Long-Term Support
World Class Quality

ISSI Auto lighting LED drivers solutions

-James su 苏裕建

About ISSI

- A Leading Fabless semiconductor company that designs DRAM, Asynchronous SRAM/High Speed Memory(QUAD, Synch SRAM, RLDRAM 2/3), Flash, Analog and Mixed-Signal products
  - Provides a broad portfolio of high quality products coupled with Long Term Support
- Founded in 1988.
- Became a private company in December 2015. No change in our strategy as a private company. Founders on the BOD and CEO. Key Management has not changed.
- Acquired two entities "Myson" and a "Division of Sigma Designs" to add MCU and wired connectivity competence to Analog Product Line
- Approximately 600 people worldwide including offices in US, Europe, Taiwan, China, Japan, SEA/India and Korea
- End Markets: Automotive, Communications, Industrial, Medical, and Digital Consumer/PC Peripherals
- Foundry Partners: DRAM – Powerchip and Nanya; SRAM – TSMC, Global Foundries, Huali, and SMIC; Flash – XMC; Analog – Tower Jazz, CSMC and HHGrace

Key Markets and Core Product Groups

Automotive

Telematics
Infotainment
Satellite Radio
Engine Control
Braking Systems
Cluster/Center Stack
HUD Displays
Body Electronics
ADAS
Automotive Lighting

Industrial/ Medical

Factory Automation
POS/Bar Code Scanners
M2M
Medical Instrumentation
HMI/PLC
Energy Management

Communications

Base Station
Switches
Routers
xDSL
xPON
VoIP
Fibre Channel Storage
WLAN

Digital Consumer

DTV/LCDTV
Set Top Boxes
HDD
Gaming/PC Peripherals
Portable Media Players
Cell Phones/ Camera

SRAM/High Speed Memory
SDR/DDR/DDR2/DDR3/DDR4/mSDR/mDDR/LPDDR2/LPDDR3 DRAMs
Flash(Serial NOR, Parallel NOR, NAND,eMMC)
Analog(Audio Amplifiers, LED Drivers, Sensors)

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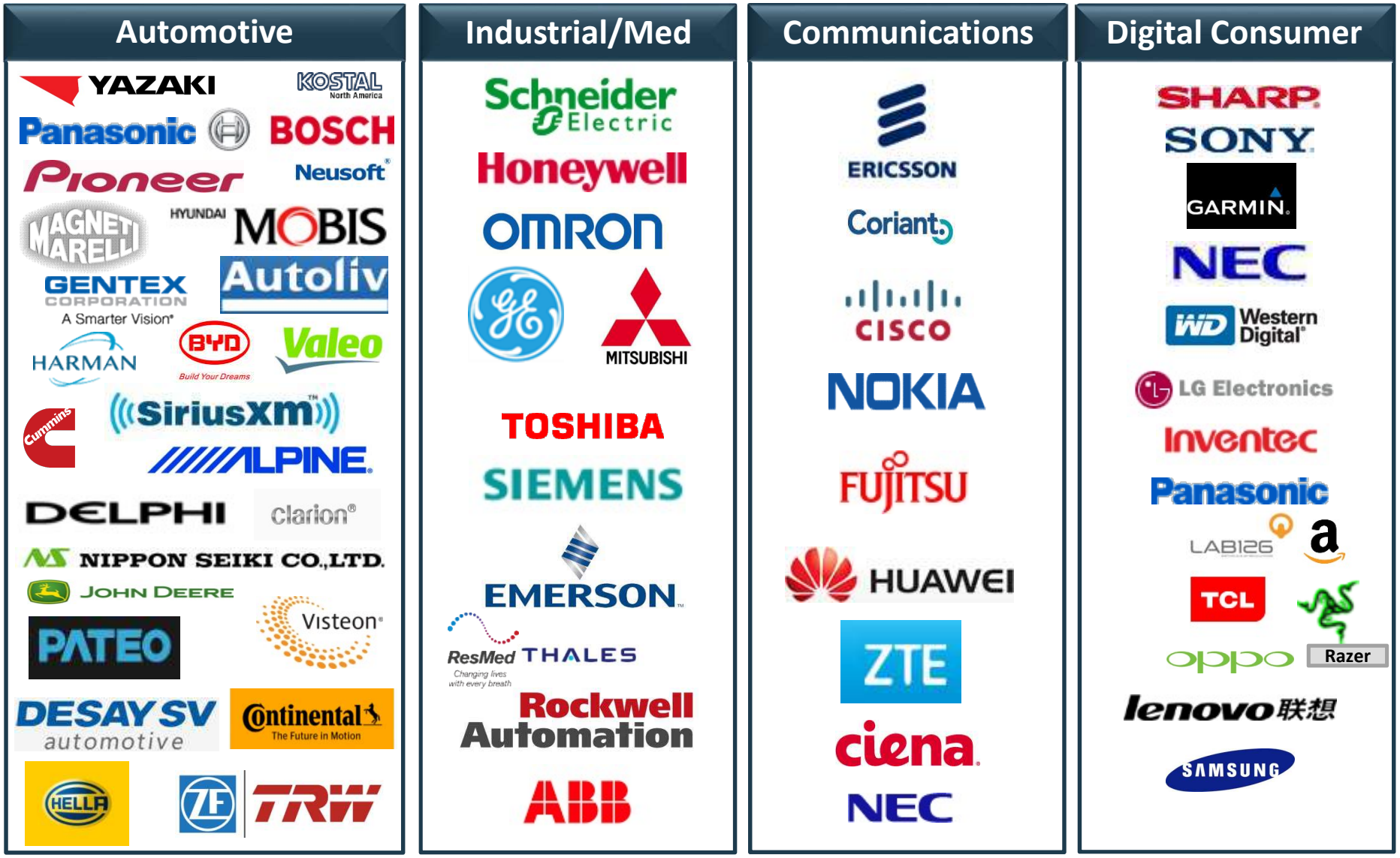
Tier 1 Customer Base



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Analog & Mixed Signal Products

Advanced Memory Solutions
Innovative Analog & Mixed Signal Solutions

Automotive

LIGHTING
Interior/Exterior
/Backlighting
Linear/Switching

Power Management
DC/DC
Embedded Controllers
Motor Drivers
LIN/CAN
ASICs

FxLED/Sensors

RGB Drivers
Multichannel/Matrix
1 -351 LEDs

Sensors
Touch/Proximity/
Gesture

Audio/Power Management

Class AB/Class D/Class G
1W – 20W
Analog /Digital Inputs

Power Management

I/O Expanders

Networking & Embedded

Networking

Home Networking

HPNA

G.hn

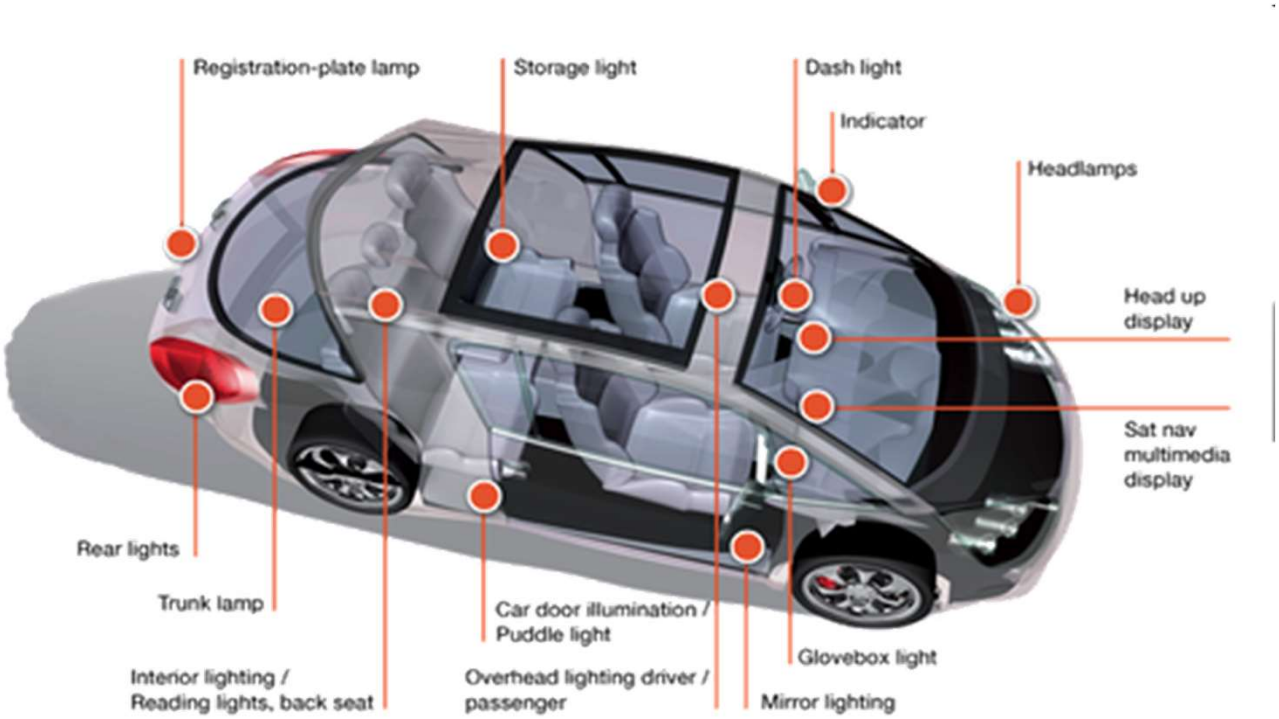
BPL

Fiber Optics

Analog products to deliver capability and effects to generate SIGHTs, SOUNDs, SENSE and CONNECT

- **SIGHTs** – Family of FXLED Drivers and Auto LED Drivers for lighting and special affects
- **SOUNDs** – Family of Audio Amplifiers to generate sound affects
- **SENSE** – Family of Proximity, Gesture and Touch Sensors
- **CONNECT**- Home and In Vehicle Networking

ISSI Auto lighting Solution



ISSI Auto lighting LED Drivers solution

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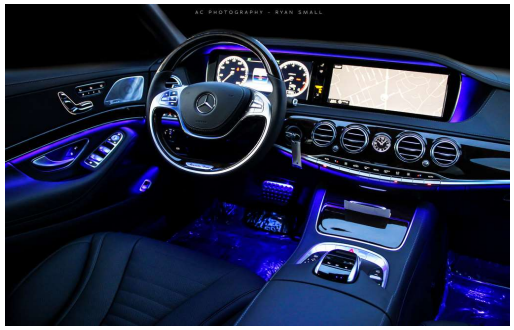
ISSI Auto lighting Solution

Interior Auto lighting solutions



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Automotive Interior Lighting

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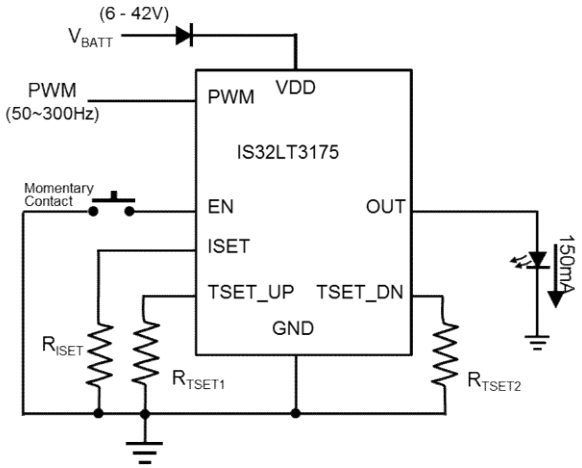
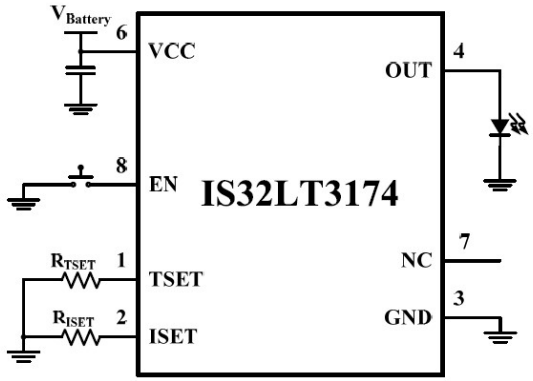
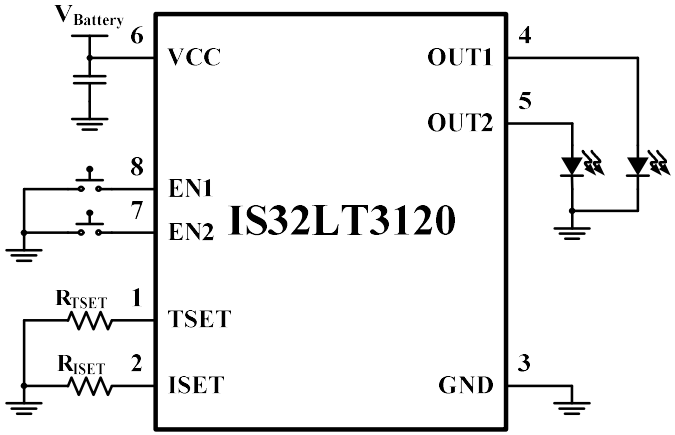
Automotive Interior Lighting

IS32LT3174/75/20 Family(with Fade in/out)







Part number	Channel	Current	Push buton	PWM	Fade in/out Timing
IS32LT3175	1	150mA	Yes	Yes	Can be different
IS32LT3174	1	200mA	Yes	No	same
IS32LT3120	2	200mAx2	Yes	No	same

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Automotive Interior Lighting

IS32LT3175-Features & application circuit

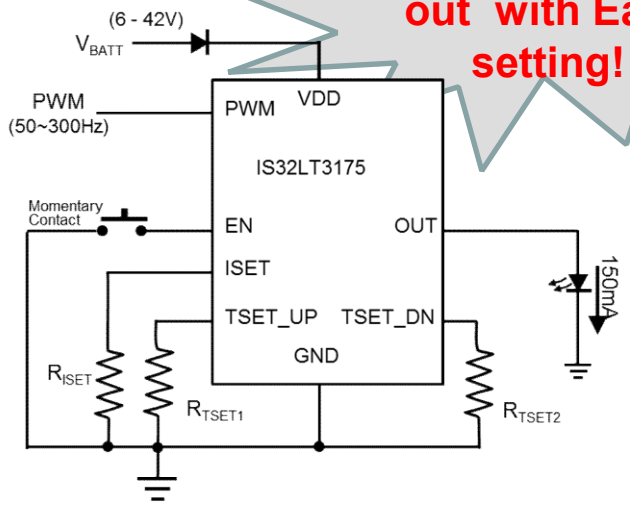
Features

- Operating voltage 6V to 42V
- Single channel current source
- -Programmable current via a single external resistor
- - Configurable from 20mA to 150mA
- Momentary contact button EN input

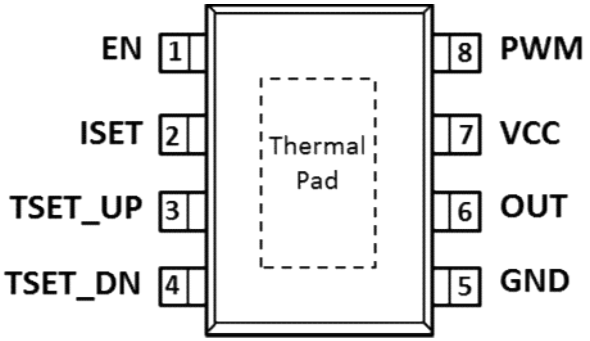
- Input is debounced and latched
- Higher priority than PWM input
- Gamma corrected fade IN/OUT algorithm

- - Pull down resistors set independent fade IN and OUT ramp time
- PWM input pin driven by external PWM source
- - PWM directly drives the current source
  - IS32LT3175P – Positive polarity
  - IS32LT3175N – Negative polarity
- Fault Protection:
  - Over current protection
  - LED string shorted to GND
  - Over temperature
- SOP-8-EP package
- Automotive Grade - AEC-Q100
- Operating temperature range from -40°C ~ +125°C

Fade in/Fade out with Easy setting!



