1MHz, 30V, 2.0A High Efficiency Synchronous Step-Down Converter for Dimmable LED Driver

Features

- Wide Input Range: 4V to 30V
- 130mΩ/70mΩ Low RDS(ON) Internal FETs
- Up to 2.0A Output Current Capability
- Fixed 1MHz Switching Frequency
- Maximum Duty Cycle Up to 99%
- Down to 0.5% LED Rated Current
- Ultra-low and Accurate FB Voltage: 100±3mV
- Peak Current Mode with Internal Compensation
- Over Current Protection with Hiccup Mode
- LED Fault Protection Features：
  - -LED open load protection
  - -LED+ short to GND protection
  - -LED+ and LED- short circuitry protection
  - -Sense resistor open load protection
  - -Sense resistor short to GND protection
- Thermal Shutdown
- Stable with Low ESR Ceramic Output Capacitors
- Available in SOT23-6 Package

Description

The TMI5302 is a high efficiency 1MHz, synchronous step-down LED driver with 30V maximum input voltage. TMI5302 integrates main switch and synchronous switch with very low $R_{DS(ON)}$ to minimize the conduction loss. It achieves up to 2A of continuous output current with excellent load and line regulation. Peak current mode operation provides fast transient response. Low LED current ripple and small external inductor and capacitor size are achieved with 1MHz switching frequency.

The TMI5302 requires a minimum number of readily available standard external components and is available in a 6-pin SOT23-6 ROHS compliant package.

Application

- Video Surveillance IR/White LED Driver
- Facial Recognition IR LED Driver
- Stage Lighting LED Driver
- 12V/24V DC Lighting and Flash Light
- Medical UV LED Driver

Typical Application

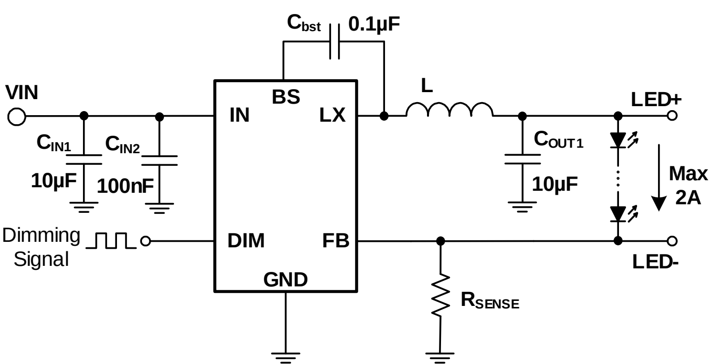
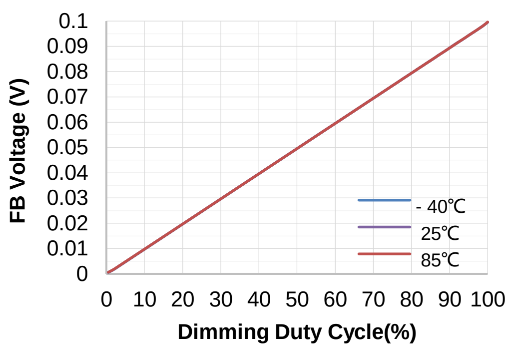


Figure 1. TMI5302 Typical Application Circuit

Dimming Curve

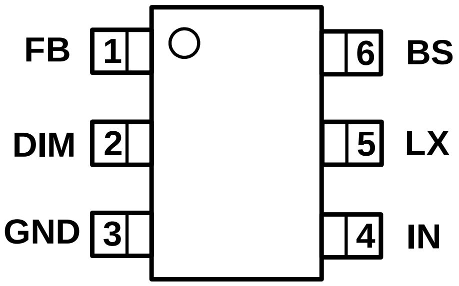
V_{IN}=12V, 1 WLED, D_{DIM}=0.5% to 100%



Absolute Maximum Ratings (Note 1)

Parameter	Min	Max	Unit
Input Supply Voltage	-0.3	36	V
LX Voltages	-0.3	36	V
LX Voltages (<10ns transient)	-5	38	V
DIM, FB Voltage	-0.3	35	V
BS to LX Voltage	-0.3	6	V
Storage Temperature Range	-65	150	°C
Junction Temperature (Note2)	160		°C
Power Dissipation	1500		mW
Lead Temperature (Soldering, 10s)	260		°C

Package



SOT23-6
Top Marking: TY3AXXX
TY3A: Device Code
XXX: Inside Code

Order Information

Part Number	Package	Top Marking	Quantity/Reel
TMI5302	SOT23-6	TY3AXXX	3000

TMI5302 devices are Pb-free and RoHS compliant.

Pin Functions

Pin	Name	Function
1	FB	LED current detection feedback, the output current, I_{LED} =0.1V/R_{SENSE}.
2	DIM	Dimming signal input. Logic high enables operation. Toggling this pin with a periodic logic square wave of varying duty cycle at different frequencies controls the brightness of LEDs. When the DIM pin signal duty rises from 0.5% to 100%, the LED current will change from 0.5% to 100% of the maximum LED current. Don't floating DIM pin.
3	GND	Ground pin.
4	IN	Power supply pin. Decouple this pin to GND pin with a 10µF ceramic cap.
5	LX	Switching pin.
6	BS	Bootstrap. A capacitor connected between LX and BS pins is required to form a floating supply across the high-side switch driver.

ESD Rating

Items	Description	Value	Unit
V_{ESD_HBM}	Human Body Model for all pins	±2000	V
V_{ESD_CDM}	Charged Device Model for all pins	±1000	V

JEDEC specification JS-001

Recommended Operating Conditions

Items	Description	Min	Max	Unit
Voltage Range	IN	4	30	V
T_J	Operating Junction Temperature	-40	125	°C

Thermal Resistance (Note3)

Items	Description	Value	Unit
θ_{JA}	Junction-to-ambient thermal resistance	95	°C/W
θ_{JC}	Junction-to-case(top) thermal resistance	36	°C/W
θ_{JB}	Junction-to-board thermal resistance	16.5	°C/W
ψ_{JT}	Junction-to-top characterization parameter	1.6	°C/W

Electrical Characteristics

V_{IN}=12V, V_{DIM} =3.3V, T_A = 25°C, unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Unit
Input Voltage Range		4		30	V
UVLO Rising Threshold	Rising V_{IN}		3.7	3.9	V
UVLO Hysteresis			0.2		V
Normal Operating Current	V_{DIM} = 3.3V, V_{FB} = 1.2V		0.5	1	mA
Shutdown Current	V_{IN} = 12V, V_{DIM} = 0V		1	3	μA
DIM High-level Input Voltage	Rising V_{DIM}	0.65			V
DIM Low-level Input Voltage	Falling V_{DIM}			0.3	V
PWM Dimming Duty Range	F_{REQ_DIM} = 50kHz	0.5%		100%	
DIM Minimum On Time to Enable Device	V_{DIM} = 3.3V		50		ns
DIM Minimum Off Time to Disable Device	V_{DIM} = 0V		38		ms
Regulated Feedback Voltage (V_{FB})	T_A = 25°C, I_{OUT} = 1.0A D_{DIM} = 100%, F_{REQ_DIM} = 50kHz	97	100	103	mV
	T_A = 25°C, I_{OUT} = 1.0A D_{DIM} = 1%, F_{REQ_DIM} = 50kHz	0.8	1.0	1.2	mV
Regulated Feedback Voltage OVP	V_{DIM} = 3.3V		140		mV
Feedback current (I_{FB})	V_{DIM} = 3.3V, V_{FB} = 1.2V			0.1	μA
Min Regulated Feedback Voltage	T_A = 25°C, I_{OUT} = 1.0A D_{DIM} = 0.5%, F_{REQ_DIM} = 50kHz		0.5		mV
High-Side Switch On-Resistance	V_{IN} ≥ 5V		130		mΩ
Low-Side Switch On-Resistance	V_{IN} ≥ 5V		70		mΩ
High-Side Switch Leakage Current	V_{EN} = 0V, V_{LX} = 0V			0.1	μA
High-side Switch Current Limit		2.9		4.2	A
Low-side Switch Sourcing Current Limit		2.4		3.6	A
Low-side Switch Sinking Current Limit		1.4		2.4	A
Switching Frequency		0.8	1	1.2	MHz
Minimum On Time			70		ns
Maximum On Time			6.5		μs
Minimum Off Time			65		ns
Maximum Duty Cycle			99		%
Auto-retry On-time			512		cycles
Auto-retry Off-time			60		ms
Soft-start Time	V_{OUT} 0V to 100%		1.5		ms
Hiccup On Time	V_{OUT} = 0V (LED+ Short to GND)		6		ms
Hiccup Time Before Restart	V_{OUT} = 0V (LED+ Short to GND)		60		ms
Thermal Shutdown Threshold (Note 4)			155		°C
Thermal Shutdown Hysteresis (Note 4)			20		°C

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: T_J is calculated from the ambient temperature T_A and power dissipation P_D according to the following formula: $T_J = T_A + P_D \times \theta_{JA}$. The maximum allowable continuous power dissipation at any ambient temperature is calculated by $P_{D\,(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$.

