

52KHz 60V 3A Buck DC to DC Converter

XL2576HVT

Features

- Operating Voltage: 4.5V~50V
- Adjustable, 5.0V and 12V Versions
- Output Adjustable from 1.23V to 45V
- Maximum Duty Cycle 90%
- Feedback Voltage Accuracy $\pm 1.5\%$
- Fixed 52KHz Switching Frequency
- 3A Constant Output Current Capability
- Internal Optimize HV Power Transistor
- High efficiency up to 90%
- Excellent line and load regulation
- TTL shutdown capability
- Built in current limit protection function
- Temperature Grade 1: -40°C to 125°C
Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class3B
- Available in TO220-5L package

General Description

The XL2576HVT is a 52 KHz fixed frequency buck DC/DC converter, capable of driving a 3A load with high voltage, high efficiency. The XL2576HVT supports wide input operating voltage range of 4.5V ~ 50V and a maximum duty cycle of 90% output. A built-in loop compensation module reduces components in the system, lowering power system cost and reducing printed circuit board space. The XL2576HVT is available in adjustable, fixed 5.0V and 12V versions. The XL2576HVT has built-in current limit protection and so on.

Applications

- Automotive Electronics
- Industrial Control
- Networking Equipment
- Internet of Things

Typical application schematic

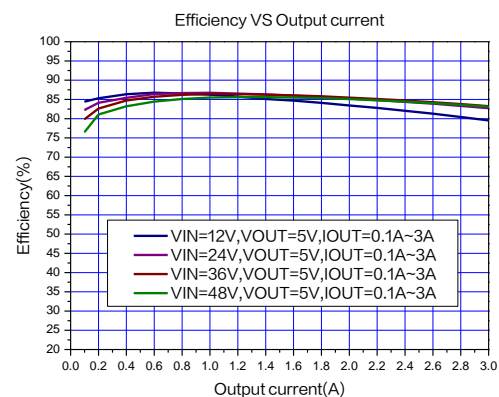
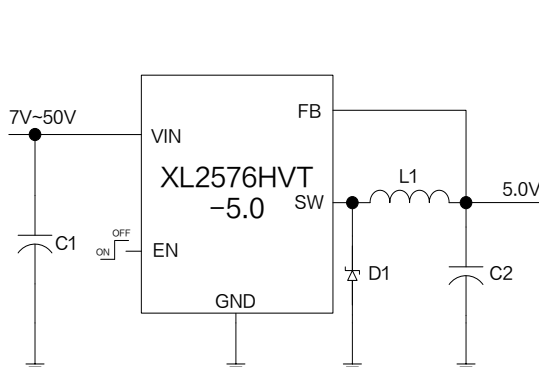


Figure1.XL2576HVT-5.0 Typical application schematic and efficiency curve

Pin Configurations

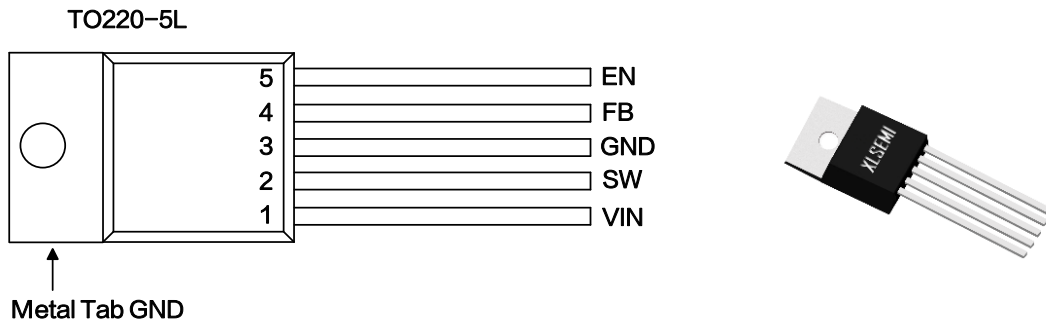


Figure2. Pin Configuration of XL2576HVT

Table 1. Pin Description

| Pin Number | Pin Name | Description |
|------------|----------|---|
| 1 | VIN | Supply Voltage Input Pin. XL2576HVT DC operating voltage range from a 4.5V to 50V. Bypass VIN to GND with a suitably large capacitor to eliminate noise on the input. |
| 2 | SW | Power Switch Output Pin (SW). Output is the switch node that supplies power to the output. |
| 3 | GND | Ground Pin. |
| 4 | FB | Feedback Pin (FB). Through an external resistor divider network, detects the output voltage for adjustment, with an adjustable version reference voltage of 1.23V. |
| 5 | EN | Enable Pin. Drive EN pin low to turn on the device, drive it high to turn it off. Floating is default low. |

Ordering Information

| Order Information | Marking ID | Package Type | Packing Type Supplied As |
|-------------------|-----------------|--------------|--------------------------|
| XL2576HVT-ADJE1 | XL2576HVT-ADJE1 | TO220-5L | 50 Units Per Tube |
| XL2576HVT-5.0E1 | XL2576HVT-5.0E1 | TO220-5L | 50 Units Per Tube |
| XL2576HVT-12E1 | XL2576HVT-12E1 | TO220-5L | 50 Units Per Tube |

Green (RoHS & HF): XLSEMI defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances.

