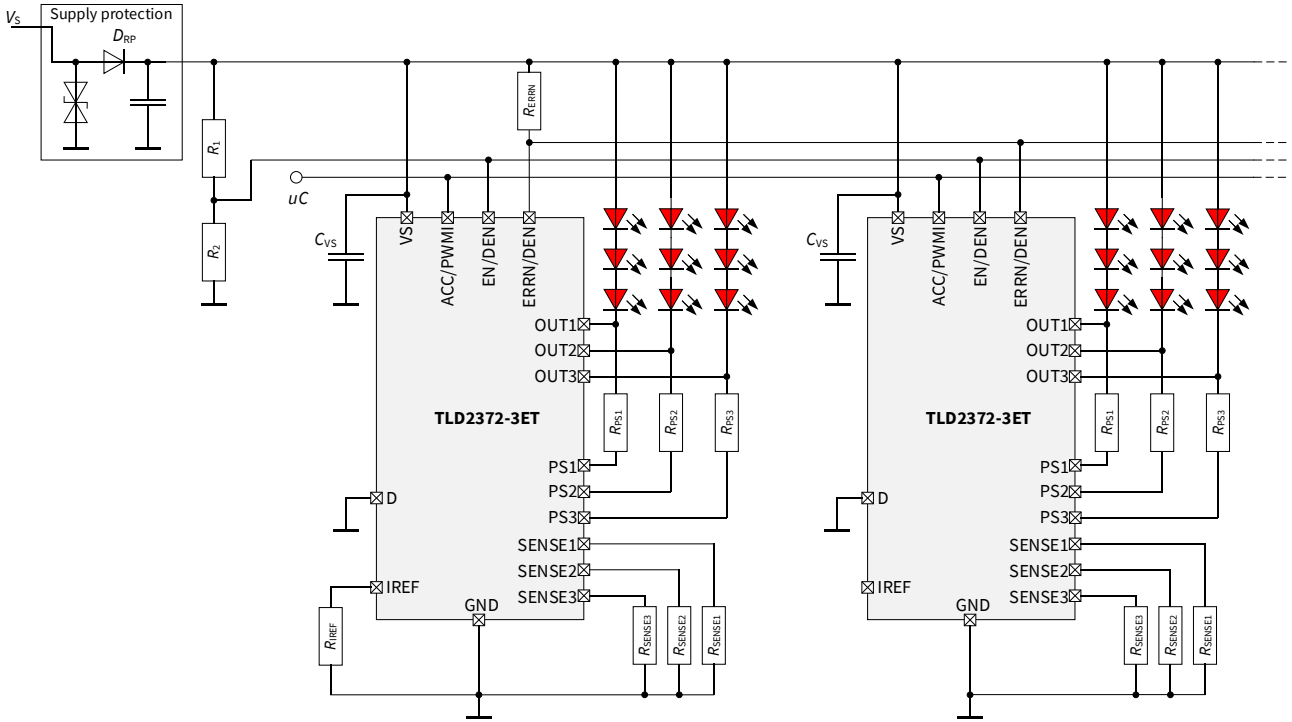
- Output current up to 400 mA
- Configurable fault management / Common error network
- Power offload feature

Benefits of TLD1173-1ET over Basic+ solution

- Saving design space and cost of BOM
- Simplified design-in
- TLD1173-1ET flexible output current regulation

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Example: Tail/Stop application with digital dimming using up to 10 devices in the same error network



Features

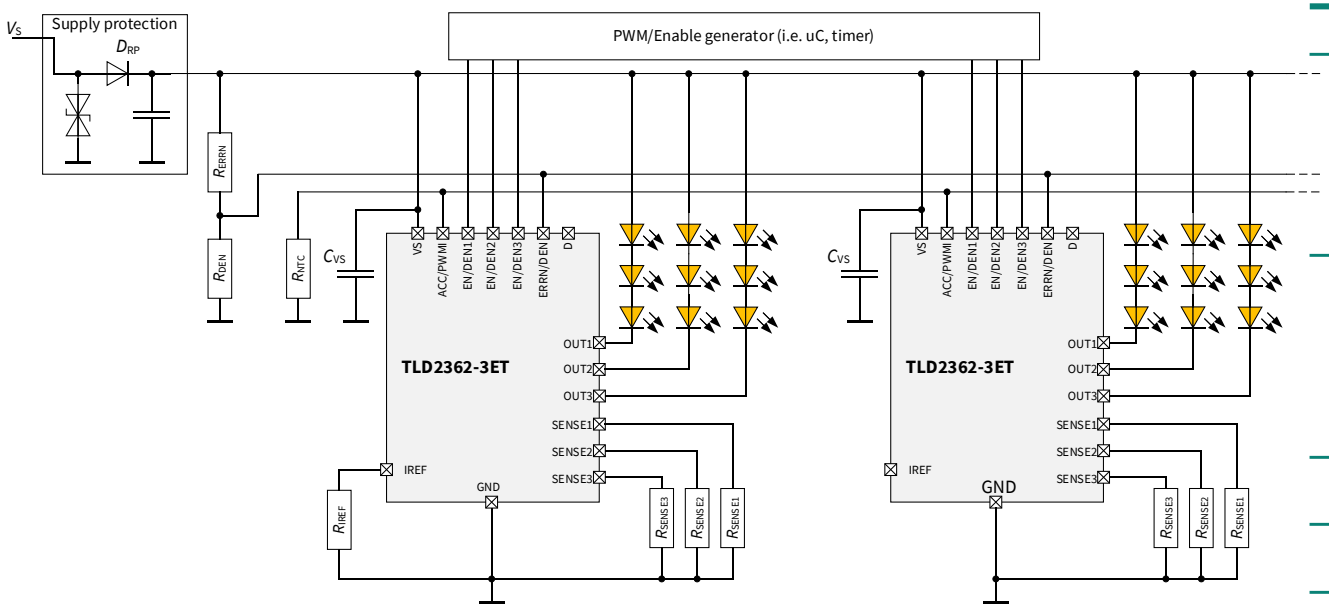
- ACC/PWMI : common analog/**digital** dimming of all output channels
- EN/DEN : apply common PWM signal / resistor divider for diagnosis disabling
- ERRN/DEN: double function
  - Error network
  - Disable diagnosis
- Offload feature
- Configurable fault management

Benefits

- Simple TAIL/STOP solution
- Small footprint
- Higher current that the already existing Basic+ family

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LITIX™ Basic+ for Animated Lighting function by individually controlling EN/DEN pins with PWM signal



Features

- Output current
  - up to 100 mA/ch
  - up to 150 mA/ch with pre-regulator
- Configurable fault management per device
  - 1-fail-all-OFF
  - 1-fail-all-ON
- Analog/digital dimming to adjust the output current
- Independent control of each output channel via EN/DENx
- Open Load (OL), Short to battery (SC) detection
- Thermal shutdown protection

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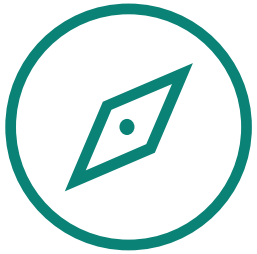
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LITIX™ Basic+
Documentation and Design Support



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