Note 3: Measured on JESD51-7, 4-layer PCB.

Note 4: Thermal shutdown threshold and hysteresis are guaranteed by design.

Block Diagram

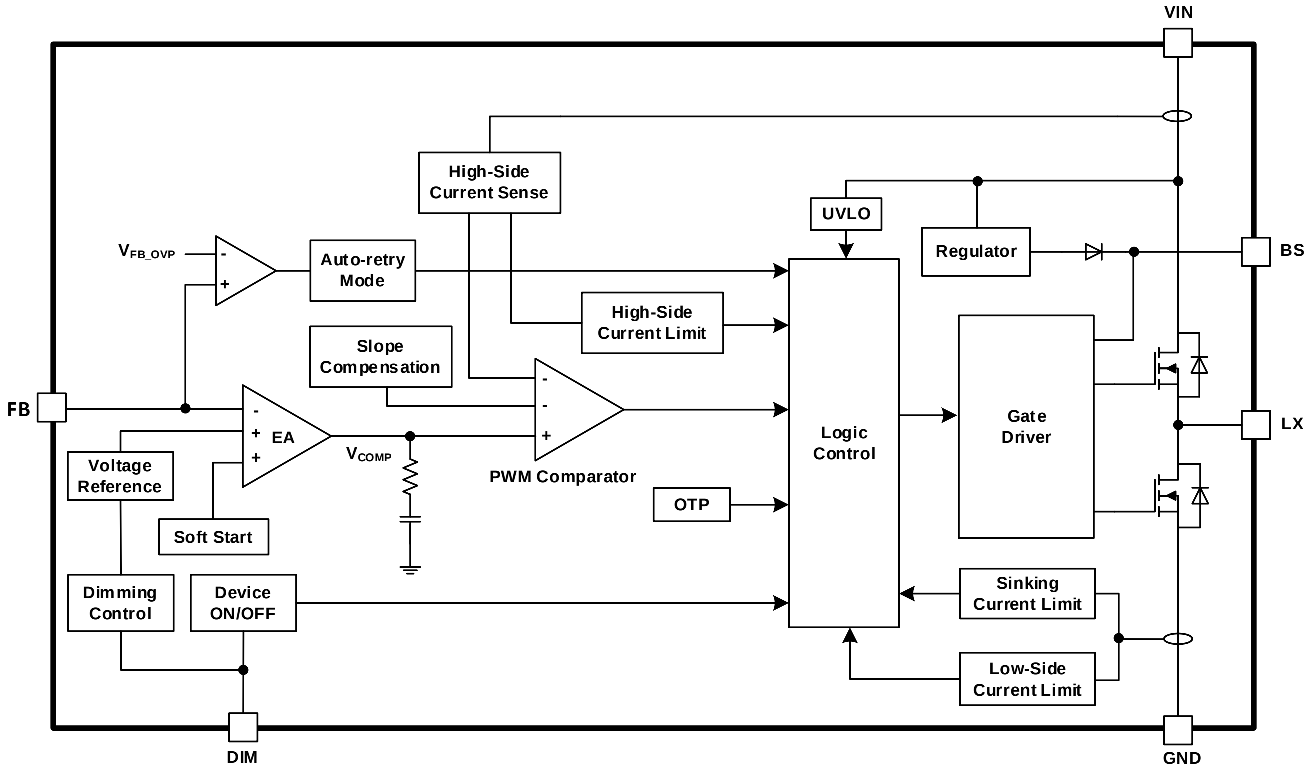


Figure 2. TMI5302 Block Diagram

Operation Description

Internal Regulator

The TMI5302 is a high efficiency 1MHz, synchronous step-down LED driver with 30V maximum input voltage. TMI5302 integrates main switch and synchronous switch with very low $R_{DS(ON)}$ to minimize the conduction loss. It achieves up to 2A of continuous output current with excellent load and line regulation. The TMI5302 is fully internally compensated, it requires a minimum number of readily available standard external components, which enables a simple design on a limited board space. Peak current mode operation provides fast transient response. Low LED current ripple and small external inductor and capacitor size are achieved with 1MHz switching frequency.

The TMI5302 implements deeper dimming by changing the internal reference voltage proportional to the duty cycle of the PWM signal input in 0.5% to 100% range.

For safety and protection, the TMI5302 integrates multiple fault protection functions, include LED open, LED+ short to GND, LED+ and LED- short, sense resistor open, sense resistor short, and device thermal protection. Hiccup mode is triggered at current limit or FB pin over-voltage scenario to avoid the device overheat.

Error Amplifier

The TMI5302 uses an internal low offset error amplifier, compares the FB voltage with the internal 100mV reference and outputs a COMP voltage, which is inside of the chip and is used to control the high-side MOSFET peak current and regulate the output current.

Internal Soft-Start

The soft-start is implemented to prevent the converter output voltage from overshooting during startup. The TMI5302 implements the internal soft-start function, the V_{REF} ramps smoothly during the soft-start period. The SS time is internally fixed to 1.5ms (typical).

Input UVLO

The TMI5302 implements internal undervoltage-lockout (UVLO) circuitry on the input pin. It is disabled when the input pin voltage falls below the internal input UVLO threshold, 3.5V (typical). The internal input UVLO threshold has a hysteresis of 0.2V (typical).

Setting LED Current

A current sense resistor is inserted between the cathode of LED and GND. The current sense resistor value can be calculated with Equation:

$$R_{SENSE} = \frac{0.1V}{I_{LED}}$$

For example, 0.8A LED output current, choose R_{SENSE} = 125mΩ.

DIM Enable and Dimming

DIM is a control pin that turns on and turns off the regulator and supports dimming by applying a square wave signal. When the DIM pulse voltage is high, the device is enabled. After the DIM pulse voltage is lowered last to t_{DIM_OFF}, 38ms (typical), the device is disabled. Figure 3 shows the control logic for DIM and Internal enable signal.

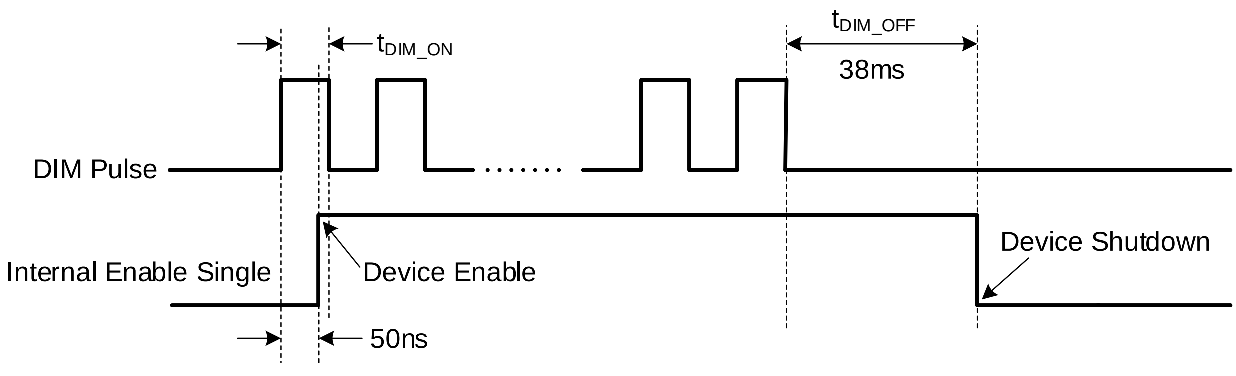


Figure 3. TMI5302 DIM Time Sequence

When applying a DC signal on the DIM pin, the device enters the maximum set current and V_{FB} = 100mV, the LED works at the maximum brightness.

The TMI5302 supports accurate dimming with a digital signal. When applying a digital signal on the DIM pin, the device enters dimming mode, and the reference voltage V_{REF} is changed proportionally to the duty cycle of digital signal input. When using dimming mode, apply a square wave with a low level of GND and a high-level voltage higher than 1V, 3.3V (typical). The dimming frequency range is 20 kHz to 200 kHz, and the DIM signal minimum on-time, t_{DIM_ON}, must be greater than 50ns. Once the connection is ready, first apply the input voltage, then apply the PWM signal.

