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High-Efficiency Boost Converter
NC4650 Series

Nisshinbo Micro Devices Inc.

Boosting SLB Output

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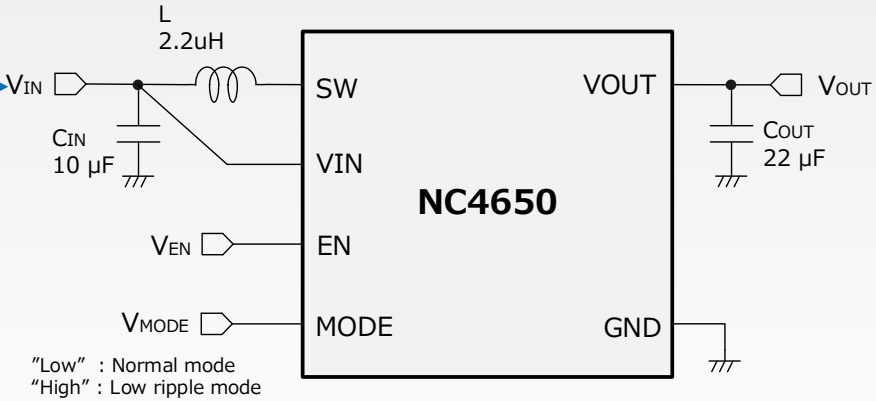
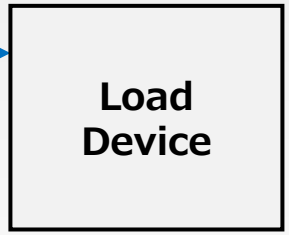
SLB

Boost DC/DC Converter



Load Devices



Nominal Voltage: 2.4V
Voltage Range: 1.8V to 2.8V
Nominal Capacity: 0.35mAh to 150mAh

Input Voltage: 0.6V to 5.5V
Output Voltage: 1.8V to 5.0V
Quiescent Current: 70nA (in normal mode)

MCUs
Sensor Devices
RF Devices, etc.

Key Requirements for Boost ICs

- **Wide Input Voltage Range**: To fully utilize SLB's voltage range
- **High Efficiency**: Maintain efficiency under all load conditions
- **Compact Size (Small Footprint)**: For downsized boards
- **Reverse Current Protection**: To avoid backflow from output to input during shutdown
- **Low Ripple**: Some devices can tolerate only low ripple
- **Fast Response**: Fast recovery against the load transient