IS32LT3175 typical application circuit



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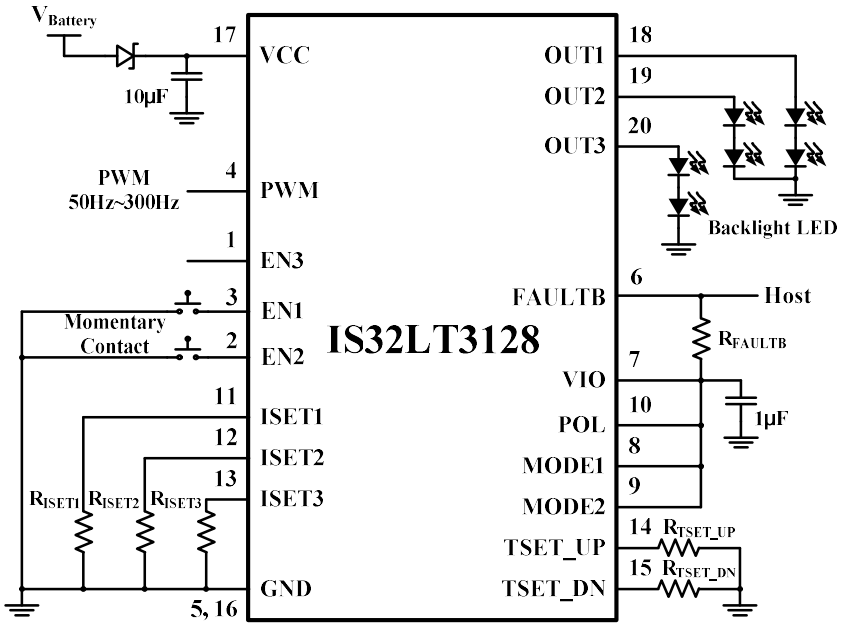
Automotive Interior Lighting

IS32LT3128 /A-Features & application circuit(ES)

Features

- Operating voltage 5V to 42V
- Dual channel current sources
- - Programmable current via a single external resistor
- - Configurable from 20mA to 150mA
- Max 30mA current source for push button backlight
- Momentary contact button /level EN input
- - Input is debounced and latched
- - Higher priority than PWM input (LT3128)
- - low priority than PWM input(LT3128A)
- - Gamma corrected Fade In/Out algorithm
- - Pull down resistors set independent fade IN and OUT ramp time
- PWM input pin driven by external and internal PWM source
- - External PWM directly drives the current source
- - Support both positive and negative polarity PWM
- - Internal 300Hz PWM source for automatic dimming the current source
- Fault Protection with reporting:
- - LED strings shorted
- - ISET pin shorted to GND
- - Over temperature
- eTSSOP-20 package
- Automotive Grade - AEC-Q100 (pending)
- Operating temperature range from -40°C ~ +125°C



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IS32LT3174/75/20/28-Key Benefits

Key Benefits:

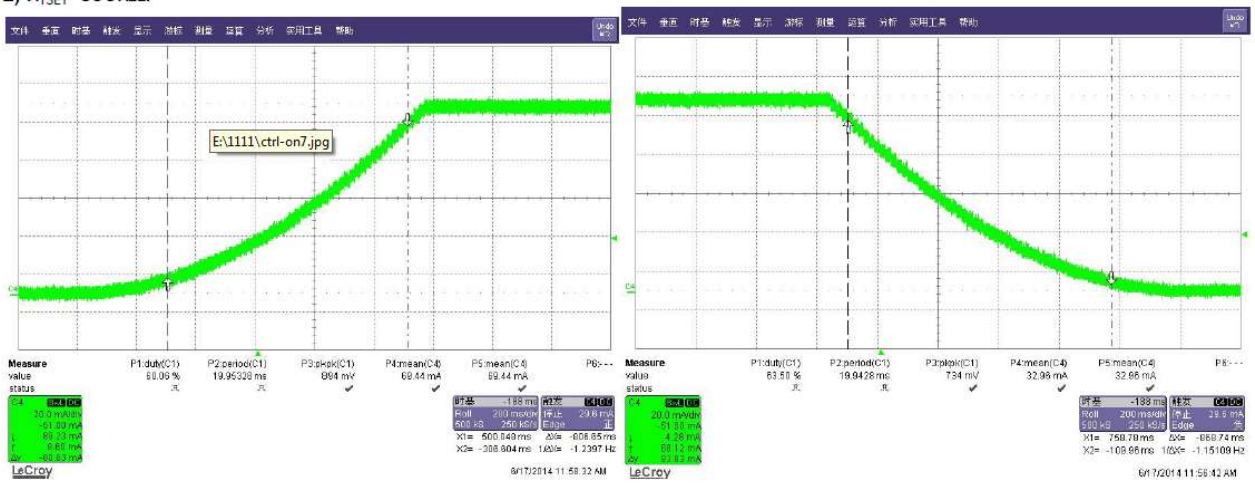
✓ **Comfortable Vision Fade in /out LED on/off**

63 step Gamma corrected fade in/out algorithm.

Programmable FADE IN, FADE OUT Time via external resistor. (

$t = R_{TSET} \times 2.5\mu s$)

2, R_{TSET}=390KΩ.



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IS32LT3174/75/20-Key Benefits

Key Benefits:

✓ **Constant current and High accuracy Timing in different Temperature**

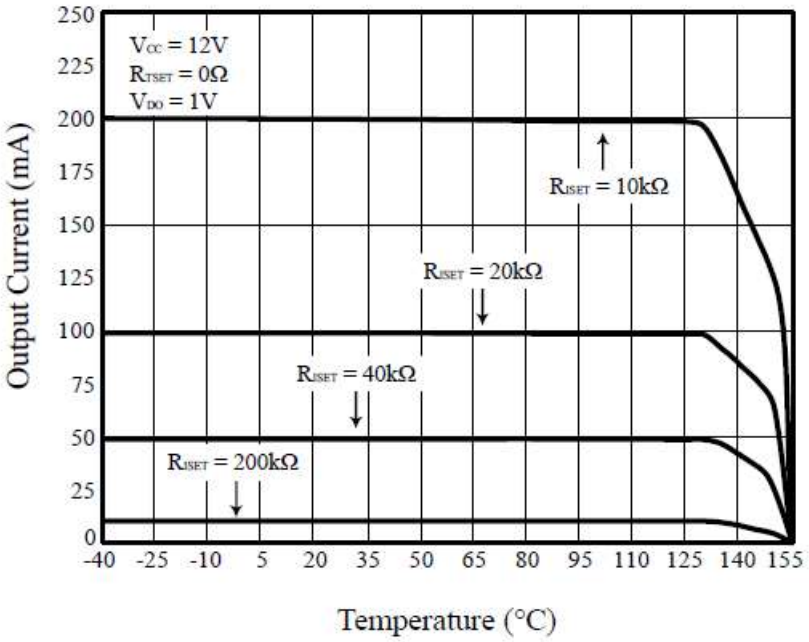


Figure 9 Output Current vs. Temperature

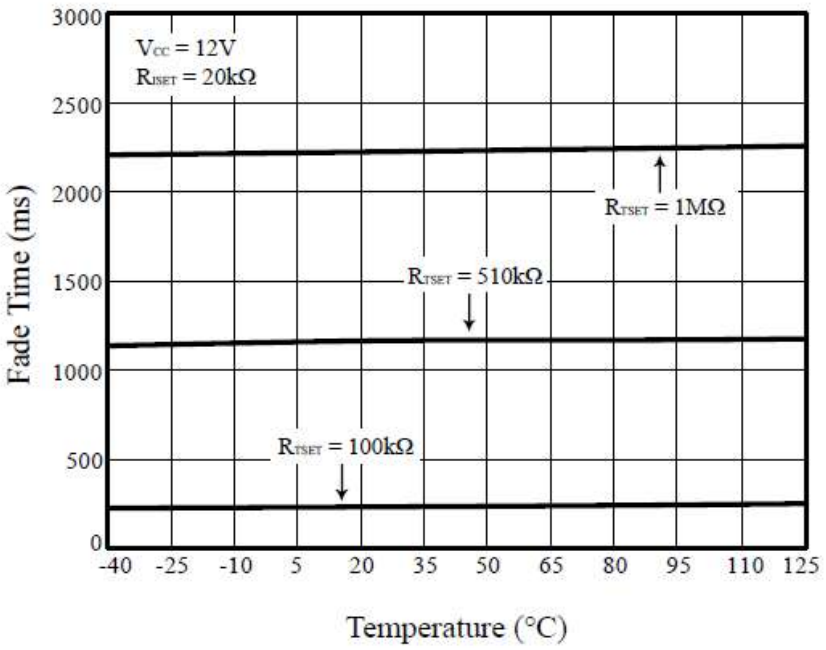


Figure 7 Fade Time vs. Temperature

IS32LT3174/75/20-Key Benefits

Key Benefits:

✓ **Constant current with Good Line Regulation and Load Regulation**

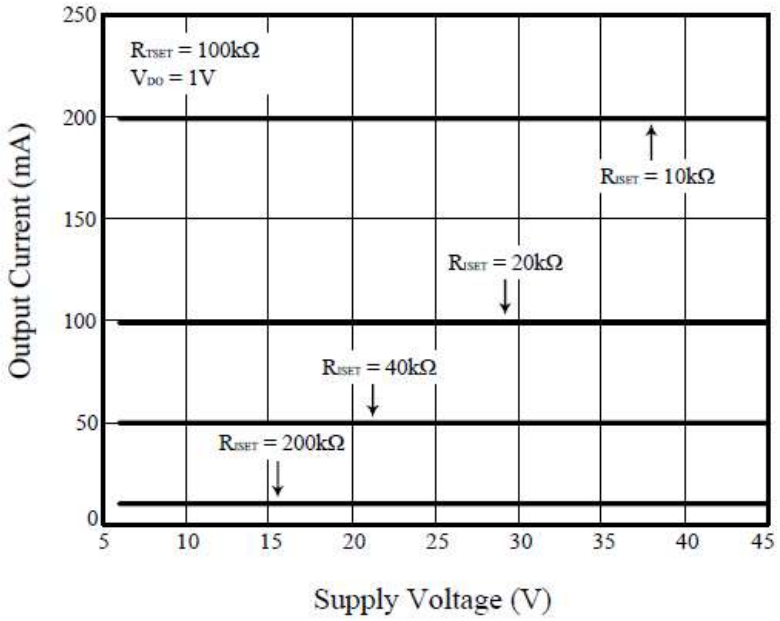


Figure 3 Output Current vs. Supply Voltage

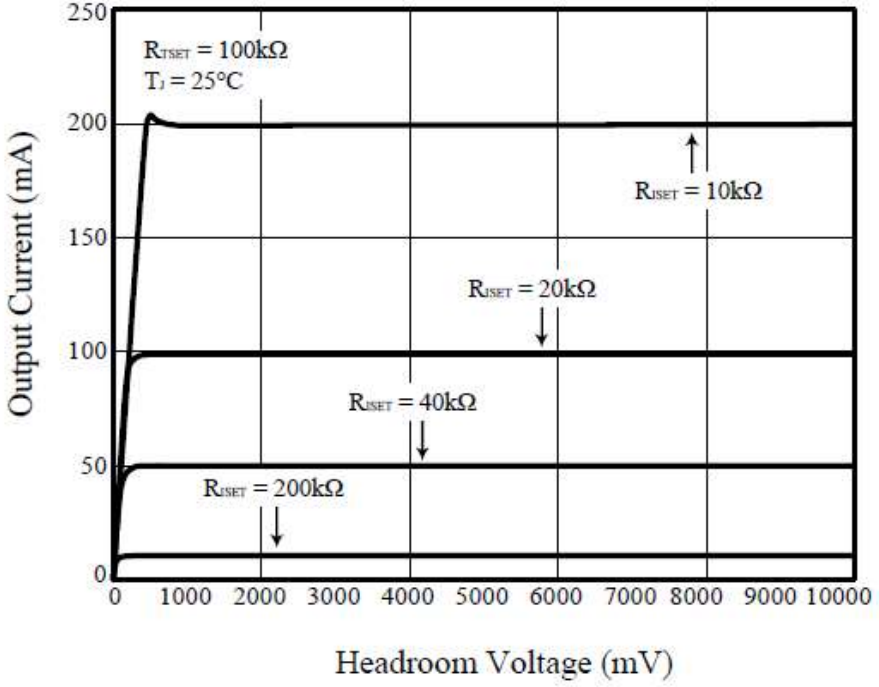


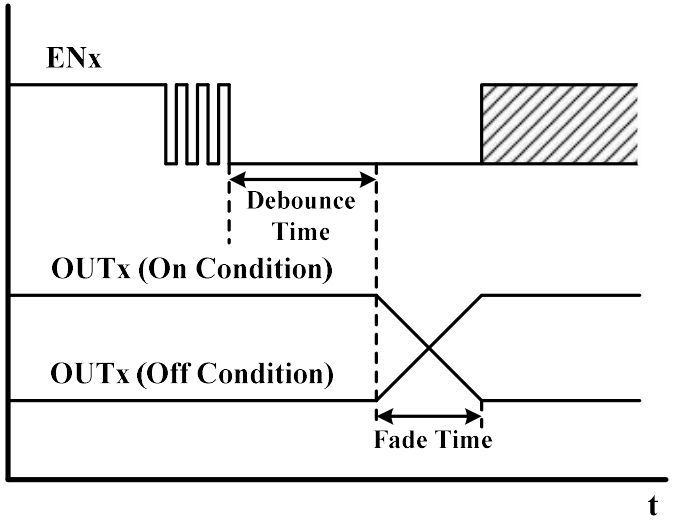
Figure 5 Output Current vs. Headroom Voltage

IS32LT3174/75/20-Key Benefits

Key Benefits:

✓ **Inputs De-bounced to filter noise**

An internal debounced circuit will condition the input signal so a single press of the mechanical switch doesn't appear like multiple presses. The ENx inputs are debounced by typically 30ms.