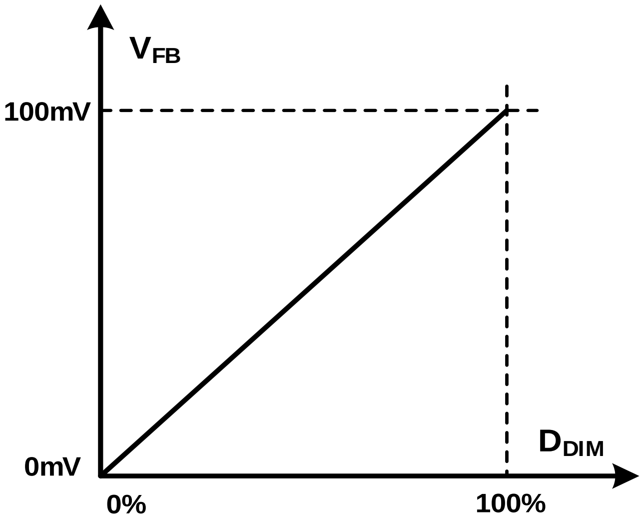


Figure 4. TMI5302 Dimming Curve

Peak-Current-Mode PWM Control

The TMI5302 uses peak-current-mode control and full internal compensation to provide high transient response performance over a wide range of operating conditions.

During each switching cycle, when the high-side power switch is turned on, the load current is sensed through the external sense resistor, R_{SENSE}. The sensed voltage on the FB pin is compared with the internal voltage reference, V_{REF}, through the error amplifier. The output of the error amplifier, V_{COMP}, is compared with the real-time current, I_{HS_SENSE}, going through the high-side power switch. Slope compensation circuit is implemented in the device to prevent sub-harmonic oscillations as the duty cycle increases in peak-current-control mode.

When the peak value of V_{HS_SENSE} reaches V_{COMP} in the PWM comparator, the high-side power switch is turned off and the low-side MOSFET is turned on at the same time. The low-side power switch stays turned on until the end of the PWM cycle. Thus, by regulating the real-time peak current in each switching cycle, the device controls the load current at the target value.

Bootstrap regulator

The TMI5302 integrates a bootstrap regulator, and requires an external capacitor between the BS and LX pins to provide the gate driver voltage for the high-side power switch. The bootstrap capacitor voltage is regulated internally. During normal operation, a 5.1V bootstrap voltage is maintained between BS and LX. A 0.1μF, ≥ 10V ceramic capacitor with an X7R or X5R dielectric is recommended because of the stable characteristics over temperature and voltage.

Maximum Duty Cycle

For a buck LED driver, the maximum duty cycle is limited by the minimum off time t_{MIN_OFF} and switching frequency. To achieve the maximum brightness when the input voltage is close to output voltage, the TMI5302 has a mechanism to decrease the switching frequency. This mechanism extends the on-time up to t_{MAX_ON}, 6.5μs (typical). With this function, the TMI5302 maximum duty cycle is able to go up to D_{MAX}, 99% (typical).

Startup and Shutdown

If both VIN and EN are higher than their appropriate thresholds, the chip starts operating. The reference block starts firstly, generating stable reference voltage and currents, and then the internal regulator is enabled. The regulator provides stable supply for the remaining circuits. Three events can shut down the chip: EN low, VIN low and thermal shutdown. In the shutdown procedure, the signal path is first blocked to avoid any fault triggering. The V_{COMP} voltage and the internal supply rail are then pulled down. The floating driver is not subject to this shutdown command.

Over Current Protection

The TMI5302 is protected from overcurrent condition by cycle-by-cycle current limit on both the high-side NMOS and the low-side NMOS.

High-Side MOSFET overcurrent protection: During each switching on cycle, the high-side sense voltage, V_{HS_SENSE}, is compared with V_{COMP} to generate the PWM duty cycle. In order to prevent an overcurrent stress, V_{COMP} is internally clamped to set the high-side MOSFET current limit as I_{LIMT_HS}. When the peak of I_{HS_SENSE} exceeds I_{LIMT_HS}, the high-side MOSFET is turned off and the low-side MOSFET is turned on accordingly. An auto-retry mechanism is implemented for this case, if an output over-current condition occurs for more than auto-retry on time t_{RETRY_ON}, which is programmed for 512 switching cycles, the device shuts down for an auto-retry off-time t_{RETRY_OFF}, which is 60ms (typical).

Low-Side MOSFET sourcing overcurrent protection: During each switching off-cycle, the low-side MOSFET is turned on and the conduction current is monitored by the internal circuitry. At the end of every clock cycle, the low-side MOSFET sourcing current is compared to the internally set low-side sourcing-current limit, $I_{LIMT\_LS\_SOUR}$. If the low-side sourcing-current limit is exceeded, the high-side MOSFET does not turn on and the low-side MOSFET stays on for the next clock cycle. The high-side MOSFET turns on again when the low-side current is below the low-side sourcing current limit at the start of a cycle.

Low-Side MOSFET sinking overcurrent protection: During each switching off-cycle, the device also monitors the sinking current of the low-side MOSFET by detecting the voltage across it and sets a sinking overcurrent limit, $I_{LIMT\_LS\_SINK}$, to protect the low-side power switch from overstress. When the peak of the sinking current reaches $I_{LIMT\_LS\_SINK}$, both the high-side MOSFET and low-side MOSFET are turned off. The high-side MOSFET turns on again when the low-side current is below the low-side sinking current limit at the start of a new cycle.

Output Over Voltage Protection

When the FB pin, for some reason, has a voltage higher than 1V applied, the device shuts down immediately. Both high-side and low-side MOSFETs are kept off, the device starts the auto-retry counter t_{RETRY_OFF}, when the counter t_{RETRY_OFF} expires, the device restarts again. If the failure still exist, TMI5302 repeats above hiccup shutdown and restart process.

Thermal Shutdown

The TMI5302 implements a thermal shutdown mechanism to protect the device from damage due to overheating. When the junction temperature rises to 155°C (typical), the device shuts down immediately. The TMI5302 releases thermal shutdown when the junction temperature of the device is reduced to 135°C (typical).

Fault Protections

For safety and protection, the TMI5302 integrates multiple fault protection functions, include LED open, LED+ short to GND, LED+ and LED- short, sense resistor open and sense resistor short, and device thermal protection.

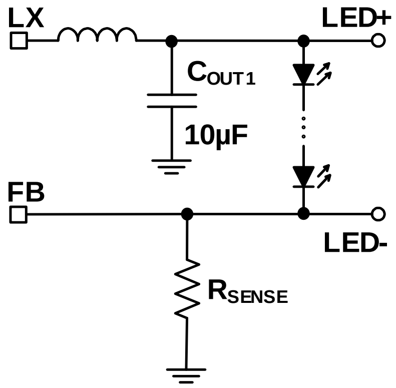


Figure 5. FB and LED+ Connect Circuit

Type	Criterion	Behavior
LED open load	V_{FB} close to 0mV	The device keeps maximum duty cycle turn-on.
LED+ short to GND	High-side or low-side MOSFET current limit triggered	When the high-side or low-side MOSFET current limit is triggered, the device starts the auto-retry timer.
LED+ and LED- short	$V_{FB} > V_{FB\_OVP}$	When $V_{FB} > V_{FB\_OVP}$, the device keeps the minimum on-time, and starts the auto-retry timer. During the auto-retry mode, the device is protected by the overcurrent limits.
Sense resistor open	$V_{FB} > V_{FB\_OVP}$	When $V_{FB} > V_{FB\_OVP}$, the device keeps the minimum on-time, and starts the auto-retry timer.
Sense resistor short to GND	High-side or low-side MOSFET current limit triggered	When the high-side or low-side MOSFET current limit is triggered, the device starts the auto-retry timer.

Application Information

Selecting the Inductor

A DC current rating of at least 25% percent higher than the maximum load current is recommended for most applications. Inductance value is related to inductor ripple current value, input voltage, output voltage setting and switching frequency. The inductor value can be derived from the following equation:

$$L = \frac{V_{OUT} \times (V_{IN} - V_{OUT})}{V_{IN} \times \Delta I_L \times f_{OSC}}$$

Where ΔIL is the inductor ripple current. TMI5302 is PWM operation mode. In dull load condition, the average inductor current is zero and valley inductor current is $-\Delta I_L/2$. the minus current valley is limited to around -1.9A, so the inductor ripple current ΔI_L should be smaller than 3.8A, and the minimum inductance value is limited. The maximum inductor peak current is:

$$I_{L(MAX)} = I_{LED} + \frac{\Delta I_L}{2}$$

For 3.6V output voltage, the recommended inductor should not be smaller than 1.0μH, and for 10.8V output voltage, the recommended inductor should not be smaller than 2.2μH.