●High Efficiency & ●Compact Size

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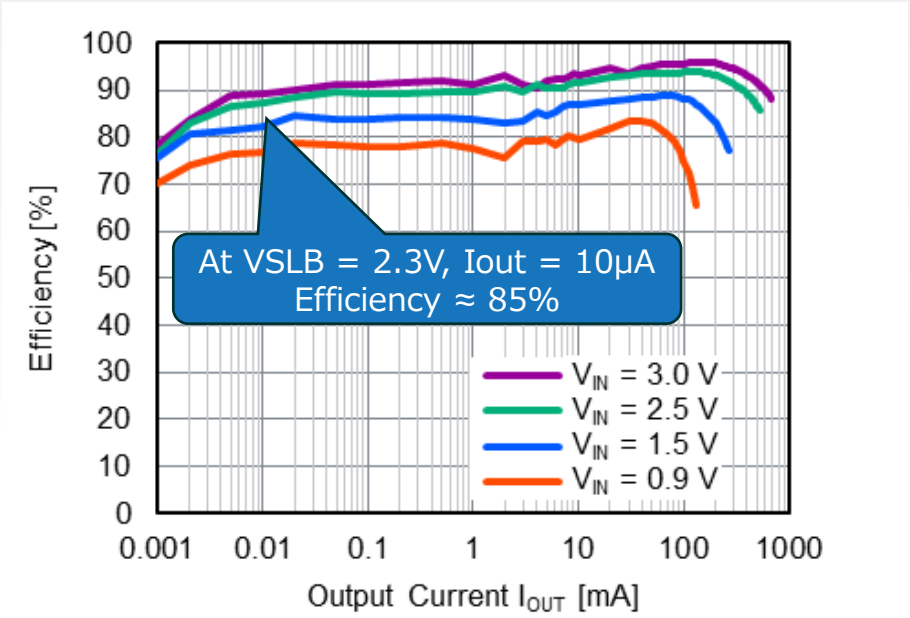
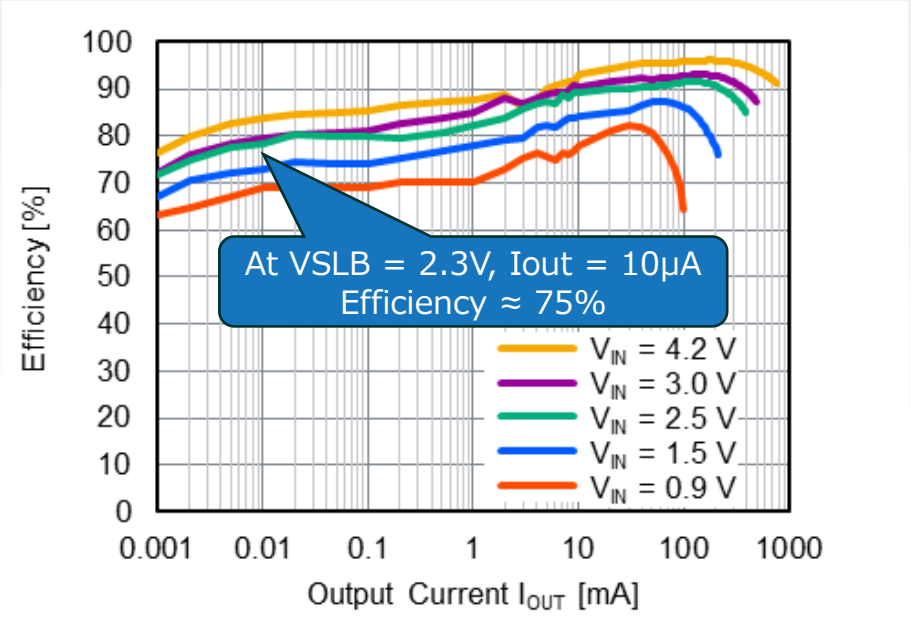
Efficiency Examples:

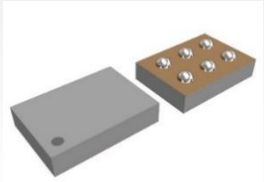
○NC4650ZA330A(**VOUT=3.3V**、MODE=L=Normal)



○NC4650ZA500A(**VOUT=5.0V**、MODE=L=Normal)



Package:



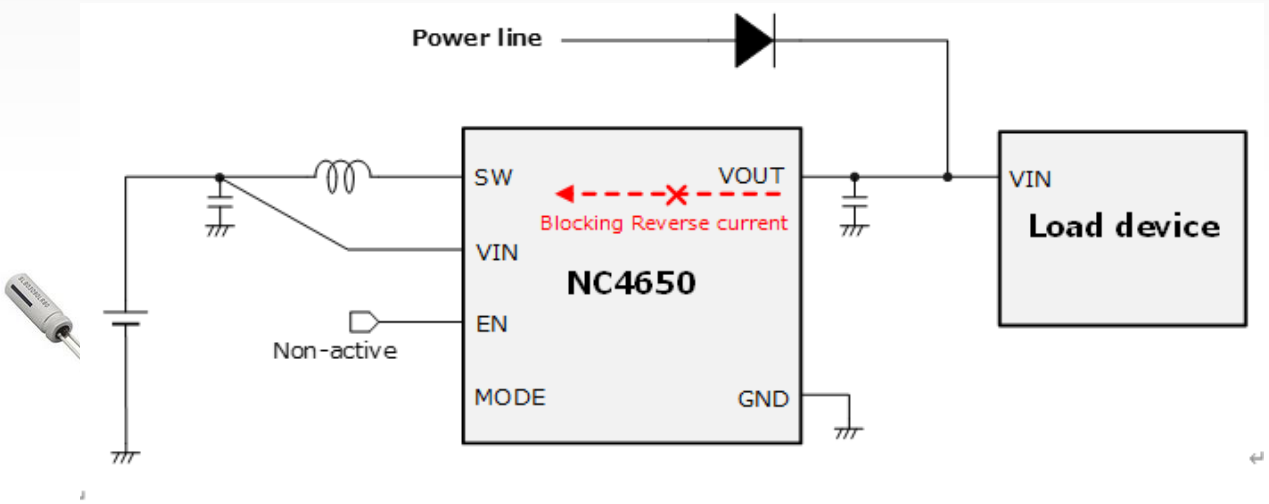
WLCSP-6-ZA1
1.3×0.92×0.4mm

Peripheral Components : 3 external parts

Symbol	Value	Part Number
C_{IN}	10 μF	GRM188R61A106MAAL
C_{OUT}	22 μF	GRM188R61A226ME15
L	2.2 μH	DFE252012F-2R2M