Function Block

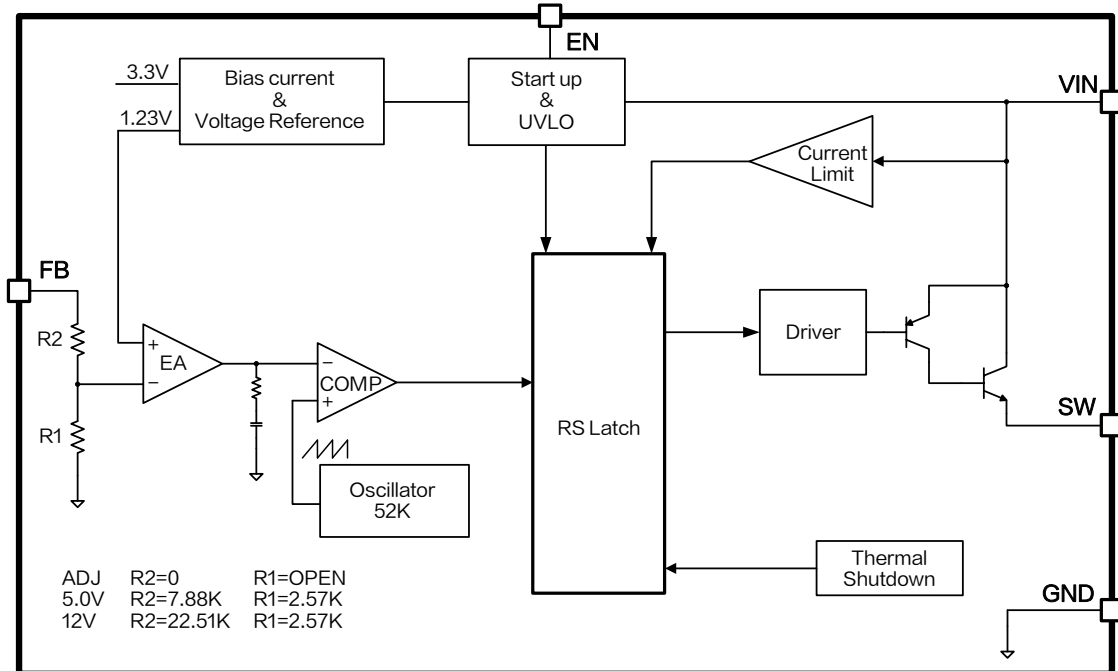


Figure3. Function Block Diagram of XL2576HVT

Absolute Maximum Ratings (Note1)

| Parameter | Symbol | Value | Unit |
|---|------------|--------------------|------|
| Input Voltage | V_{IN} | -0.3~60 | V |
| Feedback Pin Voltage | V_{FB} | -0.3~20 | V |
| EN Pin Voltage | V_{EN} | -0.3~7 | V |
| Output Switch Pin Voltage | V_{SW} | -0.3~ V_{IN} | V |
| Power Dissipation | P_D | Internally limited | mW |
| Thermal Resistance (TO220-5L) (Junction to Ambient, No Heatsink, Free Air) | R_{JA} | 30 | °C/W |
| Operating Junction Temperature | T_J | -40~150 | °C |
| Storage Temperature | T_{STG} | -65~150 | °C |
| Lead Temperature (Soldering, 10 sec) | T_{LEAD} | 260 | °C |
| ESD (HBM) | | > 8000 | V |

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

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XL2576HVT –ADJ Electrical Characteristics

T_A = 25°C; System parameters test circuit figure4 and figure6, unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|-----------------|------------------|---|-------|------|-------|------|
| V _{FB} | Feedback Voltage | V _{IN} = 12V, V _{OUT} = 5.0V I _{OUT} = 0.5A | 1.212 | 1.23 | 1.248 | V |
| η | Efficiency | V _{IN} = 12V, V _{OUT} = 5.0V I _{OUT} = 2A | – | 83.4 | – | % |
| η | Efficiency | V _{IN} = 24V, V _{OUT} = 15V I _{OUT} = 1A | – | 93.3 | – | % |

XL2576HVT –5.0 Electrical Characteristics

T_A = 25°C; System parameters test circuit figure8, unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|------------------|----------------|---|-------|------|-------|------|
| V _{OUT} | Output Voltage | V _{IN} = 12V I _{OUT} = 0.5A | 4.925 | 5.0 | 5.075 | V |
| η | Efficiency | V _{IN} = 12V, V _{OUT} = 5.0V I _{OUT} = 2A | – | 83.4 | – | % |

XL2576HVT –12 Electrical Characteristics

T_A = 25°C; System parameters test circuit figure10, unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|------------------|----------------|--|-------|------|-------|------|
| V _{OUT} | Output Voltage | V _{IN} = 24V I _{OUT} = 0.25A | 11.82 | 12 | 12.18 | V |
| η | Efficiency | V _{IN} = 24V, V _{OUT} = 12V I _{OUT} = 2A | – | 91.3 | – | % |

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Electrical Characteristics (DC Parameters)