Selecting the Output Capacitor

The output capacitor (C_{OUT1}) is required to maintain the DC output voltage. Ceramic, tantalum, or low ESR electrolytic capacitors are recommended. Low ESR capacitors are preferred to keep the output voltage ripple low. The output voltage ripple can be estimated by:

$$\Delta V_{OUT} = \frac{V_{OUT}}{f_S \times L} \times \left[1 - \frac{V_{OUT}}{V_{IN}}\right] \times \left[R_{ESR} + \frac{1}{8 \times f_S \times C_2}\right]$$

Where L is the inductor value and R_{ESR} is the equivalent series resistance (ESR) value of the output capacitor. In the case of ceramic capacitors, the impedance at the switching frequency is dominated by the capacitance. The output voltage ripple is mainly caused by the capacitance. For simplification, the output voltage ripple can be estimated by:

$$\Delta V_{OUT} = \frac{V_{OUT}}{8 \times f_S^{\,2} \times L \times C_2} \times \left[1 - \frac{V_{OUT}}{V_{IN}}\right]$$

In the case of tantalum or electrolytic capacitors, the ESR dominates the impedance at the switching frequency. For simplification, the output ripple can be approximated to:

$$\Delta V_{OUT} = \frac{V_{OUT}}{f_S \times L} \times \left[1 - \frac{V_{OUT}}{V_{IN}}\right] \times R_{ESR}$$

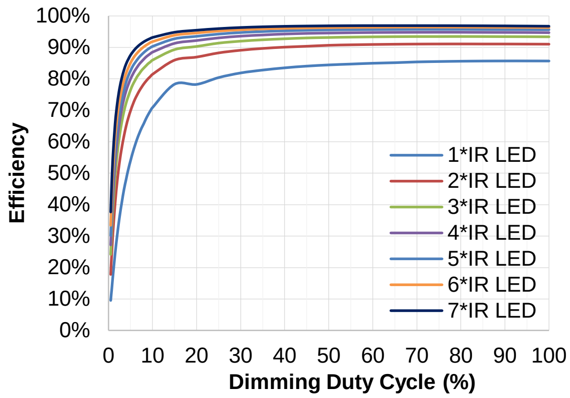
The characteristics of the output capacitor also affect the stability of the regulation system.
The output capacitor keeps the output current ripple small and ensures feedback loop stability. The output capacitor impedance should be low at the switching frequency. Ceramic capacitors with X5R or X7R dielectrics are recommended for their low ESR characteristics. For most applications, a 10μF ceramic capacitor is sufficient.

Typical Performance Characteristics

V_{IN} = 12V, V_{DIM} = 3.3V, F_{REQ_DIM} = 50kHz, T_A = 25°C, unless otherwise noted.

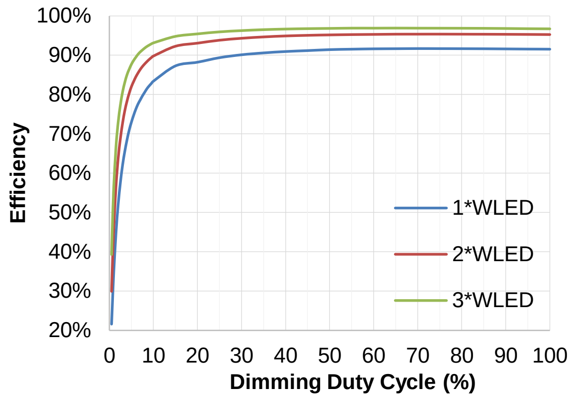
Efficiency vs. DIM Duty

1 to 6 IRLED, I_{LED} = 1A, D_{DIM} = 0.5% to 100%



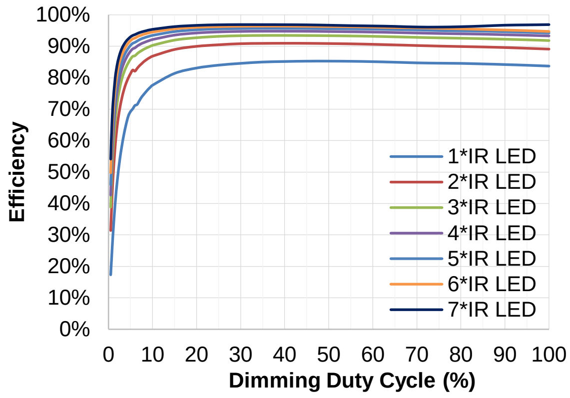
Efficiency vs. DIM Duty

1 to 3 WLED, I_{LED} = 1A, D_{DIM} = 0.5% to 100%



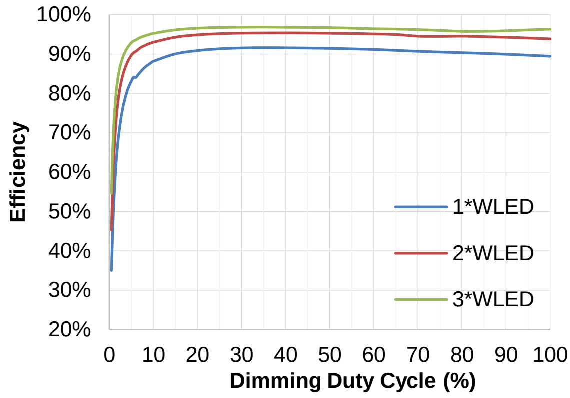
Efficiency vs. DIM Duty

1 to 6 IRLED, I_{LED} = 2A, D_{DIM} = 0.5% to 100%



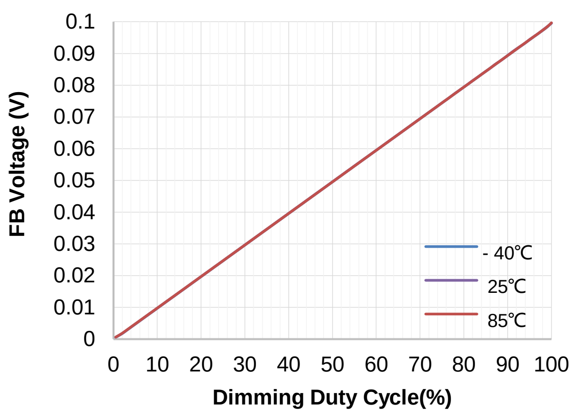
Efficiency vs. DIM Duty

1 to 3 WLED, I_{LED} = 2A, D_{DIM} = 0.5% to 100%



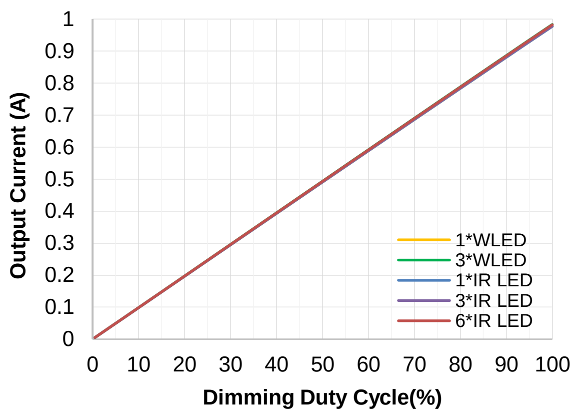
Dimming Curve

1 WLED, I_{LED} = 1A, D_{DIM} = 0.5% to 100%



Dimming Curve

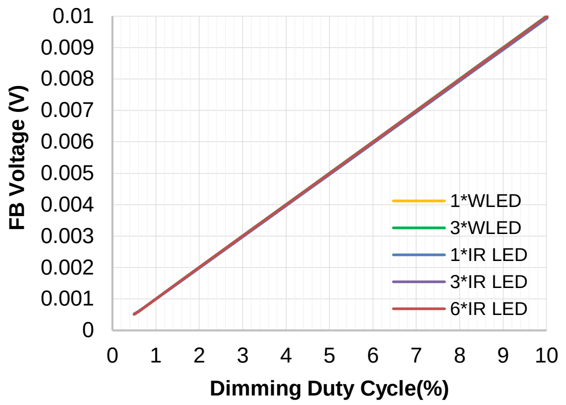
1 WLED, I_{LED} = 1A, D_{DIM} = 0.5% to 100%



Typical Performance Characteristics(continued)