IS32LT3174/75/20-Key Benefits

Key Benefits:

✓ **Strong Protection system**

(1) Over current protection

240mA (typical) Output current limit (3174/20)
200mA (typical) Output current limit (3175)

(2) Output short to Ground protection

If Vout <V_{SCD} (Short detect voltage), The channel current will reduce to 20%.

(3) Thermal Rolloff protection

If the die temperature exceeds the 130°C(145°C LT3175) threshold, the output current of the device will begin to reduce at a rate of 3%/°C.

(4) Thermal protection

In the event that the die temperature exceeds 155°C(175°C LT3175), both output channels will go to the 'OFF' state.

Automotive Interior Lighting

Map light Assembly

More than 50 components

PCB with IS32LT3120 and IS32LT3170

Reduced to less than 15 components

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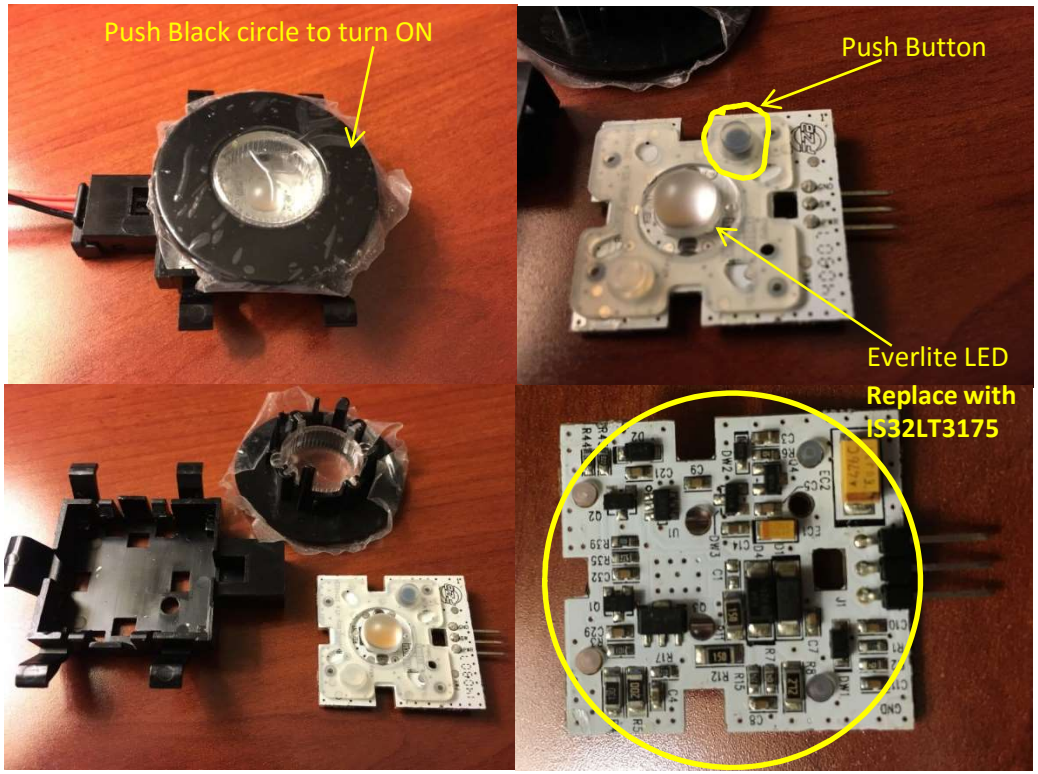
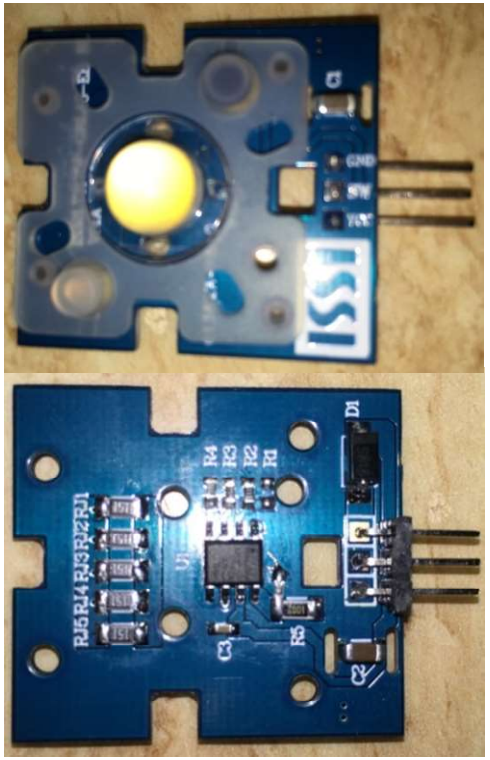
Automotive Interior Lighting





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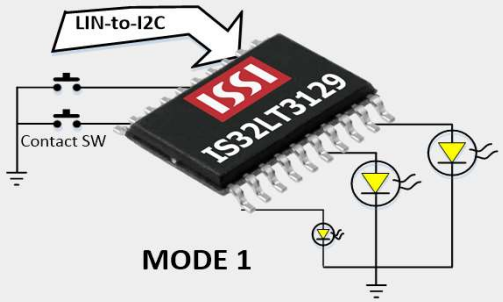
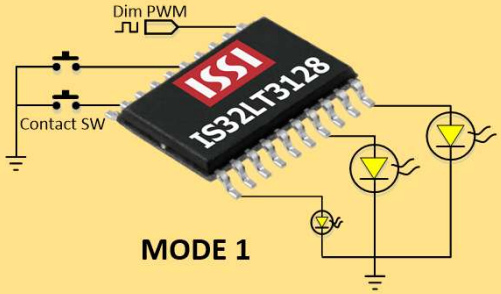
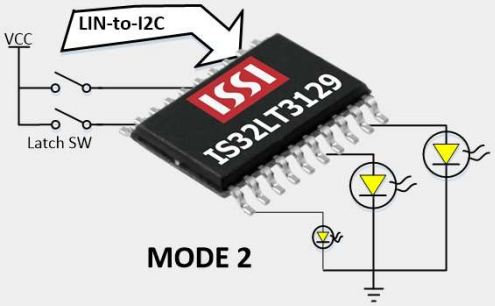
Automotive Interior Lighting

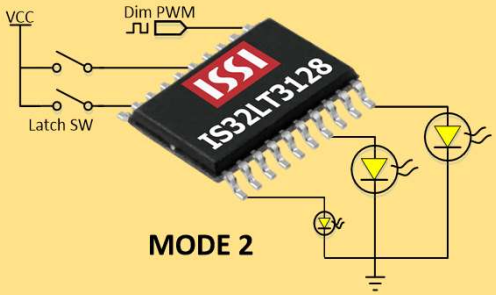
Momentary Contact Switch

Mechanical Latch Switch









I2C Register Programmable

BCM PWM Control

IS32LT3129 Map light drivers with I2C control

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ISSI Auto lighting Solution

Interior Auto lighting solutions(FxLED)

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Automotive Interior Lighting-FxLED

Part Number	Voltage	LED	LED Current	Dimming	Interface	PKG
IS32FL3738(Matrix)	2.7V~5.5V	48 or 16RGB	13mA	512 steps PWM	I2C	eTSSOP28
IS32FL3740(Matrix)	2.7V~5.5V	12 or 4RGB	26mA	1024 steps PWM	I2C	eTSSOP20
IS32FL3209	2.7V~5.5V	18	76mA	256 steps PWM	I2C	WFQFN28 eTSSOP28
IS32FL3236A	2.7V~5.5V	36	38mA	256 steps PWM	I2C	WFQFN44 TQFP48
IS32FL3237	2.7V~5.5V	36	38mA	63K steps PWM &256 steps DC	I2C	WFQFN44 TQFP48
IS32FL3238	2.7V~5.5V	18	76mA	63K steps PWM &256 steps DC	I2C	WFQFN28 eTSSOP28
IS32LT3183 (ES)	4.5V~40V	4	60mA	12bit	LIN BUS	eSOP8

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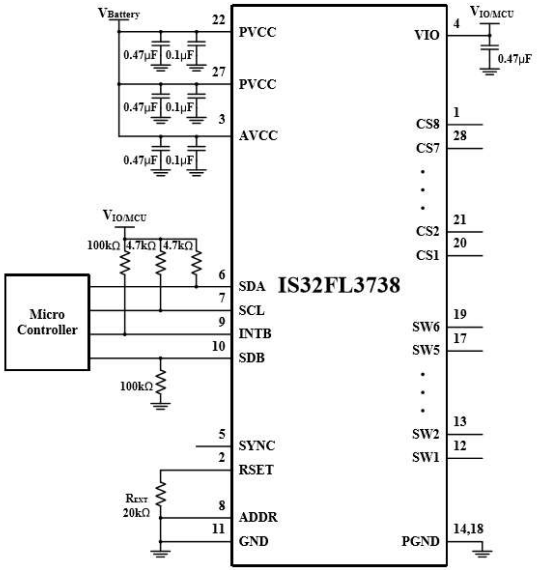
Automotive Interior Lighting-FxLED

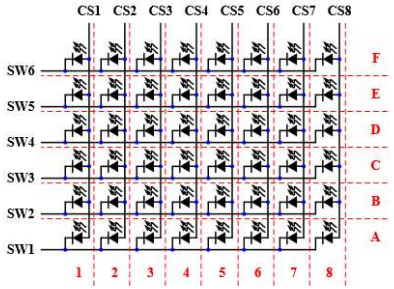
IS32FL3738

Features

--Supply voltage range: 2.7V to 5.5V

- 8 current source outputs for row control 6 switch current inputs for column scan control Up to 48 LEDs (6×8) in dot matrix
- Programmable 6×8 (16 RGBs) matrix size with deghost function
- 1MHz I2C-compatible interface
- Selectable 3 Auto Breath Modes for each dot
- Auto Breath Loop Features interrupt pin inform MCU Auto Breath Loop completed
- Auto Breath offers 128 steps gamma current, interrupt and state look up registers
- 256 steps Global Current Setting
- Individual on/off control
- Individual 512 PWM steps control
- Individual Auto Breath Mode select
- Individual open and short error detect function
- Cascade for synchronization of chips
- eTSSOP-28 package
- Automotive AECQ-100 qualified





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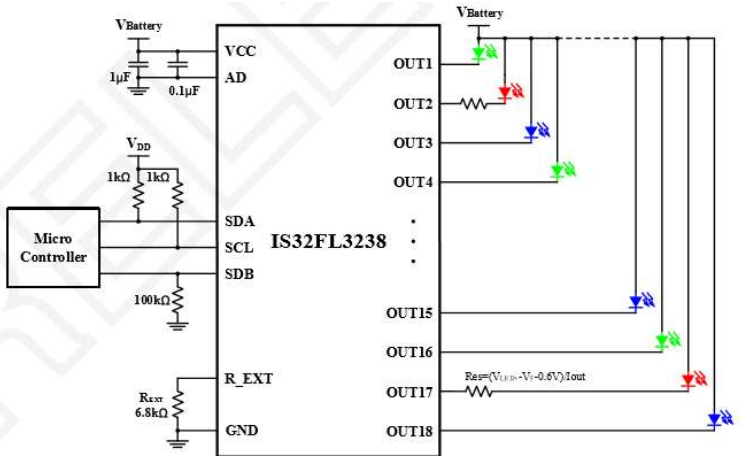
Automotive Interior Lighting-FxLED

IS32FL3237/FL3238

FEATURES

- 2.7V to 5.5V supply
- 36 channels , up to38mA each channel
- 18 channels, up to 76mA each channel
- 1MHz I2C interface, automatic address increment function with readout function
- Four selectable I2C addresses
- OSC Frequency selectable from 125K~16MHz to avoid the cap audio noise
- PWM solution bits selectable (8bit,10bit,12bit,16bit)
- Individual 256 steps DC current control for white balancing
- Global 256 analog global current control
- Open short detect function
- Temperature detect function
- Phase delay control to minimize the Vcc drop ripple
- Spread spectrum to minimize the EMI
- Temperature Sensor
- -40°C to +125°C temperature range
- QFN-44 (5mm × 5mm) package



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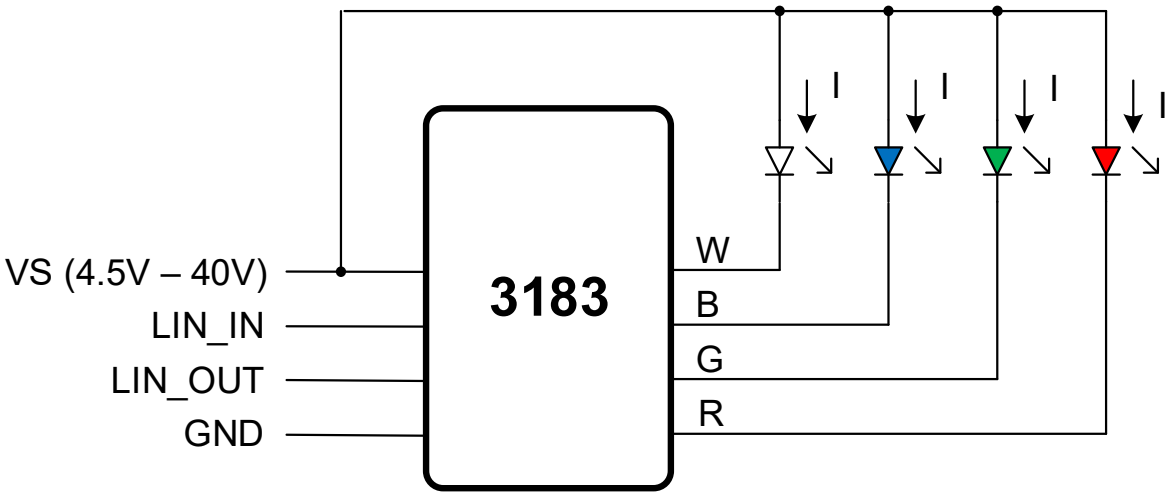
Automotive Interior Lighting-FxLED