$T_A = 25^\circ\text{C}$, $V_{IN}=12\text{V}$, $V_{EN}=0\text{V}$, System parameters test circuit figure4, unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---------------------------|-------------|---|------|------|------|---------------|
| Operating Voltage | V_{IN} | | 4.5 | | 50 | V |
| Shutdown Supply Current | I_S | $V_{EN}=2\text{V}$ | | 46 | 100 | μA |
| Quiescent Supply Current | I_Q | Note2 | | 1.3 | 2.0 | mA |
| Oscillator Frequency | F_{OSC} | | 42.8 | 52 | 57.2 | KHz |
| Switch Current Limit | I_L | $V_{FB}=0\text{V}$ | | 3.4 | | A |
| EN Pin Threshold Voltage | V_{EN_H} | High (Regulator OFF) | 1.4 | | | V |
| | V_{EN_L} | Low (Regulator ON) | | | 0.8 | V |
| EN Pin Current | I_{EN} | $V_{EN}=2.0\text{V}$ | | 5 | | μA |
| Output Saturation Voltage | V_{CE} | $V_{FB}=0\text{V}$ $I_{OUT}=2\text{A}$ | | 1.1 | 1.3 | V |
| Max. Duty Cycle | D_{MAX} | $V_{FB}=0\text{V}$ | | 90 | | % |

Note 2: In the adjustable and fixed 5.0V versions, $V_{FB}=10\text{V}$; In the fixed 12V version, $V_{FB}=15\text{V}$.

Typical System Application Schematic for ADJ Version

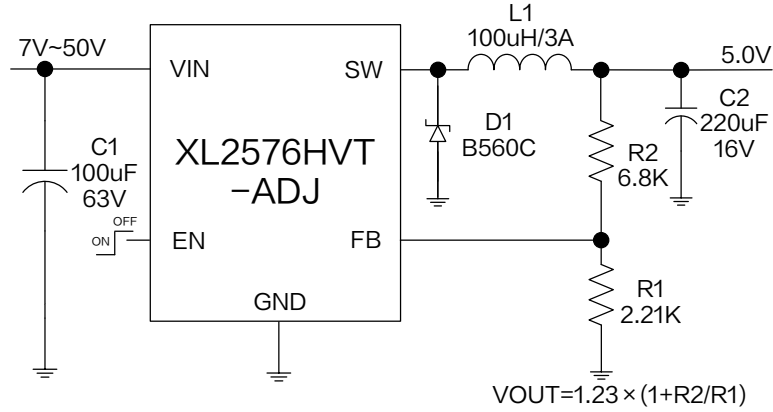


Figure4. XL2576HVT-ADJ System Parameters Test Circuit($V_{OUT}=5.0V$)

Typical System Application Transfer Efficiency

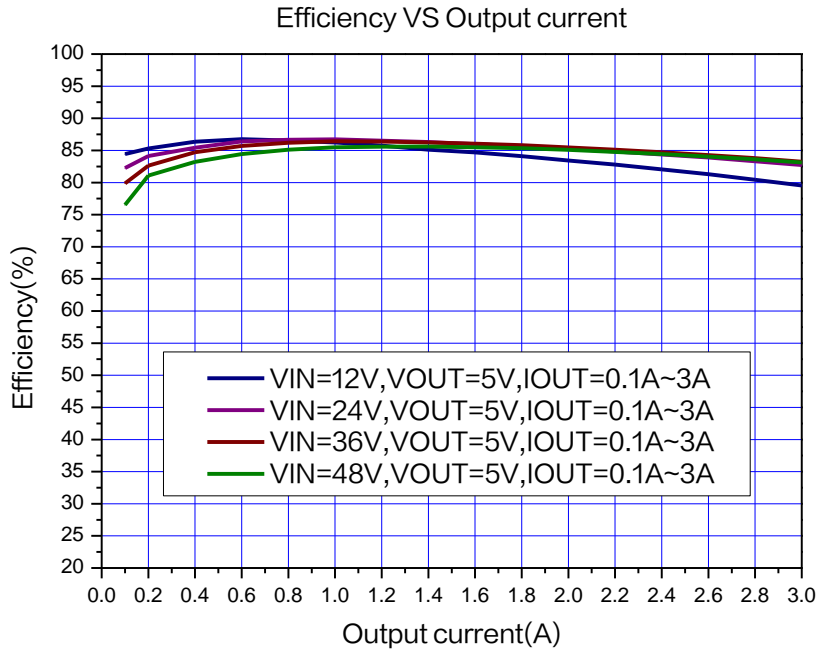


Figure5. XL2576HVT-ADJ System Efficiency Curve

Typical System Application Schematic for ADJ Version

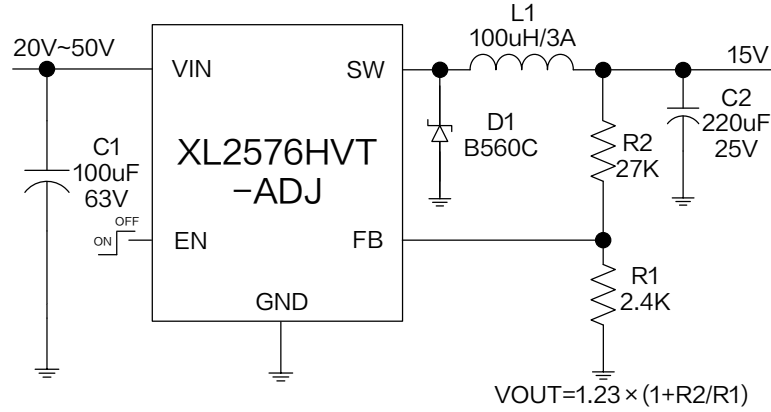


Figure6. XL2576HVT-ADJ System Parameters Test Circuit($V_{OUT}=15V$)