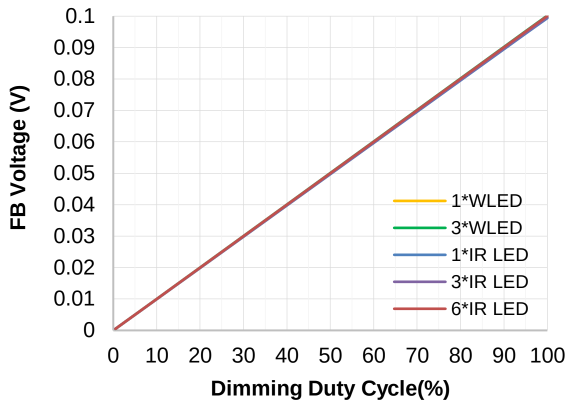
Dimming Curve

1 to 6 IRLED,1 to 3 WLED, I_{LED} = 1A,
D_{DIM} = 0.5% to 10%



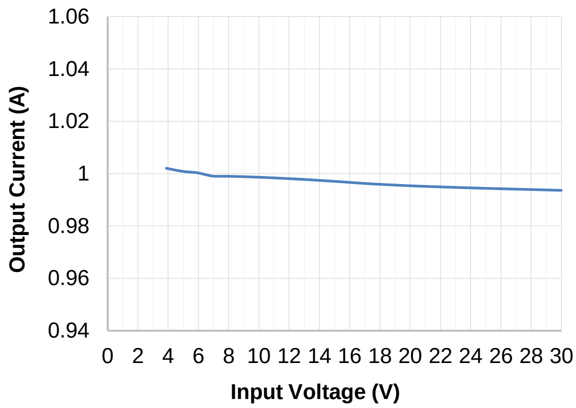
Dimming Curve

1 to 6 IRLED,1 to 3 WLED, I_{LED} = 1A



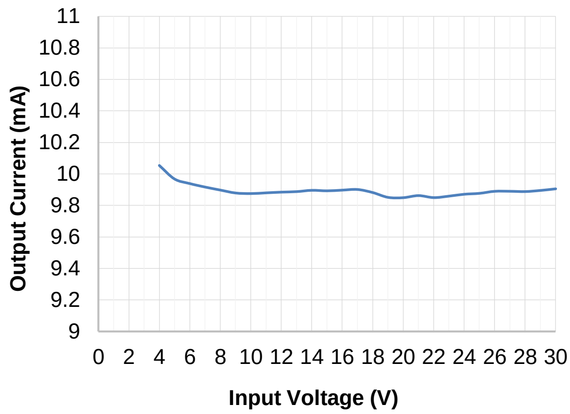
Line Regulation

1 WLED, I_{LED} = 1A, D_{DIM} = 100%



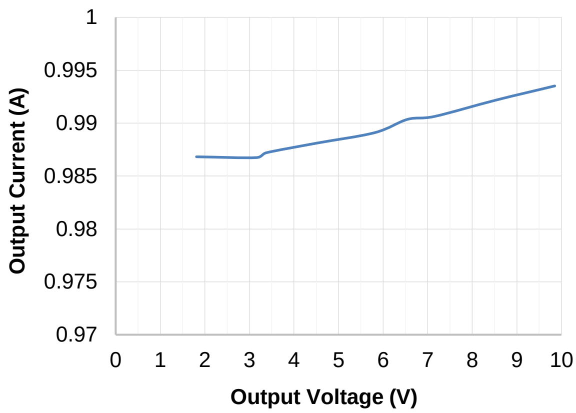
Line Regulation

1 WLED, I_{LED} = 1A, D_{DIM} = 1%



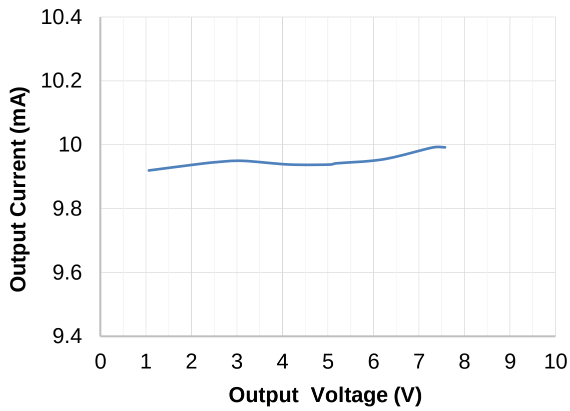
Load Regulation at V_{IN} = 12V

1 to 7 IRLED,1 to 3 WLED, I_{LED} = 1A, D_{DIM} = 100%



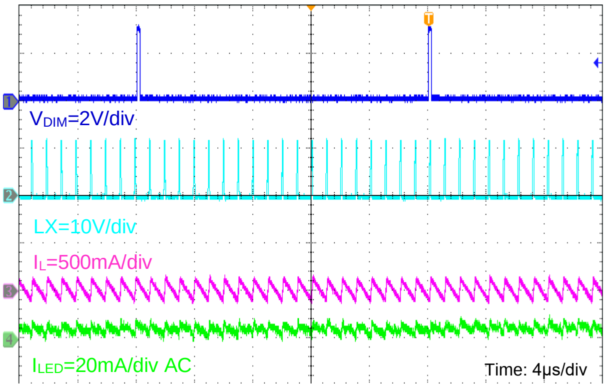
Load Regulation at V_{IN} = 12V

1 to 7 IRLED,1 to 3 WLED, I_{LED} = 1A, D_{DIM} = 1%

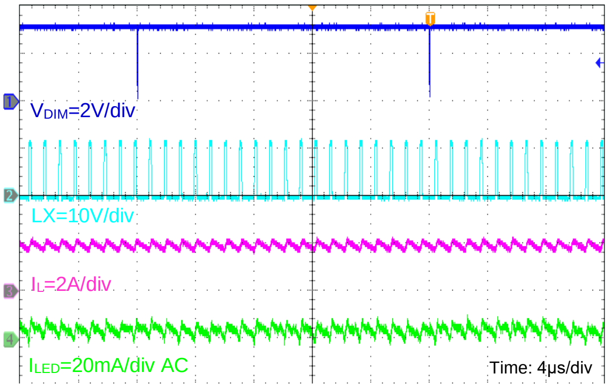


Typical Performance Characteristics(continued)

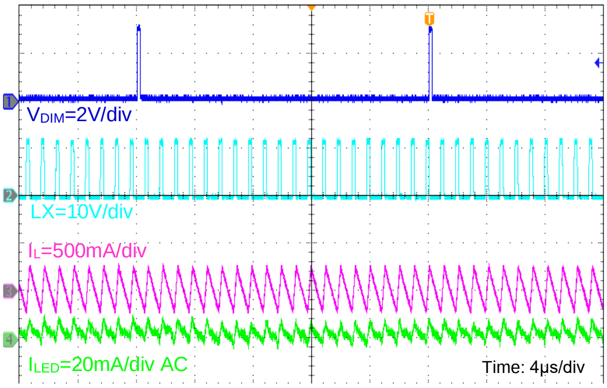
LED Current Ripple
V_{IN} =12V, 1 IRLED, I_{LED} = 2A, D_{DIM} = 1%, L = 4.7μH



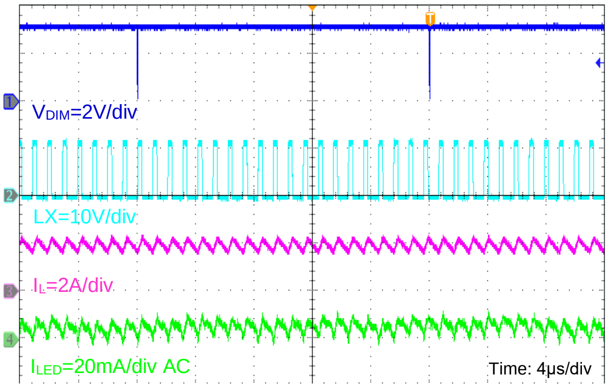
LED Current Ripple
V_{IN} =12V, 1 IRLED, I_{LED} = 2A, D_{DIM} = 100%, L = 4.7μH



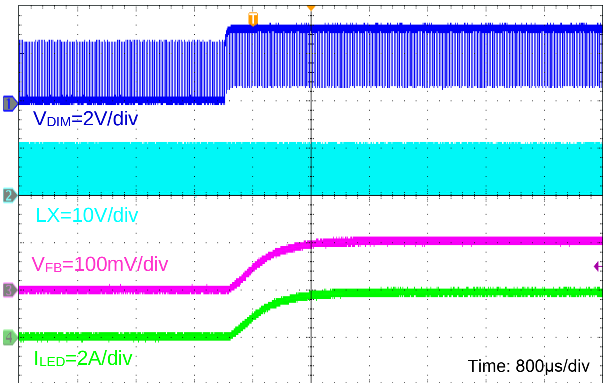
LED Current Ripple
V_{IN} =12V, 1 WLED, I_{LED} = 2A, D_{DIM} = 1%, L = 4.7μH