IS32LT3183 (LIN RGB Driver, ES)



IS32LT3183具有以下重大优势特性:

1. Vin up to 40V, output up to 60mA each channel, support LIN SNPD
2. 功能强大，外围电路简单，尺寸小，可以很容易地集成在RGB驱动模块
3. 集成大容量的64K flash , 很容易可以实现更精致，更细腻，更炫丽的定制化灯效
4. 集成4通道支持16Bit PWM亮度控制的高压恒流源，实现完美细腻颜色控制
5. 集成12bit ADC，监测RGBLED电压，支持RGBLED老化色差补偿，温度补偿
6. 集成 LED 开路短路检测，高温预警以及过热保护等功能

ISSI Auto lighting Solution

Exterior Auto lighting solutions

Long-Term Support
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Automotive Exterior Lighting Applications

- **Side Signal Mirror turn signals, Signage, License Plate Light**
  - Linear LED Drivers
    - IS32LT3126 - IS32LT3177/78


- **Fog light, Headlight, Day Time Running (DRL) Light provide bright white light**
  - Switching LED Drivers
    - IS32LT3952 - IS32LT3953 - IS32LT3954
    - IS32LT3957



- **Stop light, CHMSL (Center High-Mount Stop Lamp)**
  - Linear LED Drivers
    - IS32LT3180 - IS32LT3181
    - IS32LT3124 - IS32LT3126

- **Rear tail lights**
  - Linear LED Drivers
    - IS32LT3124 – IS32LT3126
    - IS32LT3177/78


Automotive Exterior Lighting

Family of Single, Dual, MultiChannel Linear Drivers

Part Number		Single Channel					2 Channel		>2 Channels				
		IS32LT3125	IS32LT3177/8	IS32LT3173	IS32LT3174	IS32LT3175	IS32LT3120	IS32LT3126	IS32LT3124	IS32LT3128	IS32LT3129	IS32LT3180	IS32LT3181
Operating Voltage Range		5~42	5~42	2.5~42	6~45	5~42	6~45	5~42	5~42	5~42	5~42	6~45	6~45
LED Current (mA max)		250	200	200	200	150	200	150	150	150	150	75	75
Source (S) or Sink (SK)		S	SK	SK	S	S	S	S	S	S	S	SK	SK
Number of Channels		1	1	1	1	1	2	2	4	3	3	8	6
Min Headroom Voltage		0.7	1	1	0.7	0.7	0.7	0.6	1	0.7	0.7	0.8	0.8
Dynamic Headroom Control									Y			Y	Y
Fault	N-1								Y				
	One-Fail-All-Fail	Y						Y	Y			Y	Y
PWM	PSM	Y	Y					Y					
	EN	Y		Y	Y	Y	Y	Y	Y				
	Per Channel								Y	Y	Y		
I2C Interface Bus											Y		
Dual Brightness Levels												Y	Y
AEC-Q100 (P = pending)		P	Y	Y	Y	Y	Y	P	P	P	P	Y	Y
Package		New	eSOP-8	eSOP-8	eSOP-8	eSOP-8	eSOP-	eTSSOP- New	eTSSOP-16	eTSSOP- New	eTSSOP-	eTSSOP-16	eTSSOP-16

For all interior & exterior Lighting applications: Map/Door/ Dome & Stop/tail/indicator/CHMSL/DRL Lighting

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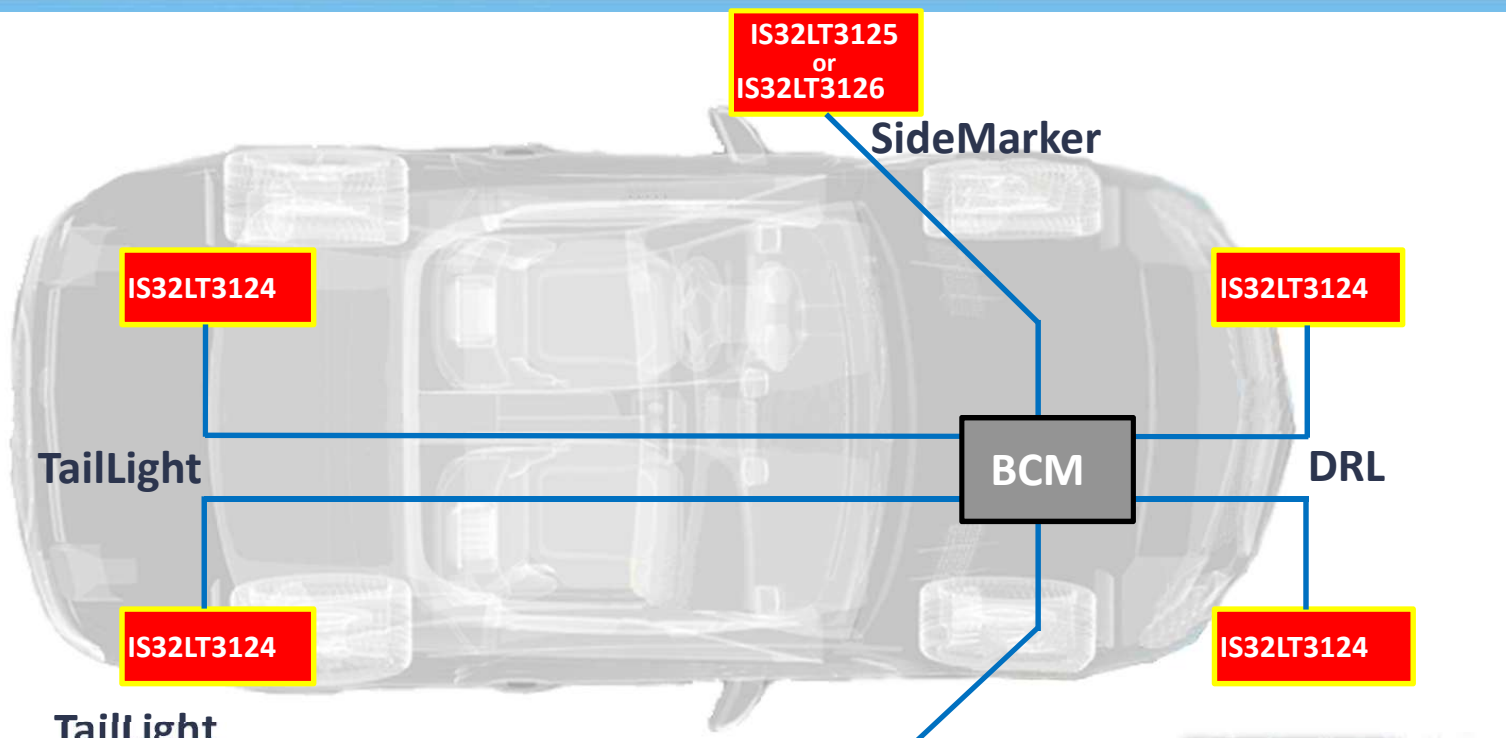
Automotive Exterior Lighting

HB LED driver For Automotive(DC/DC)

Application	Part Number	Vin	topology	Channels	Output current	Dimming	Fault Report
day running, positon light, Headlight	IS32LT3952(AECQ)	6~40V	DC/DC buck	1	1.5A	Ext-PWM	
	IS32LT3953(AECQ)	6~40V	DC/DC buck	1	3A	Ext-PWM	
	IS32LT3954(AECQ)	6~40V	DC/DC buck	1	3A	Ext-PWM	Yes
	IS32LT3955/5A(ES)	6~40V	DC/DC buck	1	3A	Ext/Inter PWM	Yes
	IS32LT3956/56A(ES)	6~40V	DC/DC buck	1	3A	Ext-PWM /High side bypass NM	Yes
	IS32LT3957	5~75V	Boost/Buck -Boost	1	Ext MOS	eTSSOP16	Yes

Automotive Exterior Lighting



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Automotive Exterior Lighting

HB LED driver For Automotive(CCR with Fault report for exterior)

Application	Part Number	Vin	topology	Channels	Output current	PKG	Fade in/out	Fault report	Comments
/Turn signal light/ Stop light/Tail light/ Fog Light/	IS32LT3125	6~45V	Linear	1	250mA	eSOP-8		Yes	
	IS32LT3126	6~45V	Linear	2	150mA	eTSSOP-16		Yes	one LED fault detect
	IS32LT3124	6~45V	Linear	4	150mA	eTSSOP-16		Yes	dynamic headroom control one LED fault detect
	IS32LT3180	6~45V	Linear	8	75mA	eTSSOP16		Yes	N-1
	IS32LT3181	6~45V	Linear	6	75mA	eTSSOP16		Yes	One fail, All Fail

Automotive Exterior Lighting

High Side CCR LED Drivers with Fault report

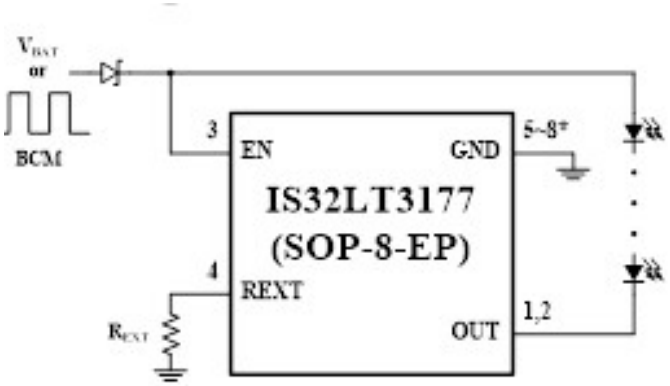
Application	Part Number	Vin	Channels	Output current	PKG	Fault Report	Unique features	Parallel with Fault Linkage
Map light /Dome ligh /Turn signal light/ Stop light/Fog Light/	IS32LT3125	6~42V	1	250mA	eSOP8	LED Open LED short to GND LED short to Vcc RSET Open RSET Short to ground Thermal shutdown	Icc set to 30mA when Fault Output limit to 300mA Thermal foldback	One IC Fault report, All others off,
	IS32LT3126	6~42V	2	150mA	eTSSOP-16	Single LED short LED Open LED short to GND LED short to Vcc RSET Open RSET Short to ground Thermal shutdown	Icc set to 2mA when Fault Output limit to 230mA Thermal foldback	One IC Fault report, All others off,
	IS32LT3124	6~42V	4	150mA	eTSSOP-16	Single LED short LED Open LED short to GND LED short to Vcc RSET Open RSET Short to ground Thermal shutdown	Dynamic headroom control Icc set to 2mA when Fault Output limit to 190mA Thermal foldback	One IC Fault report, All others off,

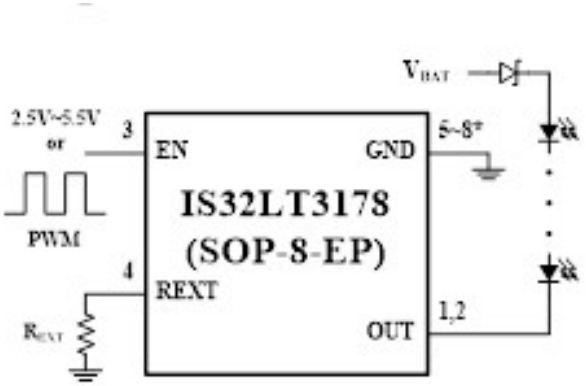
Automotive Exterior Lighting

IS32LT317x 200mA CCR

Features

- LED drive current preset to 10 mA
- Adjustable continuous output current up to 150 mA with an external resistor on ADJ pin
- EN pin for up to 10kHz PWM
- Easy paralleling of drivers to increase current
- Supply voltage up to 42 V
- Low headroom Voltage
- 3% Room temp accuracy , 5% full temp accuracy
- Current limit protection
- Thermal roll off/shut down protection
- eSOP-8 Package





Long-Term Support
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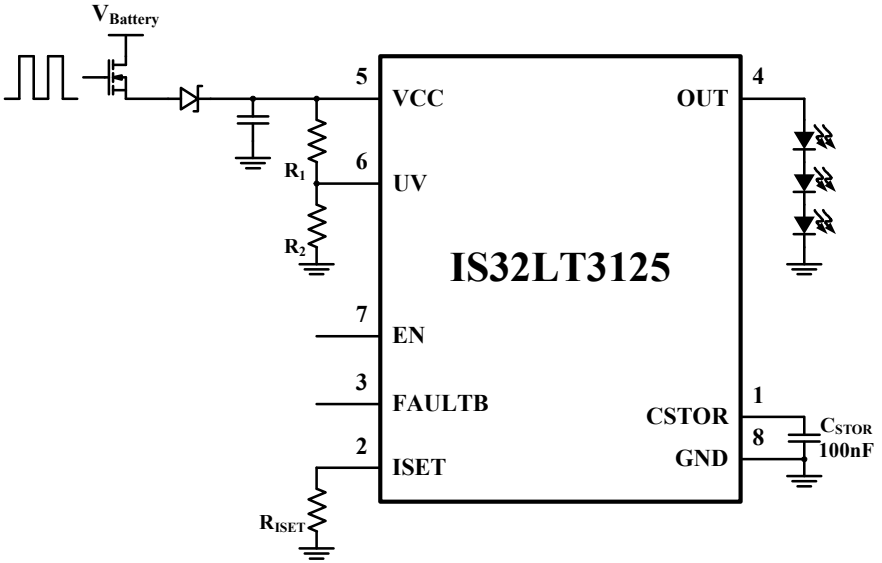
IS32LT3125 250mA CCR with fault report

FEATURES

- Vcc supply range: 5V~42V
- Single channel, sources up to 250mA
- +/-6% Output current accuracy (room temp)
- +/-10% Output current accuracy (full temp)
- Programmable current for via external resistor
- Programmable VCC under voltage lockout to match the LED stack for High Side PWM operation
- Capable of multiple IC parallel operation with fault flag linkage
- Fault protection with flag output:

- LED string open/short
- I_{CC} set to 30mA for single or multiple IC operation
- OUT pin short to VCC
- ISET pin open/short

- De-glitching check to filter out short lived fault condition (2.9ms or 4 PWM cycle)
- Over temperature
- SOP-8-EP package
- Automotive grade - AEC-Q100 (pending)
- Operating temperature range from -40°C ~ +125°