Typical System Application Transfer Efficiency

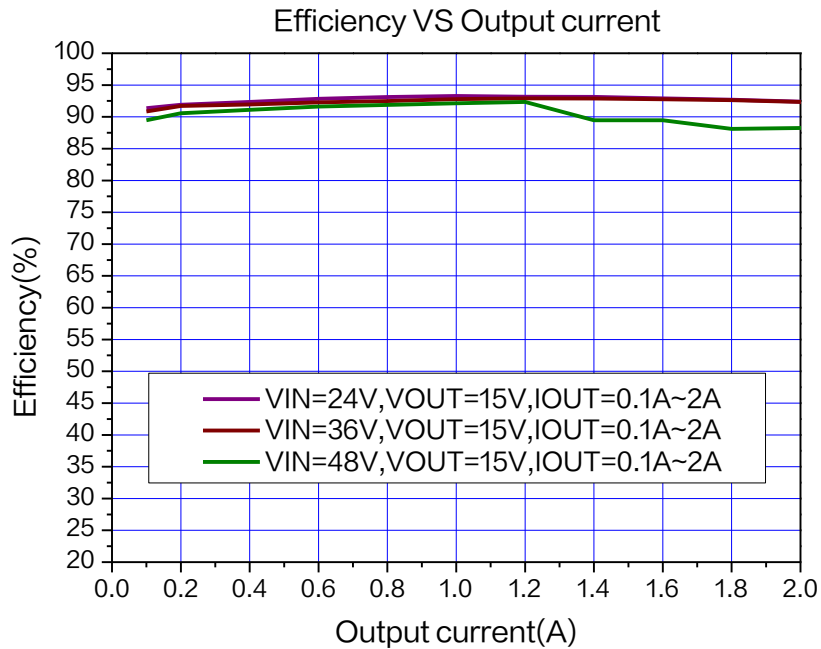


Figure7. XL2576HVT-ADJ System Efficiency Curve

Typical System Application Schematic for 5.0V Version

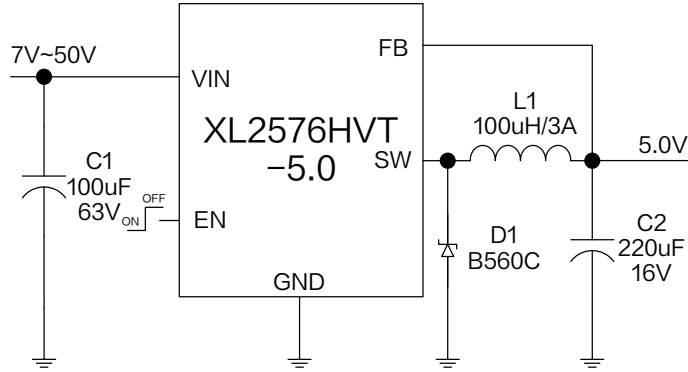


Figure8. XL2576HVT-5.0 System Parameters Test Circuit

Typical System Application Transfer Efficiency

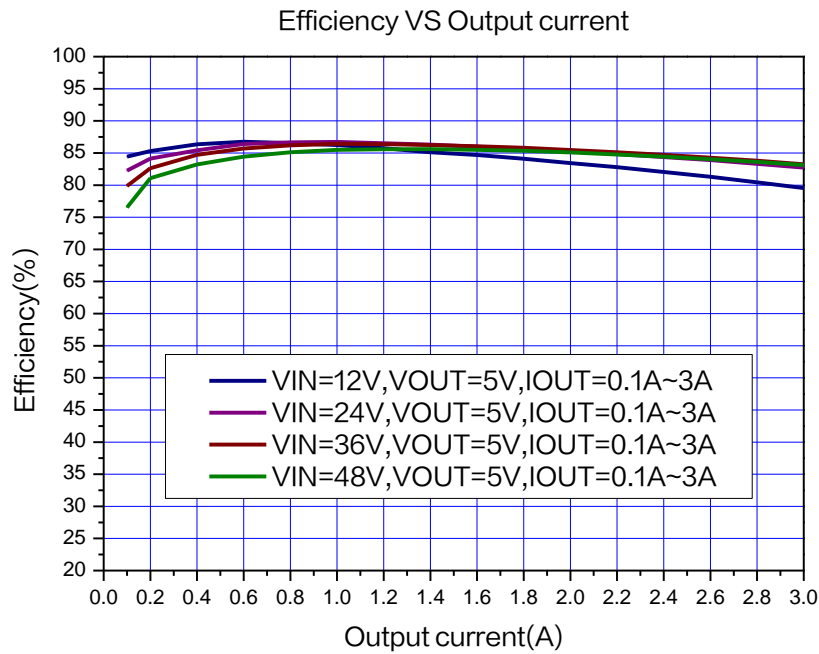


Figure9. XL2576HVT-5.0 System Efficiency Curve

Typical System Application Schematic for 12V Version

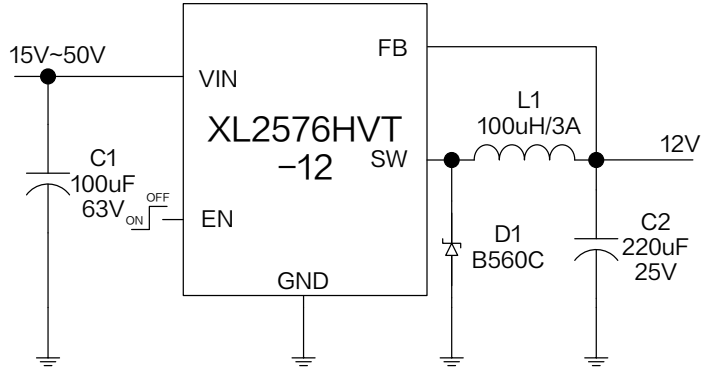