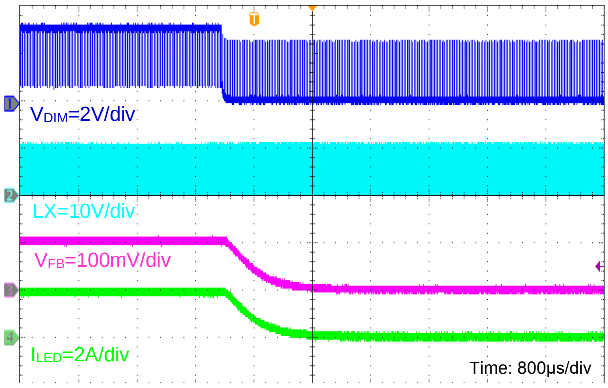
LED Current Ripple
V_{IN} =12V, 1 WLED, I_{LED}=2A, D_{DIM} = 100%, L = 4.7μH



LED Current Transient
V_{IN} =12V, 1 IRLED, I_{LED_MAX} = 2A, D_{DIM} = 1% to 100%

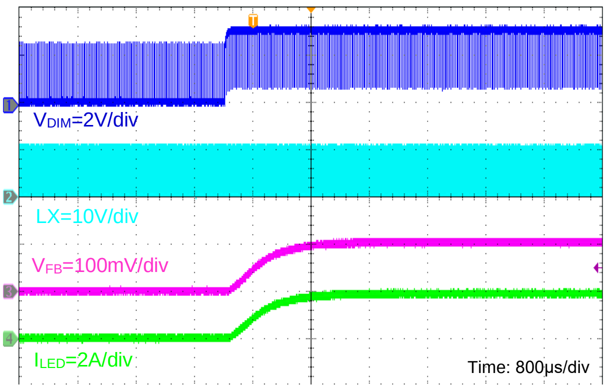


LED Current Transient
V_{IN} =12V, 1 IRLED, I_{LED} = 2A, D_{DIM} = 1% to 100%

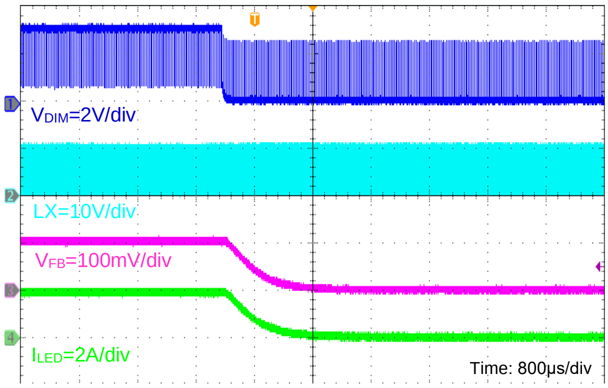


Typical Performance Characteristics(continued)

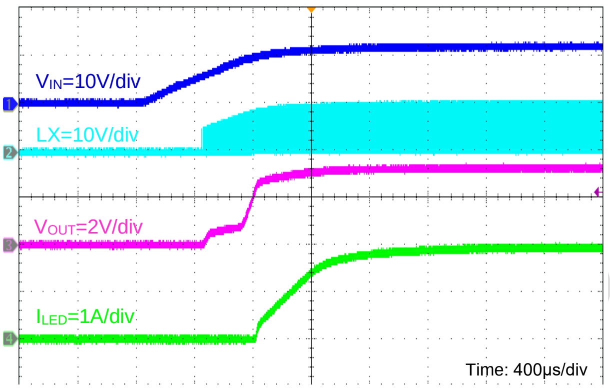
LED Current Transient
V_{IN} =12V, 1 WLED, I_{LED} = 2A, D_{DIM} = 1% to 100%



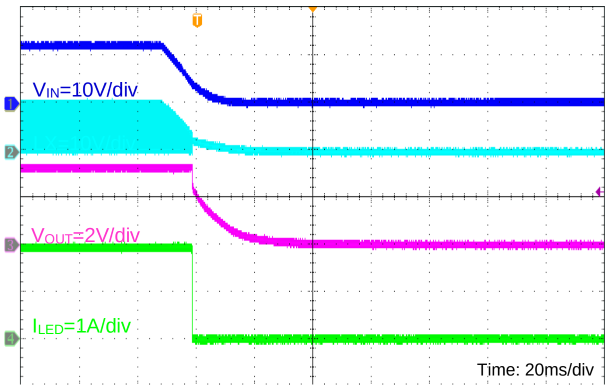
LED Current Transient
V_{IN} =12V, 1 WLED, I_{LED} = 2A, D_{DIM} = 100% to 1%



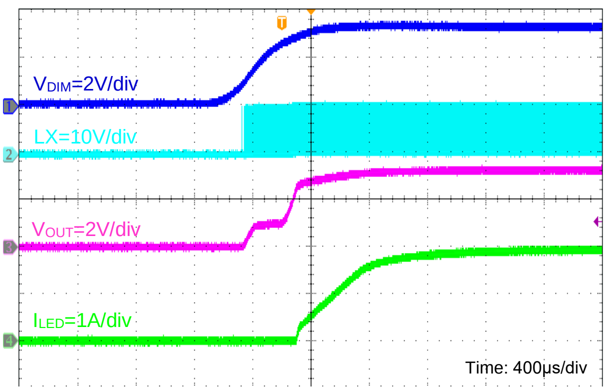
Input Power On
V_{IN} =12V, 1 WLED, I_{LED} = 2A



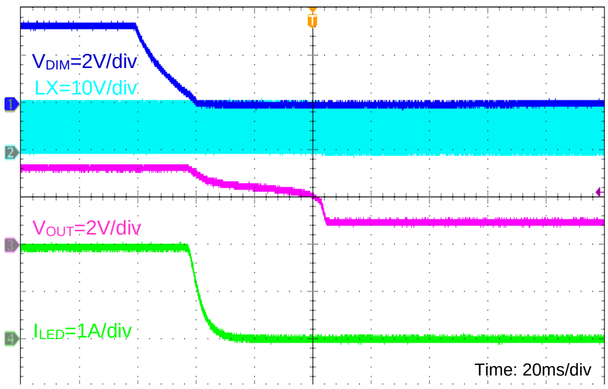
Input Power Off
V_{IN} =12V, 1 WLED, I_{LED} = 2A



DIM Input On
V_{IN} = 12V, 1 WLED, I_{LED} = 2A



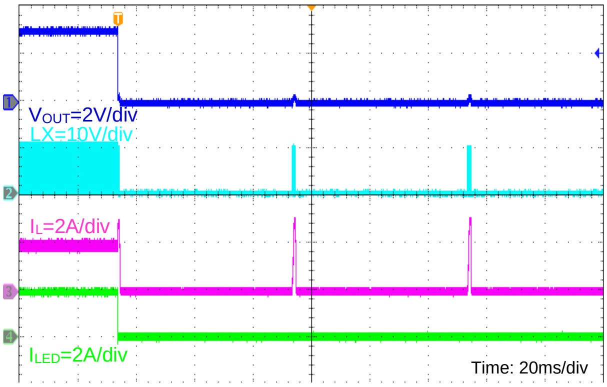
DIM Input Off
V_{IN} =12V, 1 WLED, I_{LED} = 1A



Typical Performance Characteristics(continued)