Parallel application

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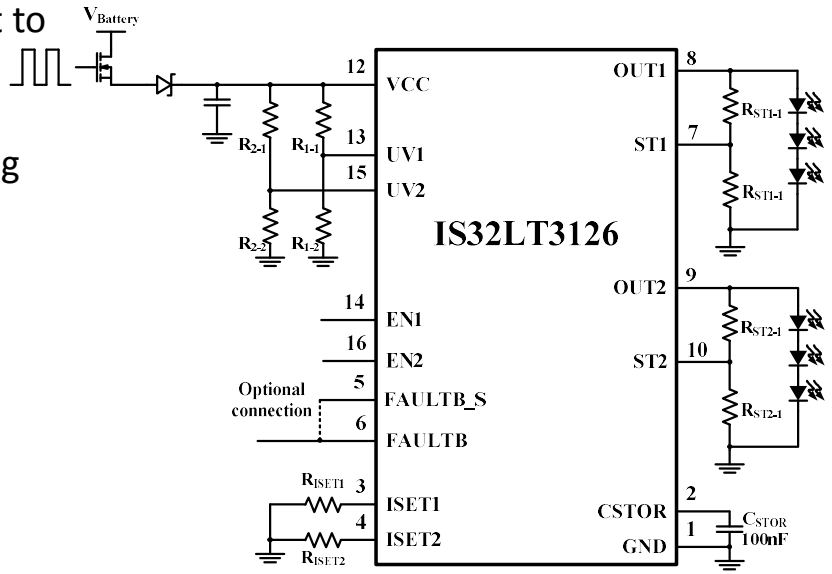
IS32LT3126 2x150mA CCR with fault report

FEATURES

- -Dual channels: each channel can source up to 150mA and the two channels combined to source up to 300mA
- +/-6%(room temp)/+/-10%(full temp) accuracy
- -Individually programmable current via external resistor
- -Individually programmable VCC under voltage lockout to match the LED stack for HS PWM operation
- -Individual DPWM control
- -Capable of multiple IC parallel operation with fault flag linkage
- -Fault protection with flag output:
  - -Single LED short (optional to turn off all LEDs)
  - -LED string open/short
  - -I_{CC} set to 2mA (max) when fault flag is set
  - -OUTx pin(s) short to VCC
  - -ISETx pin open/short
  - -Over temperature
- De-glitching check to filter out short lived fault condition (25us or 1PWM cycle)
- eTSSOP-16 packages
- Automotive grade - AEC-Q100 (pending)
- Operating temperature range from -40°C ~ +125°C



Parallel application

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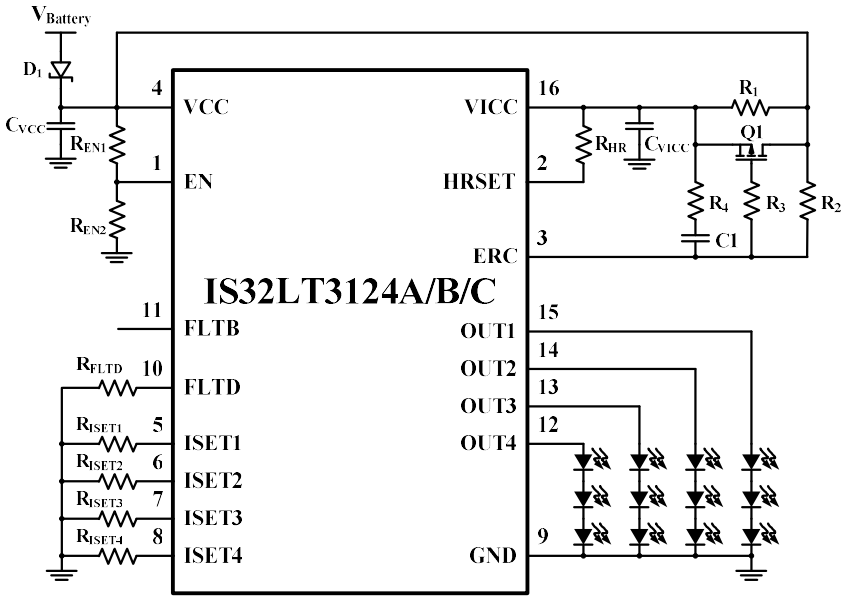
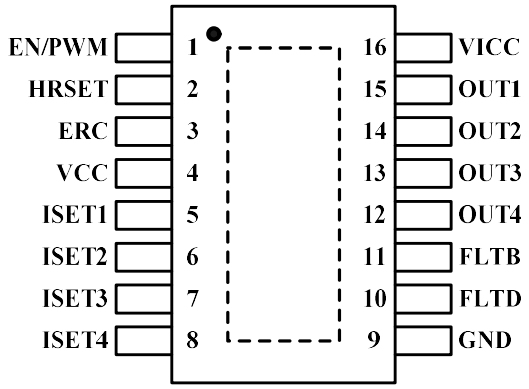
IS32LT3124-Features & application circuit

Features

- 5.0V to 42V input supply voltage range
- Four output channels can source up to 150mA each , Four current set resistors
- ±4% output current accuracy
- Low dropout voltage of 1V (Max.) at 100mA
- Combined for higher current capability with same current accuracy
- PWM dimming and shutdown control input
  0~300Hz power supply modulation(PSM)
  100Hz~1kHz individual dimming via resisters of ISETx pins (IS32LT3124B/C only)
- Dynamic headroom control with an optional external P-FET as LDO to minimize IC thermal
- Open LED Detection effective Vcc voltage is programmable via EN pin (IS32LT3124A only)





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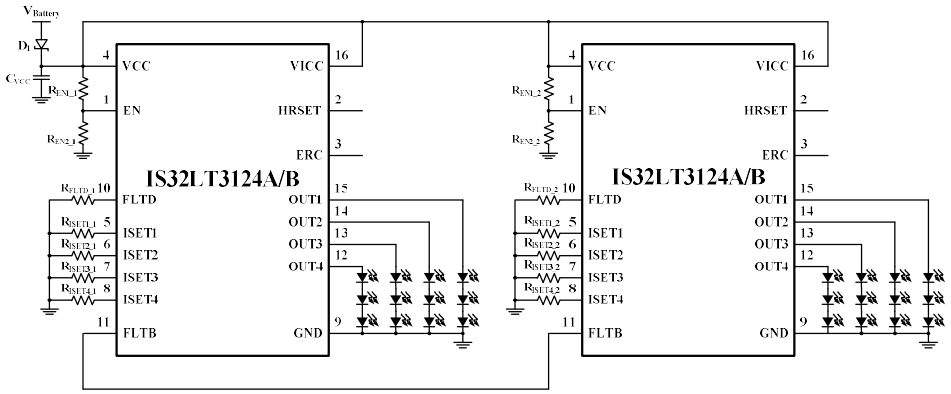
IS32LT3124-Features & application circuit

Features

- Fault protection and reporting
- Single LED short
- LED string open/short
- ISET pin short
- ISET pin open (IS32LT3124A only)
- Over temperature
- Programmable fault flag delay (deglitch timer)
- Fault condition disables output currents (IS32LT3124A/B, one fail, all fail)
- Parallel Fault connection (up to 15 devices)
- 42V load dump protection
- Automotive grade: AEC-Q100 (pending)
- Operating temperature range (-40°C ~ +125°C



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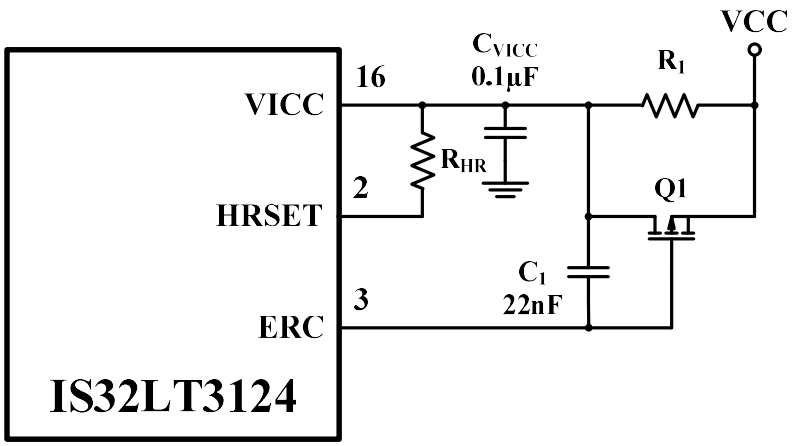
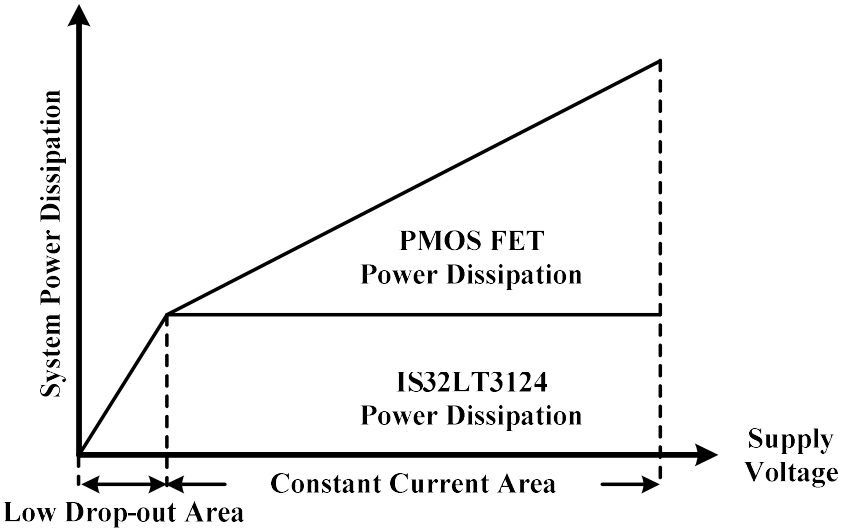
IS32LT3124 Heat Control Scheme

1. LDO mode (for low output current application)

- Choose R1=1Kohm, IS32LT3124 will linearly control PMOS to operate in LDO mode
- The current source head room programmed by a resister R_{HR}
- Maintain the IC power dissipation at setting level
- External PMOS handles the most heat

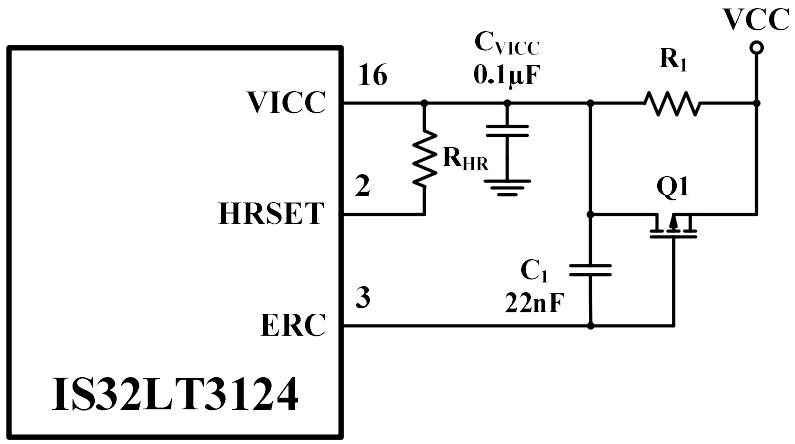


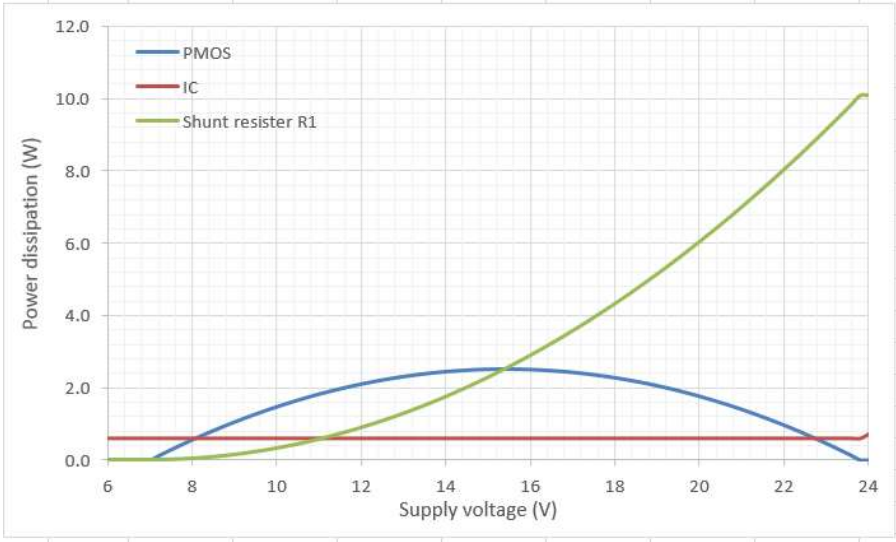


IS32LT3124 Heat Control Scheme

2. Shunt resister mode (for high output current)

- Choose R1 with several tens ohm value (depends on the total output current), IS32LT3124 will linearly control PMOS to operate in shunt resister mode
- The current source head room programmed by a resister R_{HR}
- Maintain the IC power dissipation at setting level
- The most heat is separated onto external PMOS and shunt resister R1

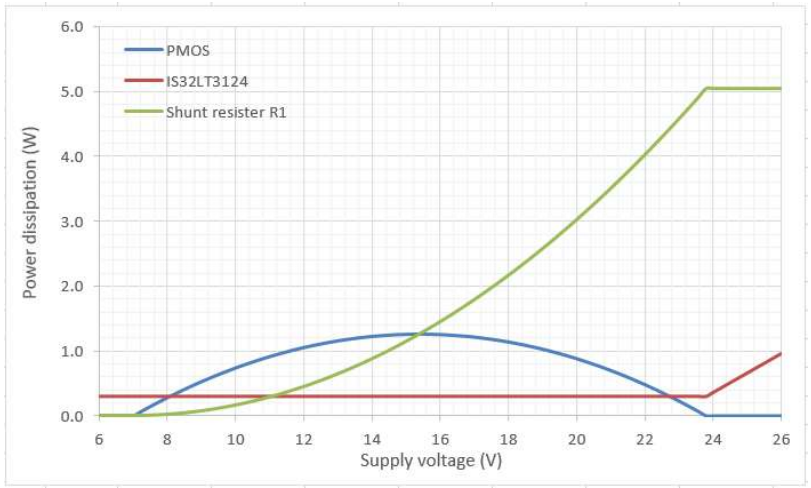


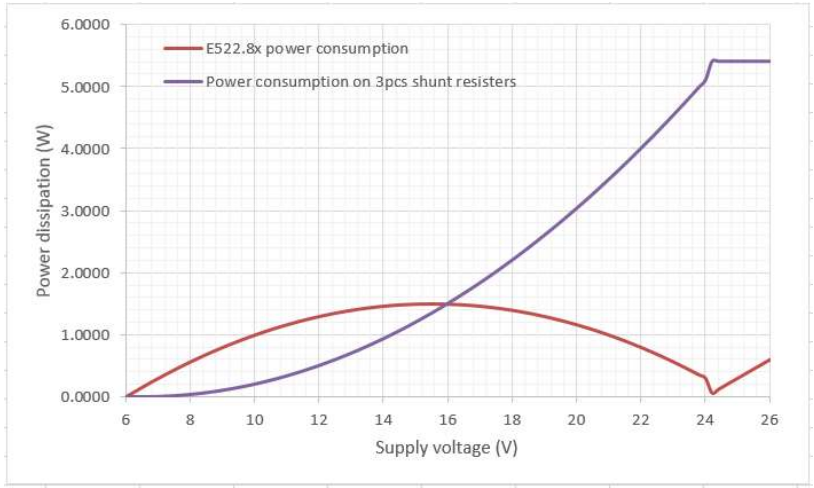


Automotive Exterior Lighting

IS32LT3124 Compare with Competitor

	IS32LT3124	Exx
Number of Channels	4 CH	3 CH
Output current of each channel	150mA	150mA
External PMOS	Yes	No





Competitor Exx has a similar shunt resister structure, however it integrates the power MOS. With the same conditions, the Exxx IC consumption is much higher than IS32LT3124. With the external PMOS, IS32LT3124 can support higher total output current.