Figure10. XL2576HVT-12 System Parameters Test Circuit

Typical System Application Transfer Efficiency

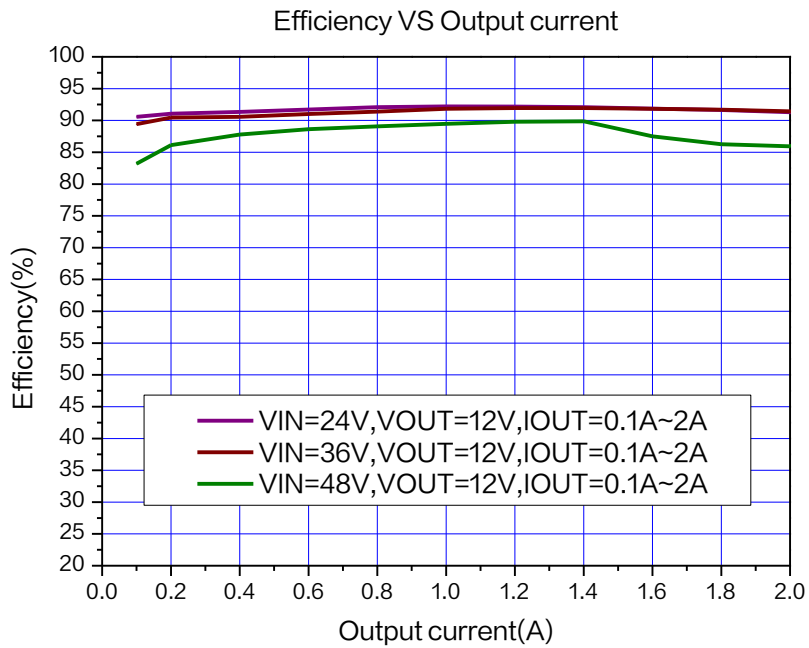


Figure11. XL2576HVT-12 System Efficiency Curve

Typical Characteristics

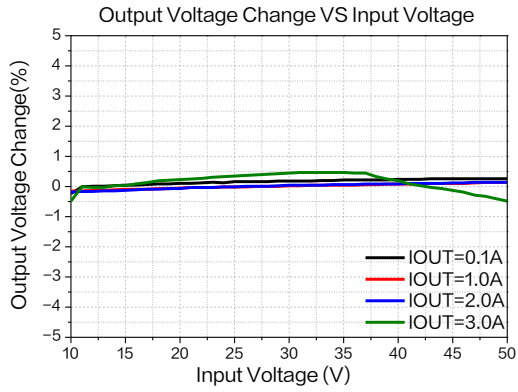


Figure12.Line Regulation

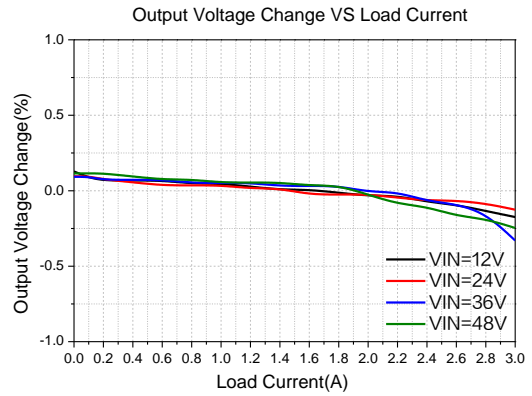


Figure13.Load Regulation

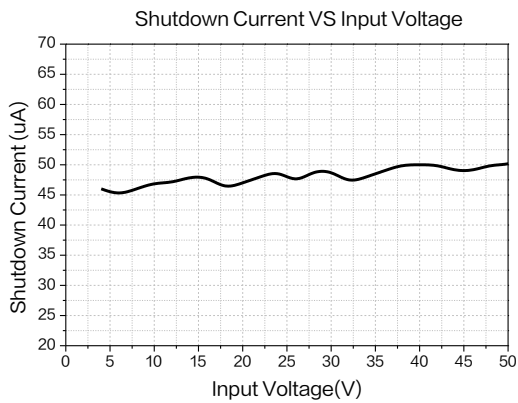


Figure14.Shutdown Current

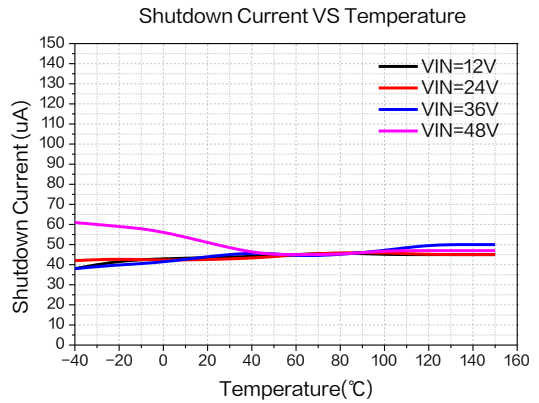


Figure15.Shutdown Current

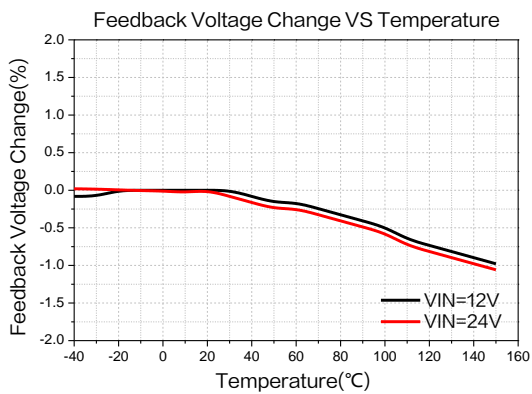