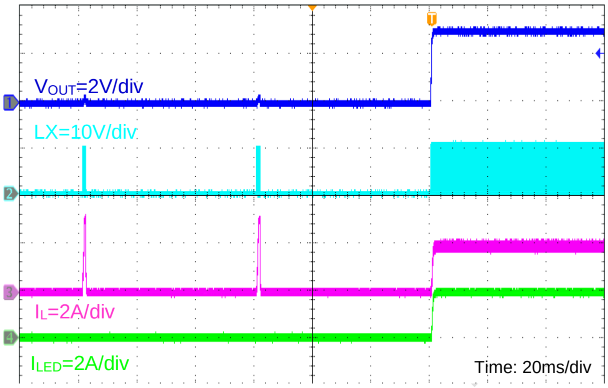
LED+ and LED- Short Entry

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



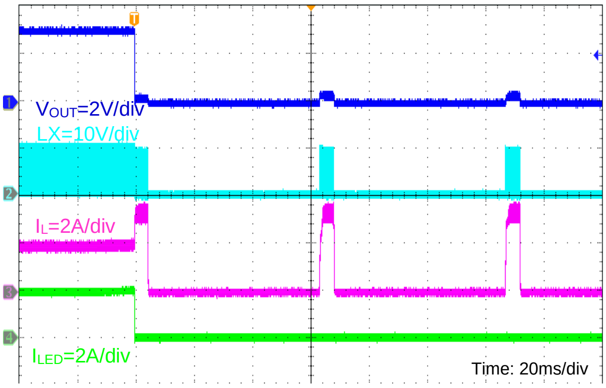
LED+ and LED- Short Recovery

V_{IN} =12V, 1 WLED, I_{LED} = 2A



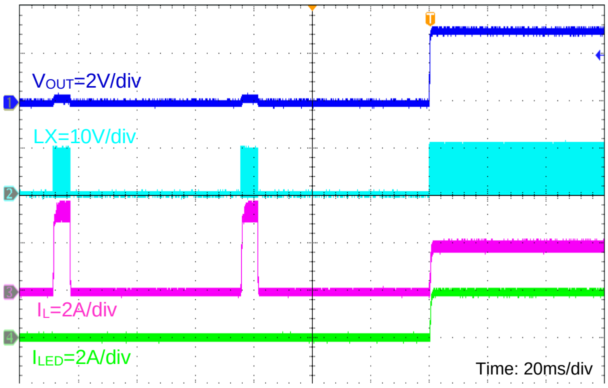
LED+ Short to GND Entry

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



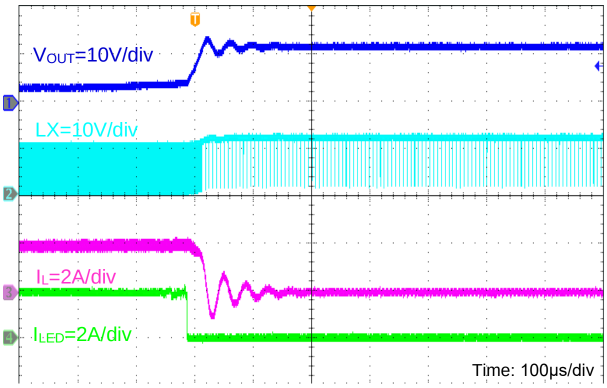
LED+ Short to GND Recovery

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



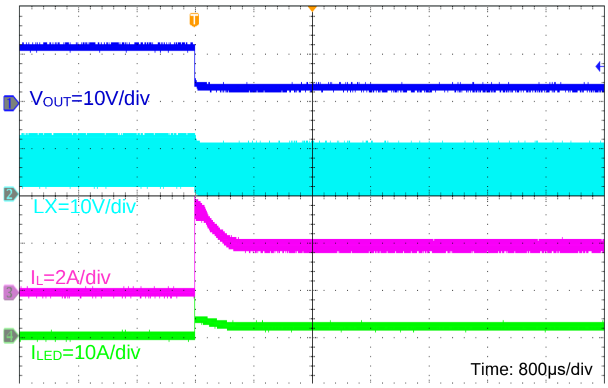
LED Open Load Entry

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



LED Open Load Recovery

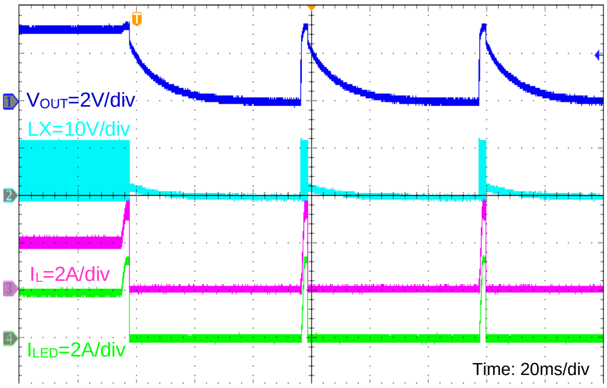
V_{IN} = 12V, 1 WLED, I_{LED} = 2A



Typical Performance Characteristics(continued)

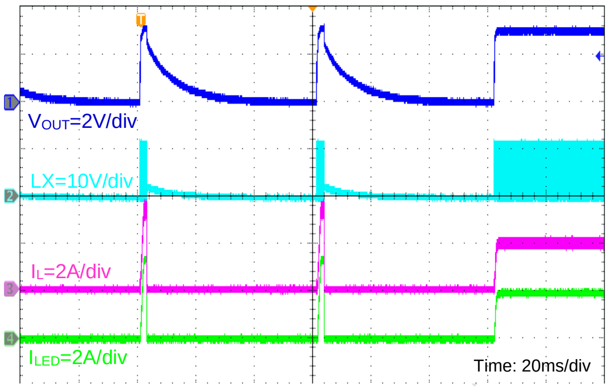
Sense Resistor Short to GND Entry

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



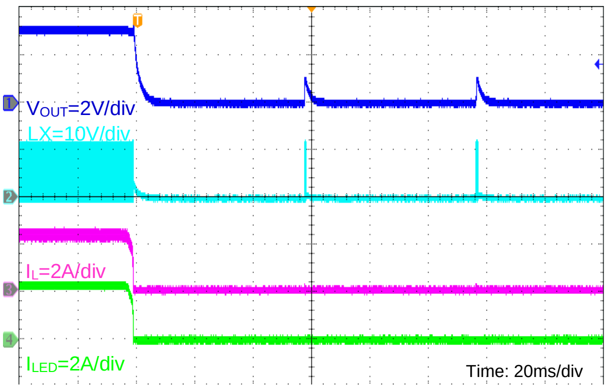
Sense Resistor Short to GND Recovery

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



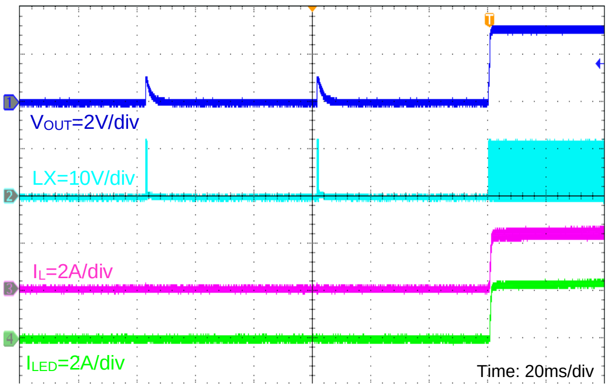
Sense Resistor Open Entry

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



Sense Resistor Open Recovery

V_{IN} = 12V, 1 WLED, I_{LED} = 2A



PCB Layout Guide

PCB layout is very important to achieve stable operation. It is highly recommended to duplicate EVB layout for optimum performance. If change is necessary, please follow these guidelines and take Figure 6 for reference.

1) Keep the path of switching current short and minimize the loop area formed by Input capacitor, IN pin and GND.

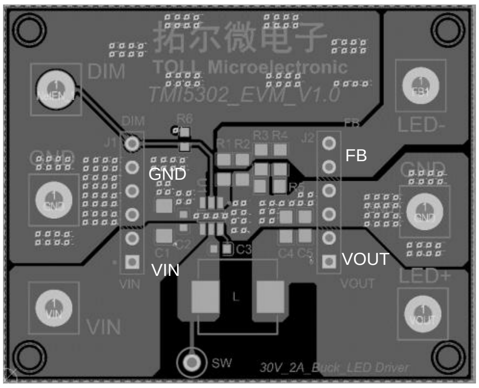
2) Bypass ceramic capacitors are suggested to be put close to the IN Pin.

3) Ensure all feedback connections are short and direct. Place the feedback resistors as close to the chip as possible.

4) VOUT, LX away from sensitive areas such as FB.

5) Connect IN, LX, and especially GND respectively to a large copper area to cool the chip to improve thermal performance and long-term reliability.