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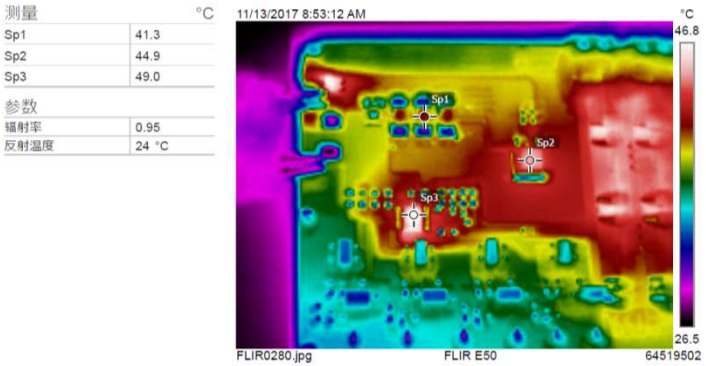
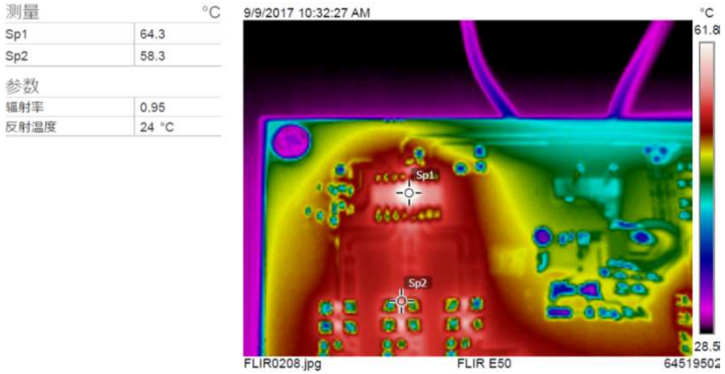
IS32LT3124 Compare with Competitor Exx

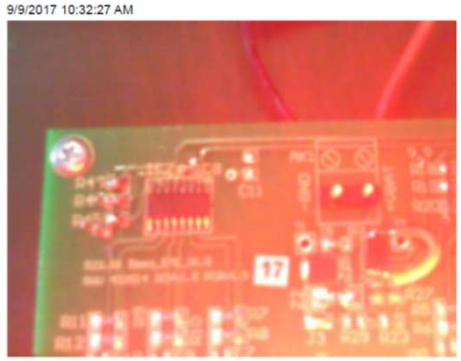
With the same conditions:

Vin=**9V**, Vout=6V, 3 LEDs in series(red), 3 channels, Iout=100mA per channel

	IS32LT3124	Exx
IC	49°C	64.3°C
Shunt resisters	41.3°C	58.3°C
External PMOS	44.9°C	-







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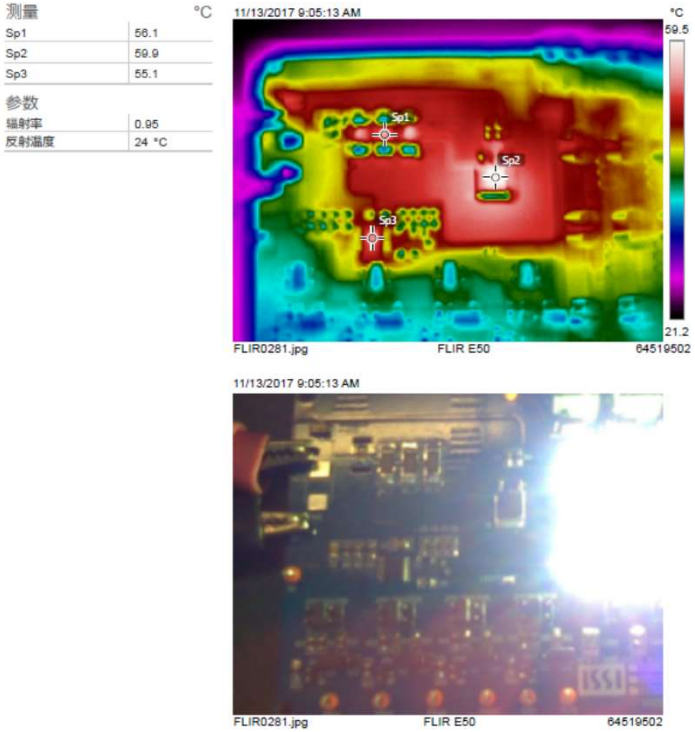
Automotive Exterior Lighting

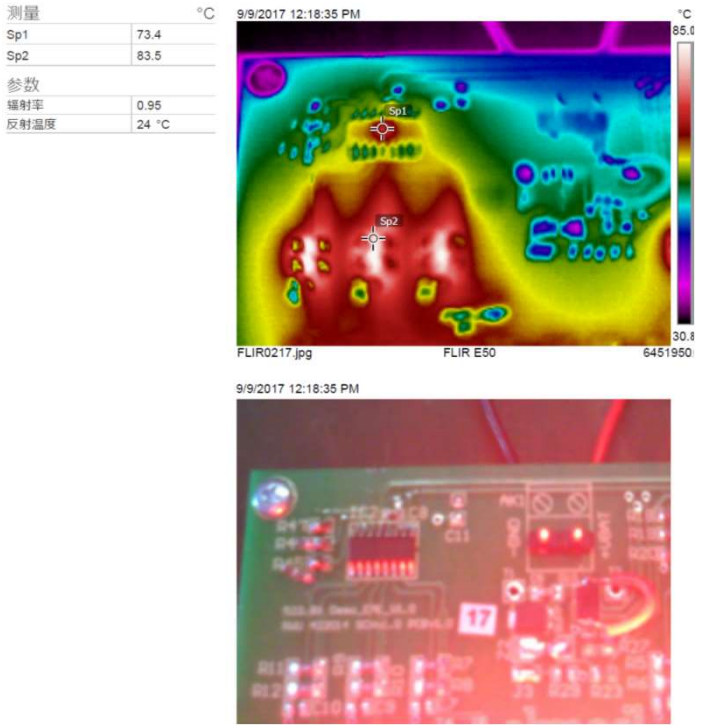
IS32LT3124 Compare with Competitor Exx

With the same conditions:

Vin=**12V**, Vout=6V, 3 LEDs in series(red), 3 channels, Iout=100mA per channel

	IS32LT3124	Exx
IC	55.1°C	73.4°C
Shunt resisters	56.1°C	83.5°C
External PMOS	59.9°C	-





Long-Term Support
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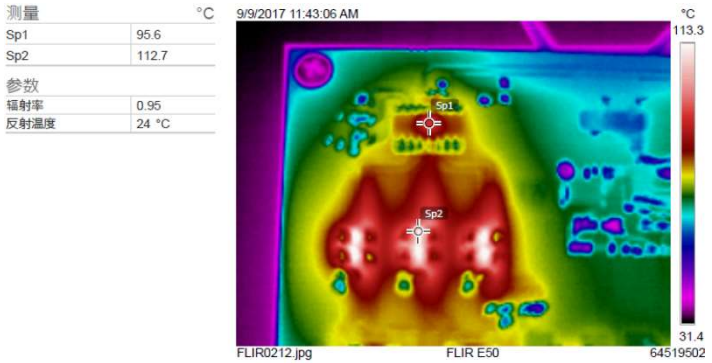
Automotive Exterior Lighting

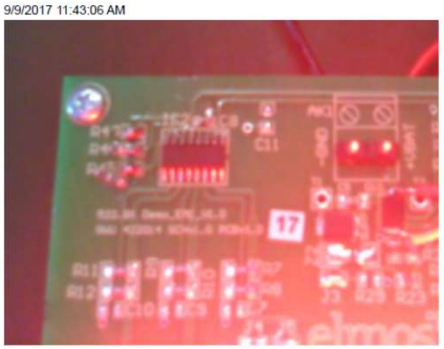
IS32LT3124 Compare with Competitor E522.x

With the same conditions:

Vin=**16V**, Vout=6V, 3 LEDs in series(red), 3 channels, Iout=100mA per channel

	IS32LT3124	Exx
IC	65.3°C	95.6°C
Shunt resisters	93°C	112.7°C
External PMOS	66.3°C	-





Long-Term Support
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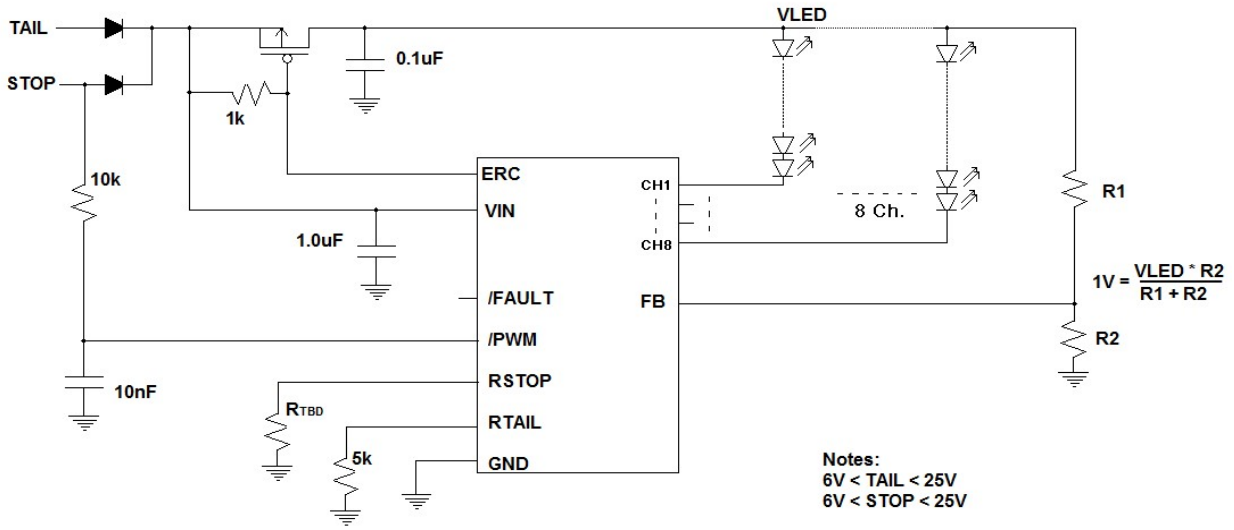
Automotive Exterior Lighting

IS32LT3180(8CH)

Features

- 8-75mA output channels
- Integrated Stop/Tail PWM generator
- Optional Gate driver for external ballasting Switch
- FAULT condition output
- Slew current control minimize EMI
- LED OC/SC detection (3180 OC/SC)
- Thermal roll off protection (3180)

Application: Tail/Stop light, CHMSL, Rear, Turn signal etc.



Long-Term Support
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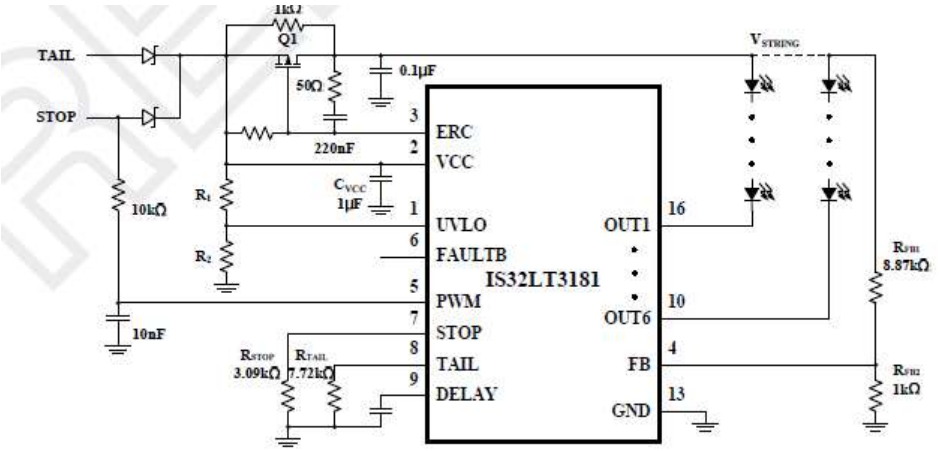
Automotive Exterior Lighting

IS32LT3181(6CH)



FEATURES

- Fault Detection Table

Table 2 Fault Assertion

Fault Type	Test Condition	Output Driver Action	FAULTB Pin Output	Fault Logic Decision	Fault Recovering
LEDs Open (1 to 6 LED string)	V_{OUT}<0.4V, V_{UVLO}>1.2V	Keeping the open channel on and turning the other channels off.	Pulled Low	For stop mode, Fault state will be reported after fault delay time T_D.	V_{OUT} exceeds 0.4V.
				For Tail mode, Fault state can be reported due to fault delay time T_D and PWM signal. (See Figure13)	
	V_{OUT}<0.4V, V_{UVLO}<1.15V	All channels turn on	High impedance	NA	NA
RSTOP PIN Over Current	I_{RSTOP}>1mA	All channels shutdown	Pulled Low	Fault state will be reported after fault delay time T_D.	I_{RSTOP} falls lower than 1mA.
Thermal shutdown	T_J>160°C	All channels shutdown	Pulled Low	Fault state will be reported after fault delay time T_D.	The junction temp falls lower than 145°C.