Figure16.Feedback Voltage Regulation

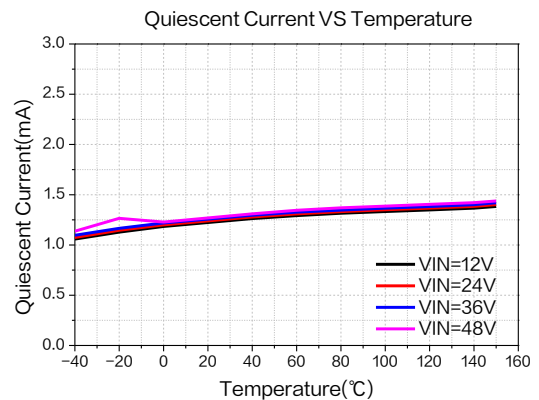


Figure17. Quiescent Current

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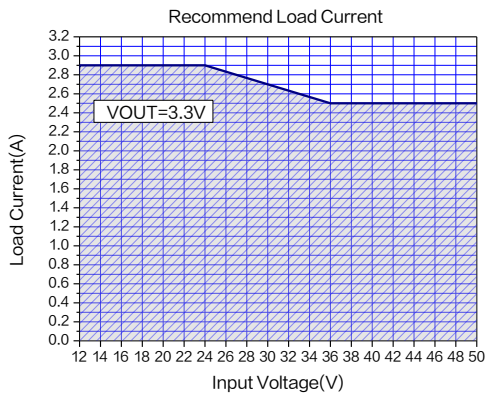


Figure18.Max Output Current
(V_{OUT}=3.3V, T_A=25°C)

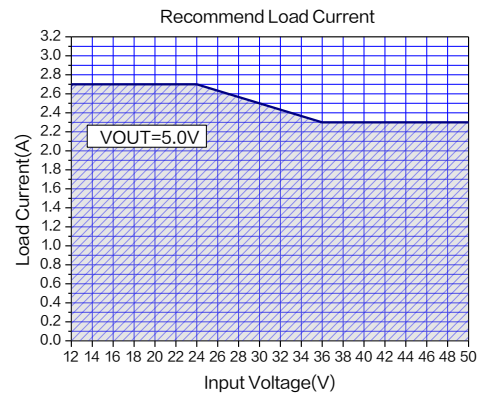


Figure19.Max Output Current
(V_{OUT}=5.0V, T_A=25°C)

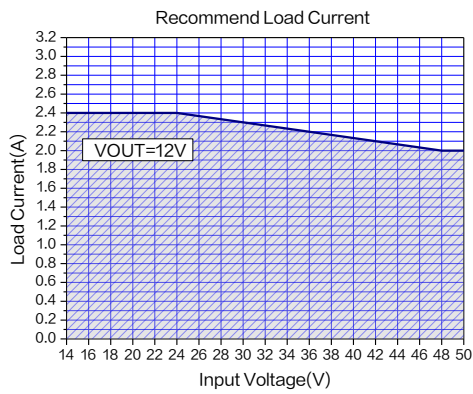


Figure20.Max Output Current
(V_{OUT}=12V, T_A=25°C)

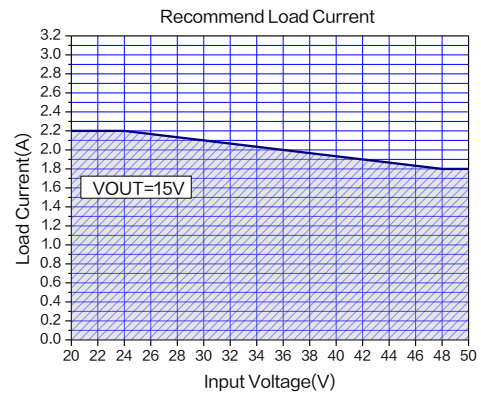


Figure21.Max Output Current
(V_{OUT}=15V, T_A=25°C)