Top Layer



Bottom Layer

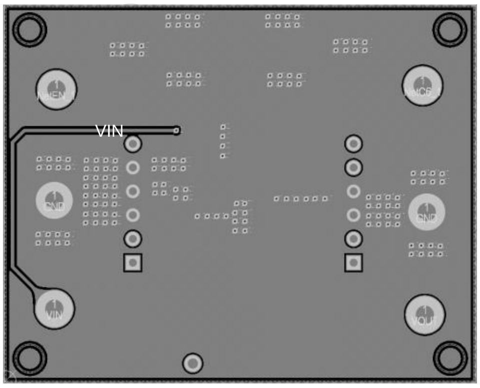
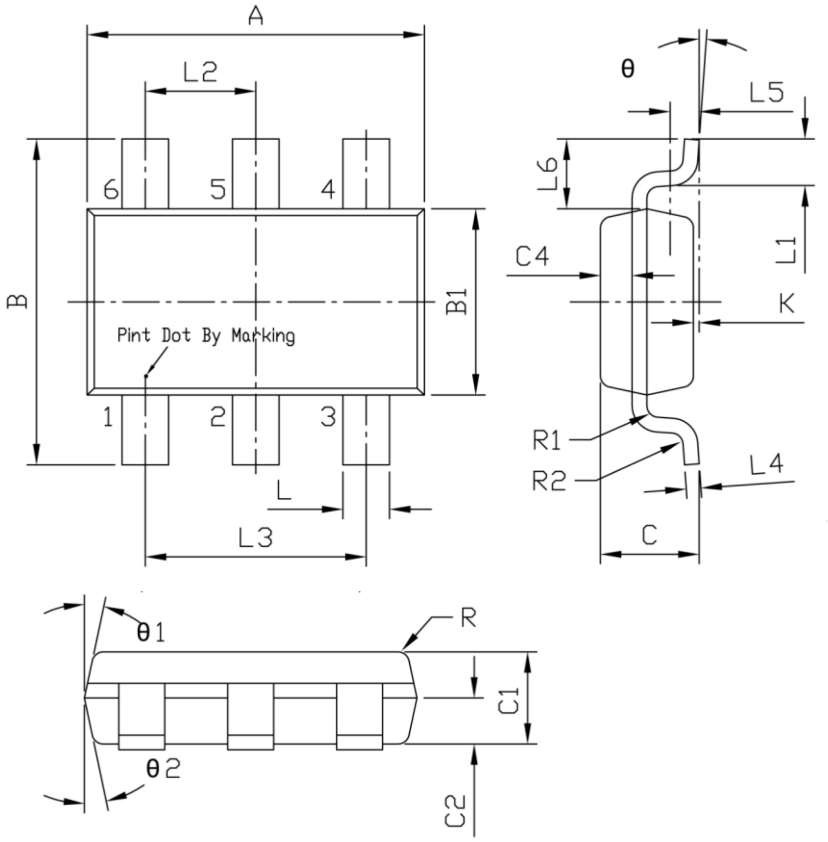


Figure 6. PCB Layout Reference

Package Information

SOT23-6



Unit: mm

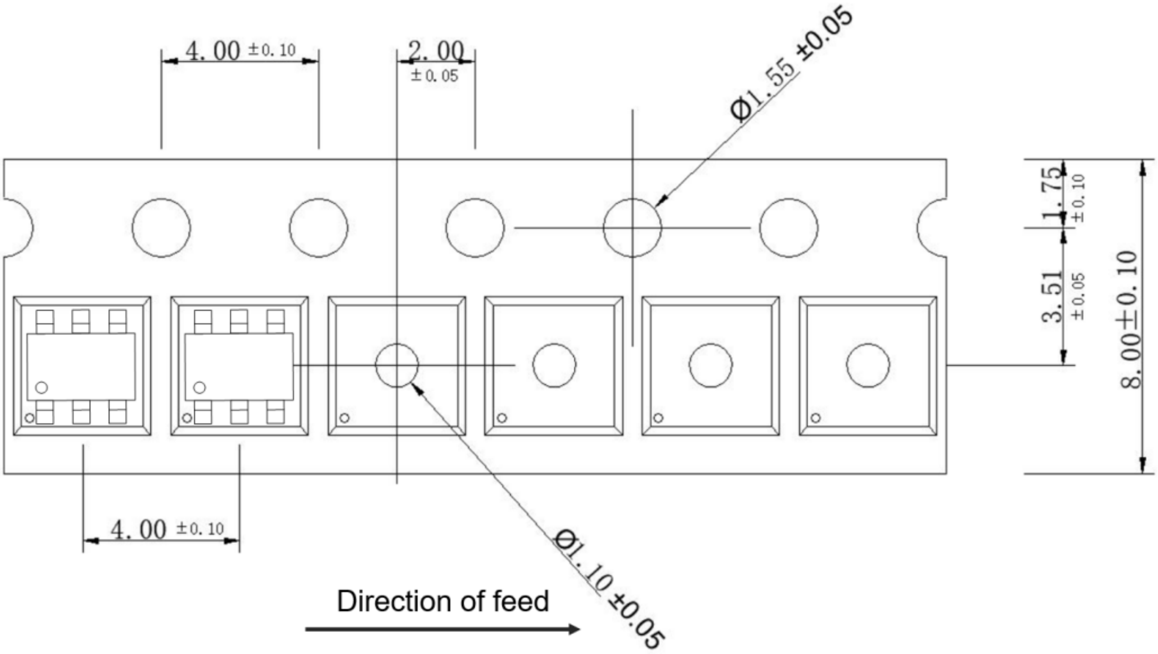
Symbol	Dimensions In Millimeters			Symbol	Dimensions In Millimeters		
	Min	Typ	Max		Min	Typ	Max
A	2.80	2.90	3.00	L3	1.800	1.900	2.000
B	2.60	2.80	3.00	L4	0.077	0.127	0.177
B1	1.50	1.60	1.70	L5	-	0.250	-
C	-	-	1.05	L6	-	0.600	-
C1	0.60	0.80	1.00	θ	0°		0°
C2	0.35	0.40	0.45	Θ1	10°	12°	14°
C4	0.223	0.273	0.323	Θ2	10°	12°	14°
K	0.000	0.075	0.150	R	-	0.100	-
L	0.325	0.400	0.475	R1	-	0.100	-
L1	0.325	0.450	0.550	R2	-	0.100	-
L2	0.850	0.950	1.050				

Note:

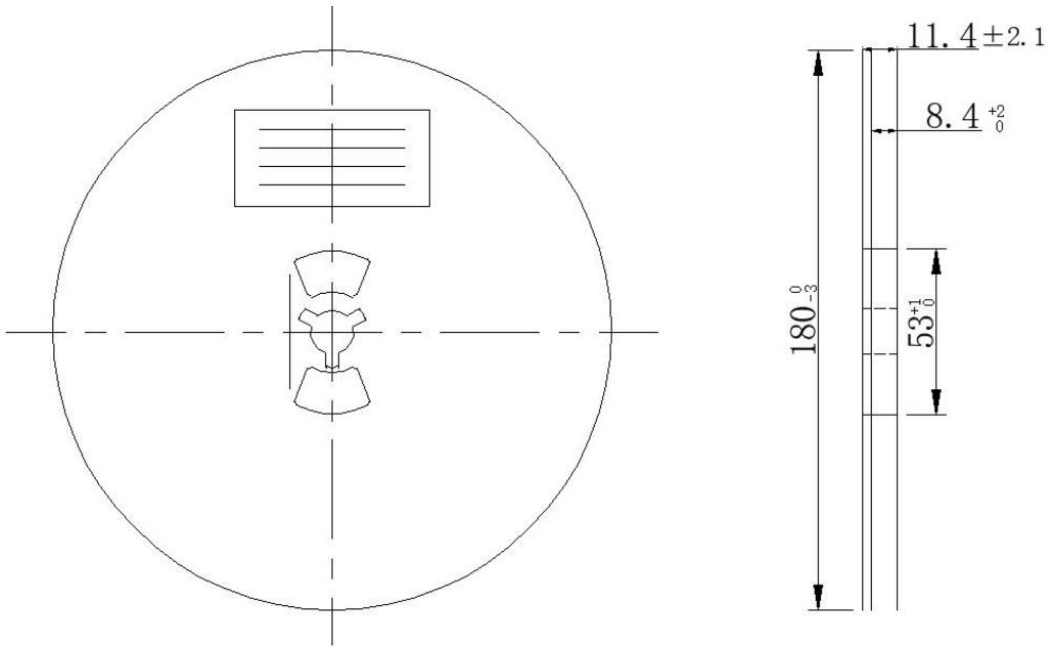
1) All dimensions are in millimeters.
2) Package length does not include mold flash, protrusion or gate burr.
3) Package width does not include inter lead flash or protrusion.
4) Lead popularity (bottom of leads after forming) shall be 0.10 millimeters max.
5) Pin 1 is lower left pin when reading top mark from left to right.

Tape and Reel Information

Tape Dimensions:



Reel Dimensions:



Note:

1) All Dimensions are in Millimeter
2) Quantity of Units per Reel is 3000
3) MSL level is Level 3.

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