Automotive Exterior Lighting

IS32LT3180/1 Comparison

	IS32LT3180	IS32LT3181	xxx7680
Suggest Vcc	6V~16V (HV FT tested @16V Vcc, process HTOL qualified up to 42V, but there is 18V OVP)	6V~16V (HV FT tested @16V Vcc, process HTOL qualified up to 42V)	6V~16V
Maximum Vcc, Vout	50V	50V	45V
channels	8	6	8
Maxium Currrent	75mA	75mA	75mA
Current Accuracy (35mA, -40~125C)	8%	8%	12%
Current Matching (35mA, -40~125C)	5%	5%	7%
Fault Report	OVP, LED Open, LED Short, Short STOP Pin, Thermal Rollback	LED Open, Short STOP pin, Thermal Shutdown	OVP, LED Open,Short STOP pin
Open fault Mode	One channel open, other channels are still on	One Channel Open, All channel will be off	One channel open, other channels are still on
LED open detection	Yes, for both STOP and Tail mode	Yes, for both STOP and Tail mode	Only for Stop mode
Promgrammable dection votalge for active LED open fualt dection	No	(1) relative to Vin or Vsring to enalbe the funciton or not , by programmable Resistor Devider (2) Vout<0.4V	No
Promgrammable Fault Delay	No	Yes, Programmable by Cap	No
Fault report in Parallel	No	Yes , One fault report, others IC output will be off also	No
LED short detection	Yes, Vout>3.6V	No	No
OVP	Yes	No	Yes
OCP	Yes	Yes	Yes
OTP	Yes	Yes	Yes
Thermal roll off	Yes	No	No

Automotive Exterior Lighting

HB LED driver For Automotive(DC/DC)

Application	Part Number	Vin	topology	Channels	Output current	Dimming	Fault Report
day running, positon light, Headlight	IS32LT3952	6~40V	DC/DC buck	1	1.5A	Ext-PWM	
	IS32LT3953	6~40V	DC/DC buck	1	3A	Ext-PWM	
	IS32LT3954	6~40V	DC/DC buck	1	3A	Ext-PWM	Yes
	IS32LT3955/5A(ES)	6~40V	DC/DC buck	1	3A	Ext/Inter PWM	Yes
	IS32LT3956/56A(ES)	6~40V	DC/DC buck	1	3A	Ext-PWM /High side bypass NM	Yes
	IS32LT3957	5~75V	Boost/Buck-Boost	1	Ext MOS	eTSSOP16	Yes

Automotive Exterior Lighting

IS32LT3952/3 1.5A/3A Buck LED Driver

Features

- Wide input voltage supply from 5V to 40V
- Fixed Freq
- Spread Spectrum To Optimize EMI
- 1.5A/3A maximum output over operating temperature range
- Cycle-by-cycle current limit
- Integrated MOSFET switch
- Dimming via direct logic input or power supply voltage
- Internal control loop compensation
- Under-voltage lockout (UVLO) and thermal shutdown protection
- 1µA low power shutdown
- Robust fault protection :
- -LED Open/Short
- -Pin-to-GND short
- -Component open/short faults
- -Adjacent pin-to-pin short
- Automotive AEC-Q100 Qualified

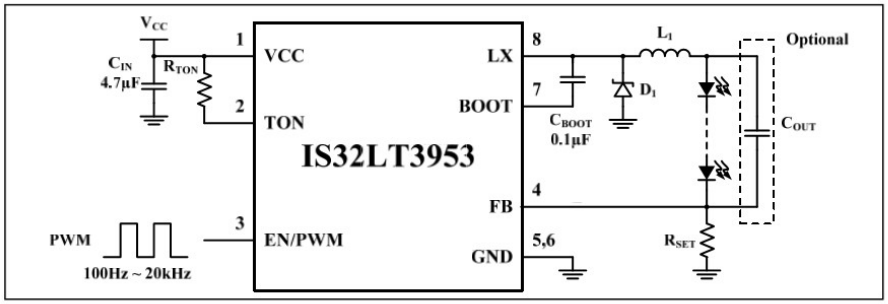


Figure 1 Typical Application Circuit

Long-Term Support
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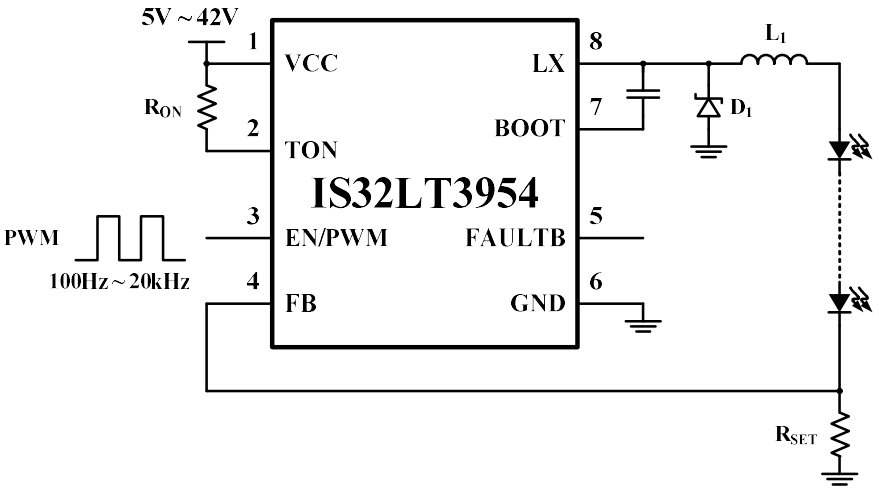
IS32LT3954 3A Buck LED Driver with Fault Report

Features

- Wide input voltage supply from 5V to 40V
- True average output current control
- 3A maximum output over operating temperature range
- Cycle-by-cycle current limit
- Integrated MOSFET switch
- Dimming via direct logic input or power supply voltage
- Internal control loop compensation
- Under-voltage lockout (UVLO) and thermal shutdown protection
- 1µA low power shutdown
- Robust fault protection and report function:
- -LED Open/Short
- -Pin-to-GND short
- -Component open/short faults
- -Adjacent pin-to-pin short
- Automotive AEC-Q100 Qualified



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Automotive Exterior Lighting

- 展频可以将能量分散到开关频率附近的频段

EMI TEST REPORT

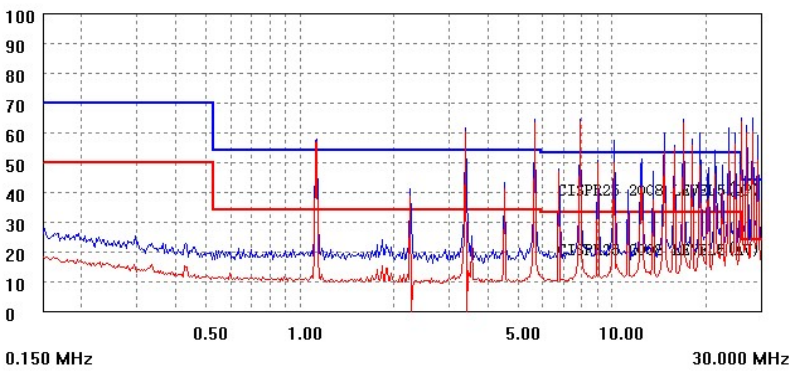
parameter

Organization: xm		Operator:	jim	EUT:	
Place:		Time:	2017/1/19/11:1	Test equipment:	KH3935
Detector:	PK+AV	Test-time(ms):	30	SN:	1435249
Limit:	CISPR25 2008 LEVEL5	Transductor(PK/AV):	PK / AV	JZ:	2,14,1836
Remark:					

freq, step

Start(MHz)	End(MHz)	Step(MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

scan result



Without Spread spectrum
Vin=12V,Load=2LED,Iout=500mA,L=10uH,F=1MHz.

EMI TEST REPORT

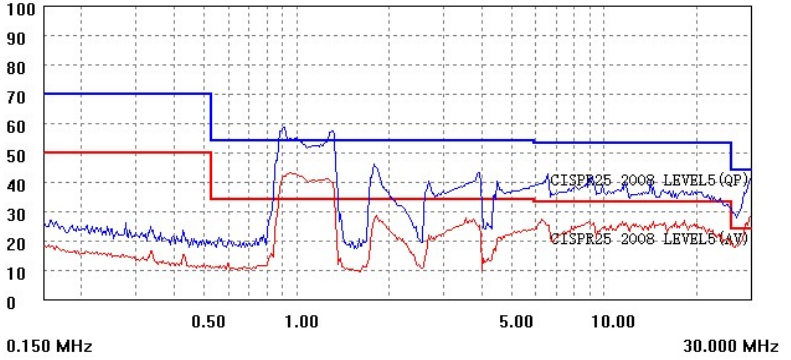
parameter

Organization: xm		Operator:	jim	EUT:	
Place:		Time:	2017/1/19/10:56	Test equipment:	KH3935
Detector:	PK+AV	Test-time(ms):	30	SN:	1435249
Limit:	CISPR25 2008 LEVEL5	Transductor(PK/AV):	PK / AV	JZ:	2,14,1860
Remark:					

freq, step

Start(MHz)	End(MHz)	Step(MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

scan result



With Spread spectrum
Vin=12V,Load=2LED,Iout=500mA,L=10uH,F=1MHz.

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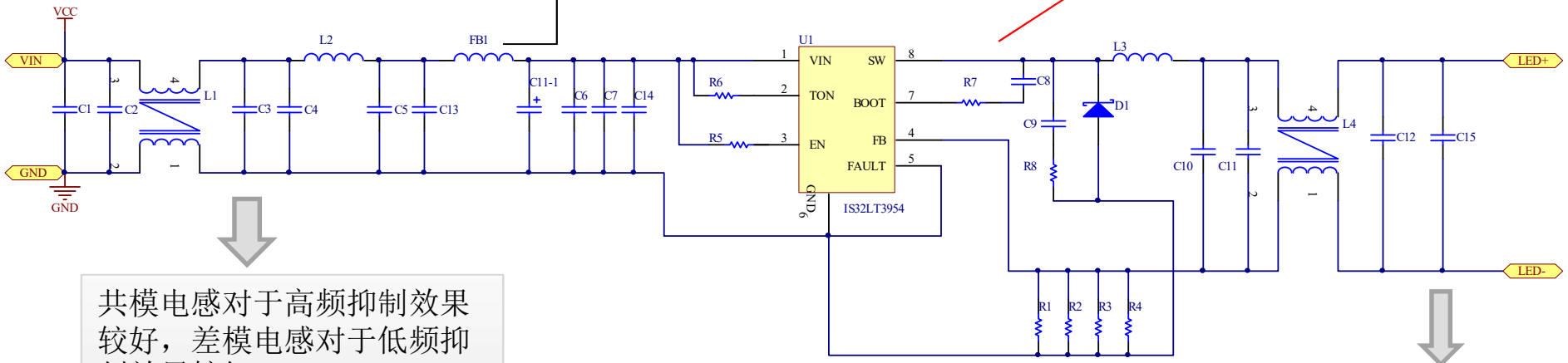


预留了磁珠位置，目前来说可以短接

R8，C9抑制振铃现象，R7减慢SW开启速度。

共模电感对于高频抑制效果较好，差模电感对于低频抑制效果较好。

Pi 型滤波后的电容一般除了加一个uf级的电容还可以加1-100nF 的小电容滤除高频杂波

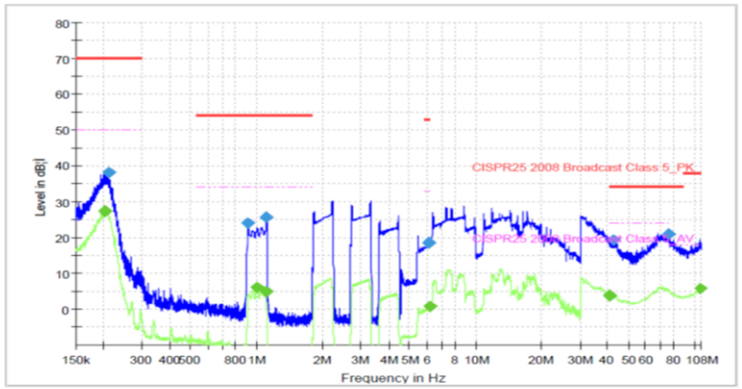
Automotive Exterior Lighting

- Test condition :Input=13.5V,Vout=9.6V,Iout=2.4A **CE/RE CISPR25 Class5**

CE: 150KHz~108MHz

Common Information

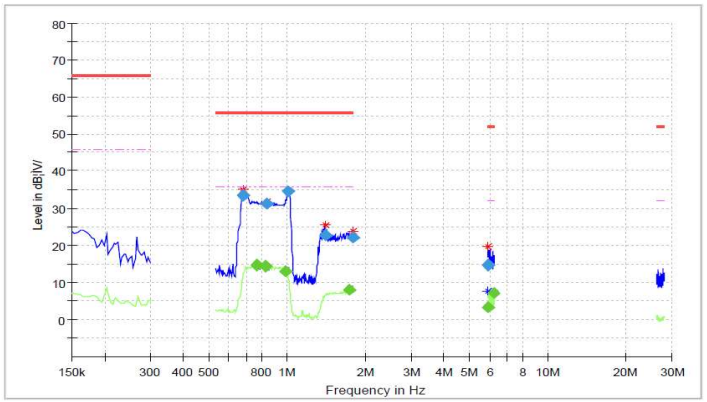
Test Description:	SI-EN
Operating Conditions:	ESU26 RECEIBER, ESH3-Z6, DC12V
Operator Name:	CISPR25
Comment:	ON MODE 12V (-)



RE: 150K-108M_V

Common Information

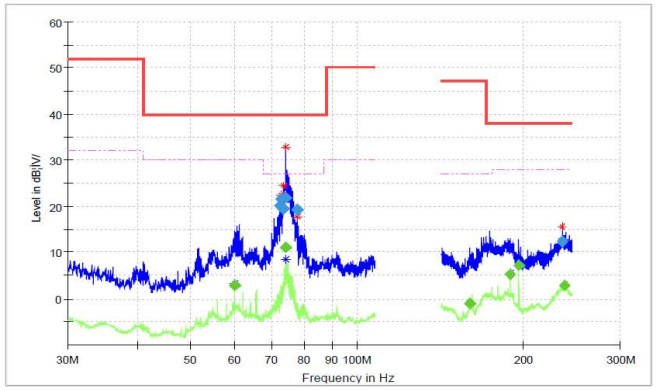
Test Description:	IS32LT3954
Test Site:	ESU40 RECEIBER,VUBL9163 ANTENNA
Test Standard:	CISPR25
Environment Conditions:	ON MODE DC13.5V VER
Operator Name:	LRB
Comment:	XIEN