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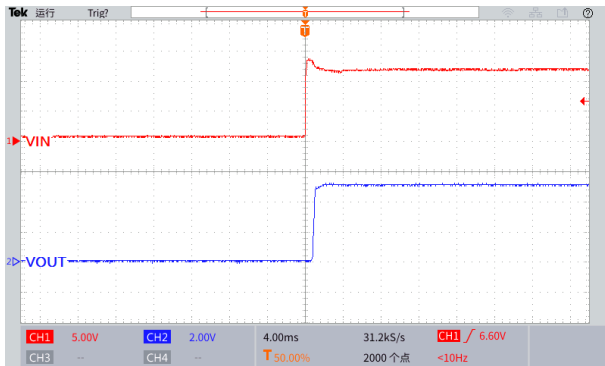


Figure22. Start-Up Characteristic
($V_{IN}=12V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1A$)

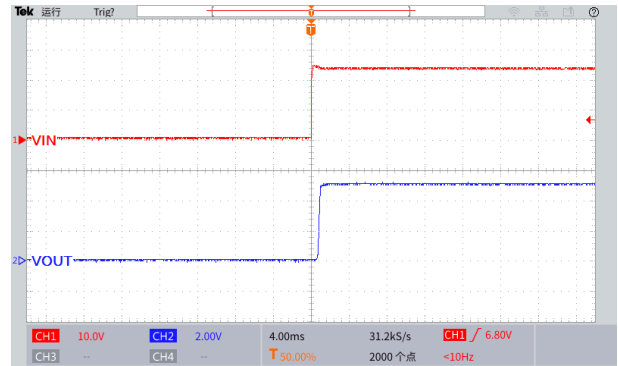


Figure23. Start-Up Characteristic
($V_{IN}=24V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1A$)

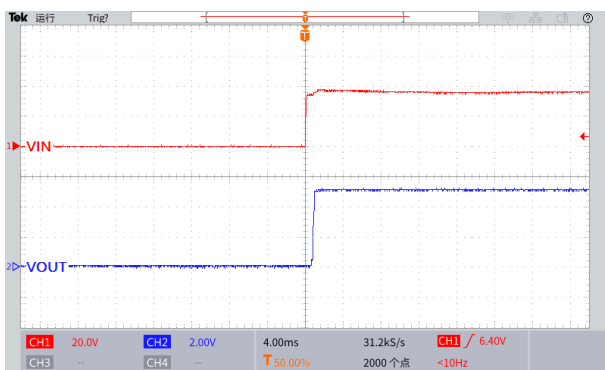


Figure24. Start-Up Characteristic
($V_{IN}=36V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1A$)

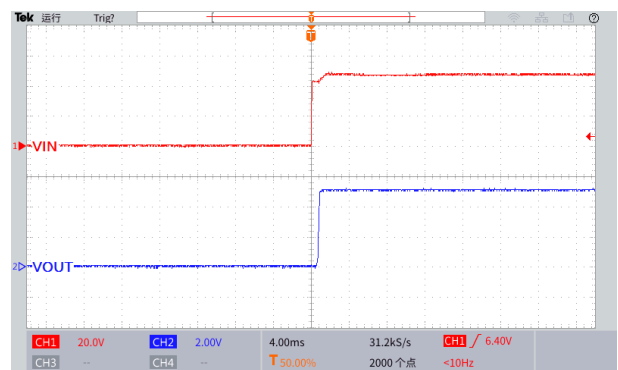


Figure25. Start-Up Characteristic
($V_{IN}=48V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1A$)



Figure26. Load Transient Response
($V_{IN}=12V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1$ to $1A$)



Figure27. Load Transient Response
($V_{IN}=24V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1$ to $1A$)

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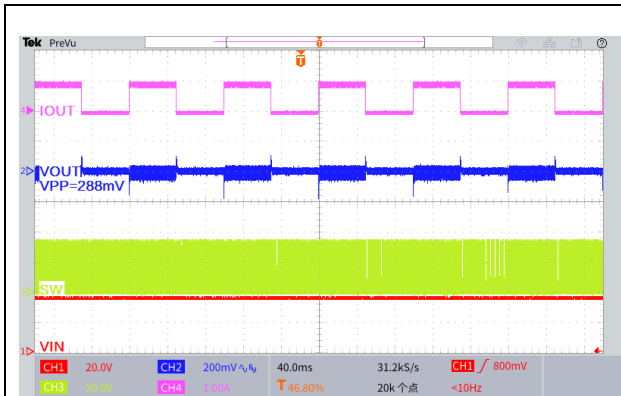


Figure28. Load Transient Response
($V_{IN}=36V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1$ to $1A$)

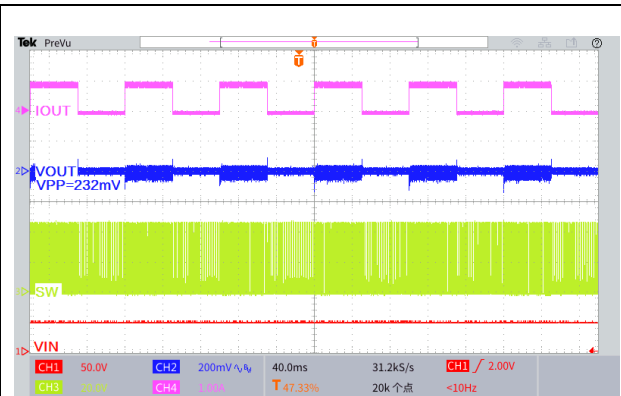


Figure29. Load Transient Response
($V_{IN}=48V$, $V_{OUT}=5.0V$, $I_{OUT}=0.1$ to $1A$)

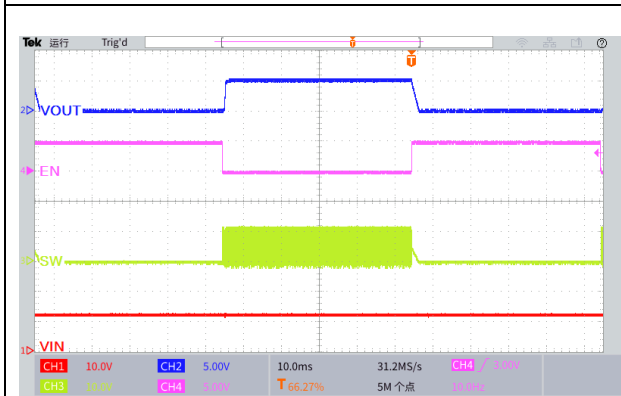


Figure30. Start or Shutdown Using EN Pin
($V_{IN}=12V$, $V_{OUT}=5.0V$, $I_{OUT}=0.5A$)

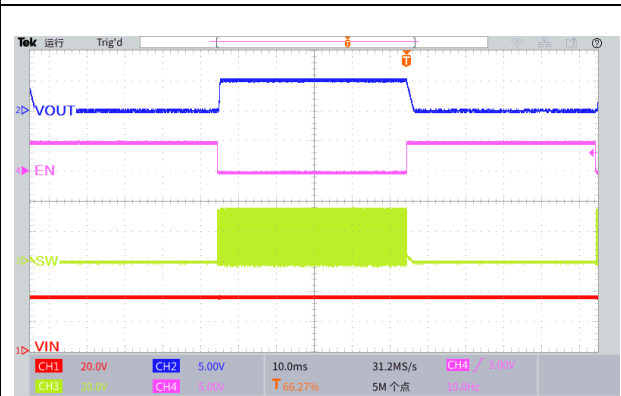
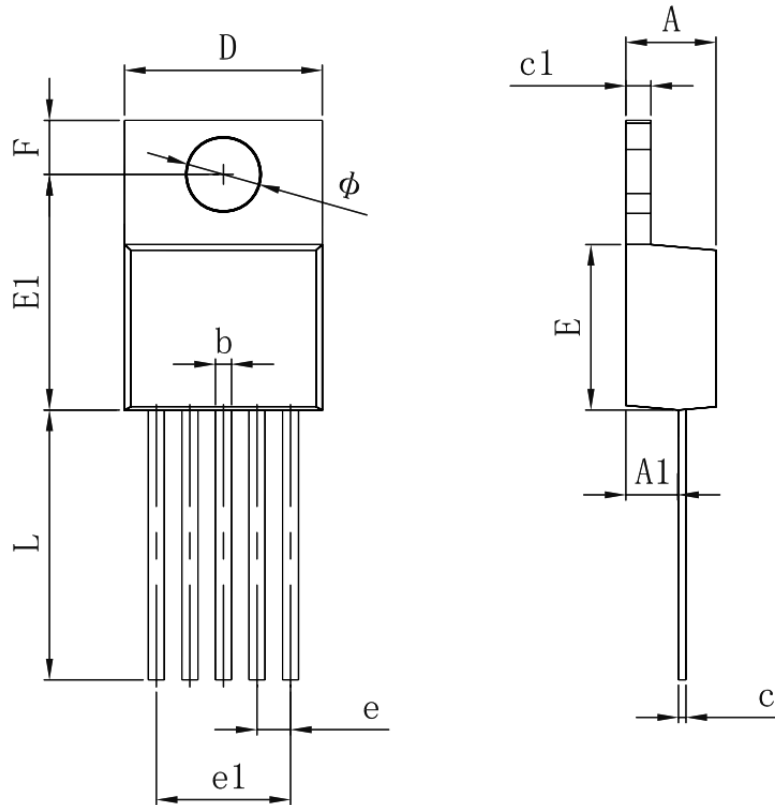


Figure31. Start or Shutdown Using EN Pin
($V_{IN}=36V$, $V_{OUT}=5.0V$, $I_{OUT}=0.5A$)

Package Information

TO220-5L



COMMON DIMENSIONS

| SYMBOL | MM | | |
|--------|-------|-------|-------|
| | MIN | NOM | MAX |
| A | 4.37 | 4.57 | 4.77 |
| A1 | 2.52 | 2.67 | 2.82 |
| b | 0.71 | 0.89 | 1.02 |
| c | 0.31 | 0.38 | 0.64 |
| c1 | 1.17 | 1.27 | 1.42 |
| D | 9.85 | 10.26 | 10.39 |
| E | 8.20 | 8.70 | 9.00 |
| E1 | 11.76 | - | 12.55 |
| e | 1.55 | 1.70 | 1.85 |
| e1 | 6.70 | - | 6.90 |
| F | 2.54 | - | 3.05 |
| L | 13.34 | 13.74 | 14.10 |
| ϕ | 3.70 | - | 3.95 |

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