RE: 30M-300M_H

Common Information

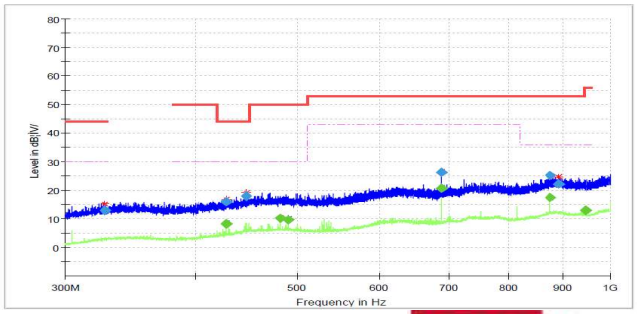
Test Description:	IS32LT3954
Operating Conditions:	ESU26 RECEIBER,HK116&HL223 ANTENNA
Operator Name:	CISPR25
Comment:	ON MODE DC13.5V HOR



RE: 300M-1G H

Common Information

Test Description:	IS32LT3954
Operating Conditions:	ESU26 RECEIBER,HK116&HL223 ANTENNA
Operator Name:	CISPR25
Comment:	ON MODE DC13.5V HOR



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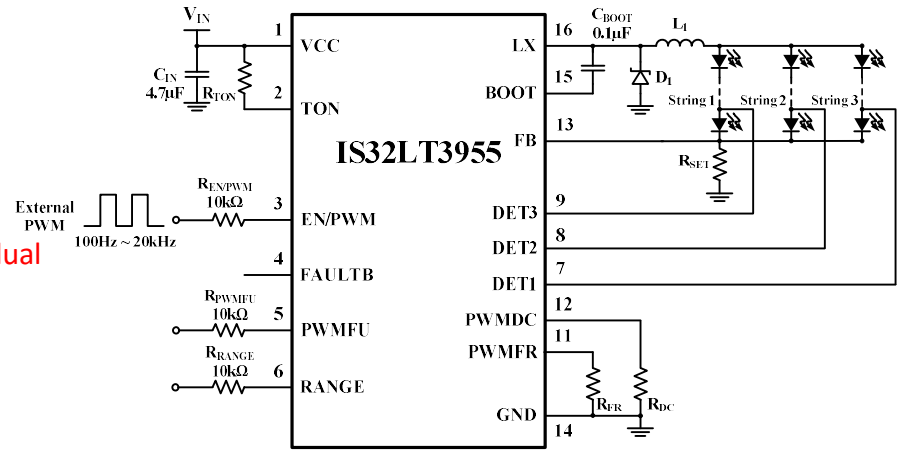
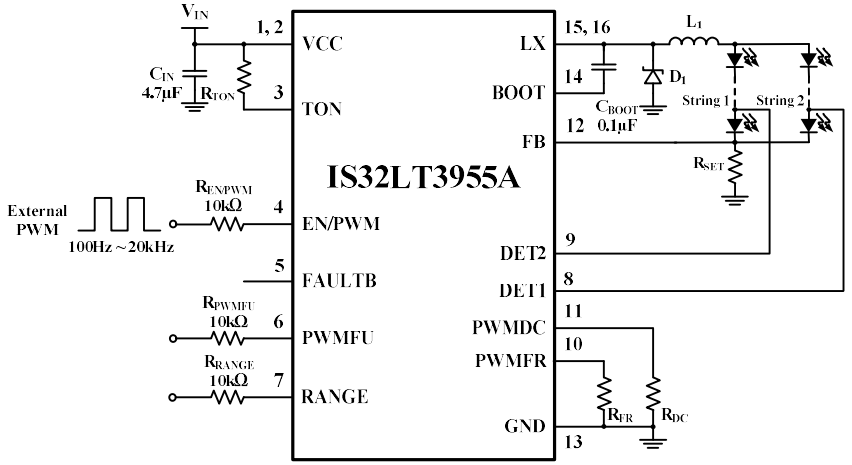
Automotive Exterior Lighting

IS32LT3955/5A 3A Buck LED Driver with Inter PWM/String Fault Report

Features

- Standalong dual brightness output
- Integrated PWM generator
- 100Hz~1KHz adjustable PWM frequency
- 5%~100% adjustable PWM duty cycle
- Support upto 2-3 LED strings in parallel as output with individual LED string open fault detection
- Wide input voltage supply from 4.5V to 40V
- 3A maximum true average output current control
- Cycle-by-cycle current limit
- Integrated MOSFET switch
- Dimming via direct logic input or power supply voltage
- Internal control loop compensation
- Under-voltage lockout (UVLO) and thermal shutdown protection
- 1μA low power shutdown
- Spread spectrum to optimize EMI
- Robust fault protection and report function:
- LED string open/short circuit
- Pin-to-GND short
- Adjacent pin-to-pin short
- Parallel FAULTB pins connection





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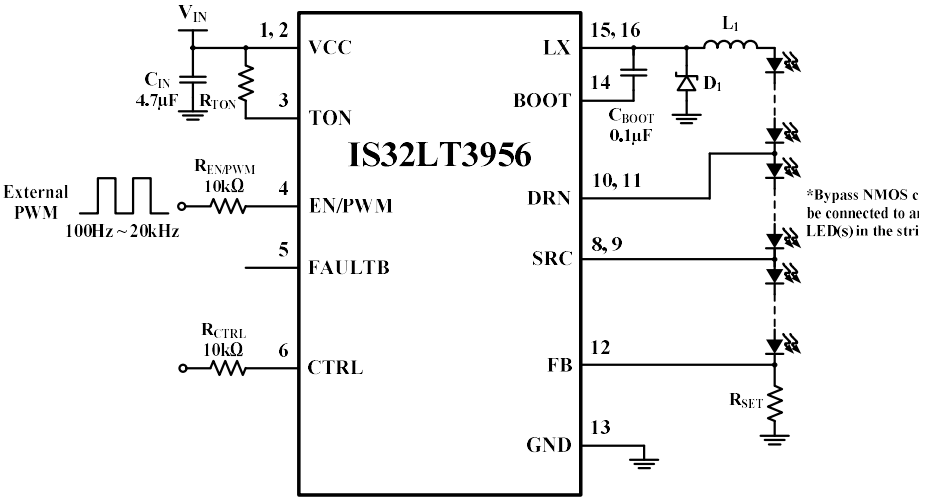
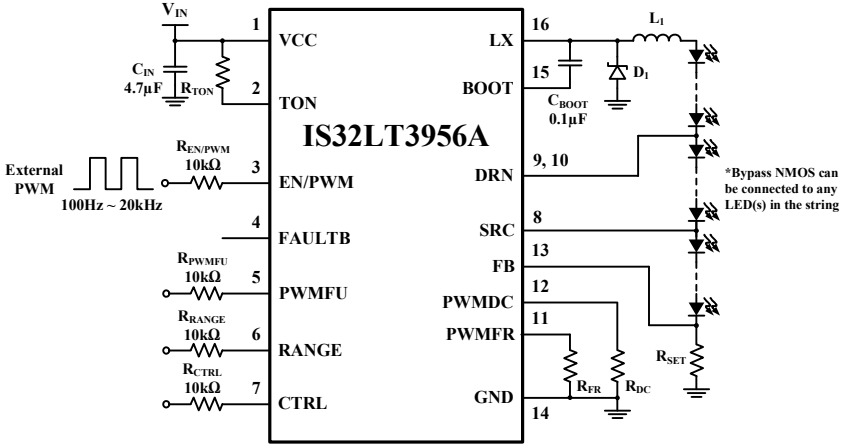
Automotive Exterior Lighting

IS32LT3956/6A

3A Buck LED Driver with high side bypass NOMS and Fault Report

- Wide input voltage supply from 4.5V to 40V
- 3A maximum true average output current control
- Cycle-by-cycle current limit
- Integrated high-side bypass NMOS for different amount LEDs output
- 100Hz~1KHz adjustable PWM frequency
- 5%~100% adjustable PWM duty cycle
- Dimming via direct logic input or power supply voltage
- Internal control loop compensation
- Under-voltage lockout (UVLO) and thermal shutdown protection
- 1μA low power shutdown
- Spread spectrum to optimize EMI
- Robust fault protection and report function:
  - LED string open/short circuit
  - Pin-to-GND short
  - Component open/short faults
- Adjacent pin-to-pin short
- Parallel FAULTB pins connection





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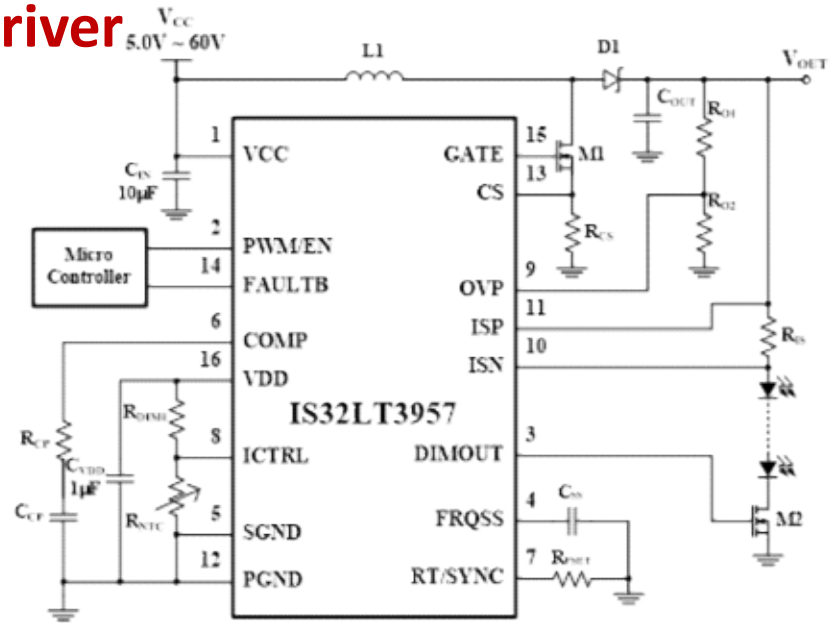
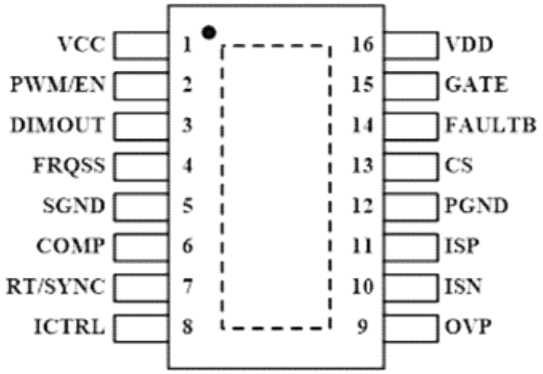
Automotive Exterior Lighting

IS32LT3957 – Buck/boost, Boost LED Driver

- Current mode PWM controller
  - 5~75V operation
  - 100kHz~1MHz operating frequency
    - Programmable spread spectrum
  - Operation frequency synchronization
- External switching FET
- Soft start to minimize inrush current
- Analog and/or Digital PWM dimming
  - The analog dimming range is 0.1V~1.1V (pin 8)
  - Digital PWM upto VCC (pin 2)
- Fault protection with reporting:
  - VCC under voltage lockout (UVLO)
  - Output over voltage protection (OVP)
  - Output short circuit protection
  - RT/SYNC pin short protection
  - VDD pin short protection
  - Over temperature protection (OTP)
- Automotive AEC-Q100 on going
- eTSSOP-16 package





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New Touch Sensors products and Applications

- **IS32SE5110/1**
  - 8051 based with 32KB Flash/2KB SRAM TSSOP-24/-20/-16, QFN-24
  - Low Standby Power
  - ADC/PWM/RTC/Touch Key
  - Power Management
  - Touch Key Controller

- **IS31SE5114**
  - 8051 based with 32KB Flash/2KB SRAM LQFP-64
  - Low Standby Power
  - ADC/PWM/RTC/(E)UART, Buzzer generator
  - Power Management
  - LED matric/STN-LCD Driver
  - Touch Key Controller

POWERbot

Refrigerator Touch Key Control Panel

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Highlight to Auto-MCU & Its Related Application

❑ Intelligent Touch Key User Interface Module for Vehicle

- ❖ SE5110 Used for touch key projects. Each IC can detect as many as 14 touch keys. Proximity mode was provided also.

LUXGEN SUV

LUXGEN MPV

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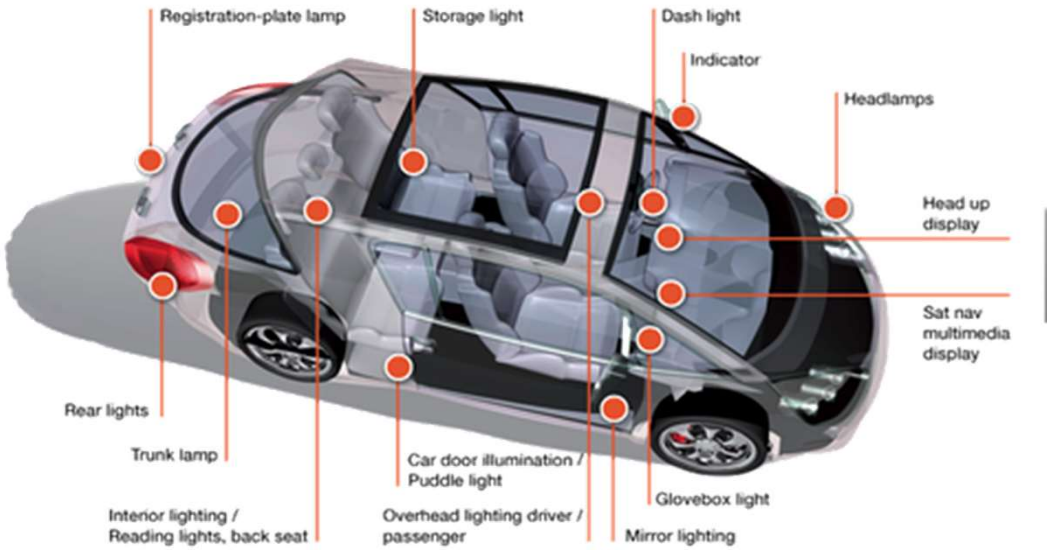

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