● Reverse Current Protection (During Shutdown)

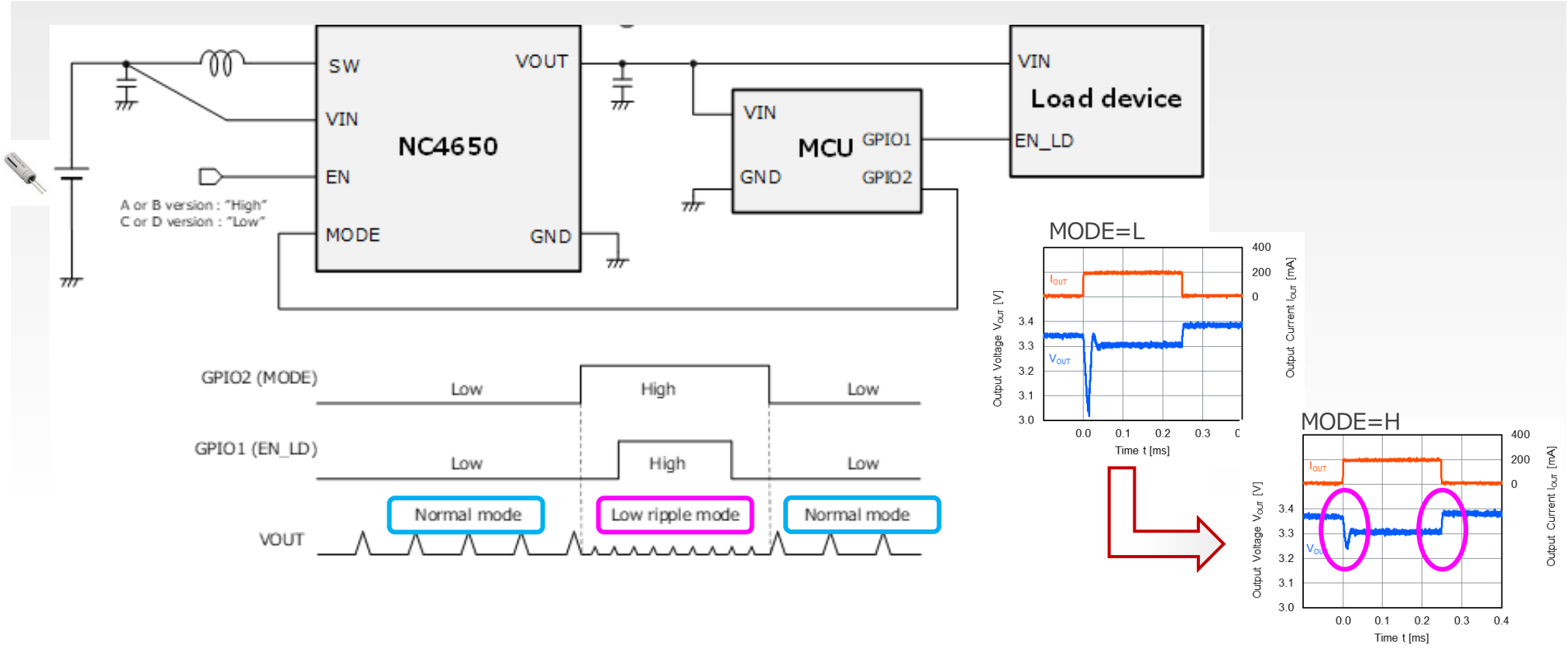
Composition c	EN Pin Function	Operation in Shutdown
A	EN=H:Active、EN=L:Shutdown	VIN-VOUT Complete Disconnect
B	EN=H:Active、EN=L:Shutdown	VOUT Discharge(Auto-Discharge Function)
C	EN=H:Shutdown、EN=L:Active	VIN-VOUT Complete Disconnect
D	EN=H:Shutdown、EN=L:Active	VIN-VOUT Pass-Through(Seamless Pass-Through Function)



A-Version System Assumptions and Usage Examples

VIN-VOUT Complete Disconnect allows “OR-connection” from the external power supply to the VOUT terminal in Shutdown.

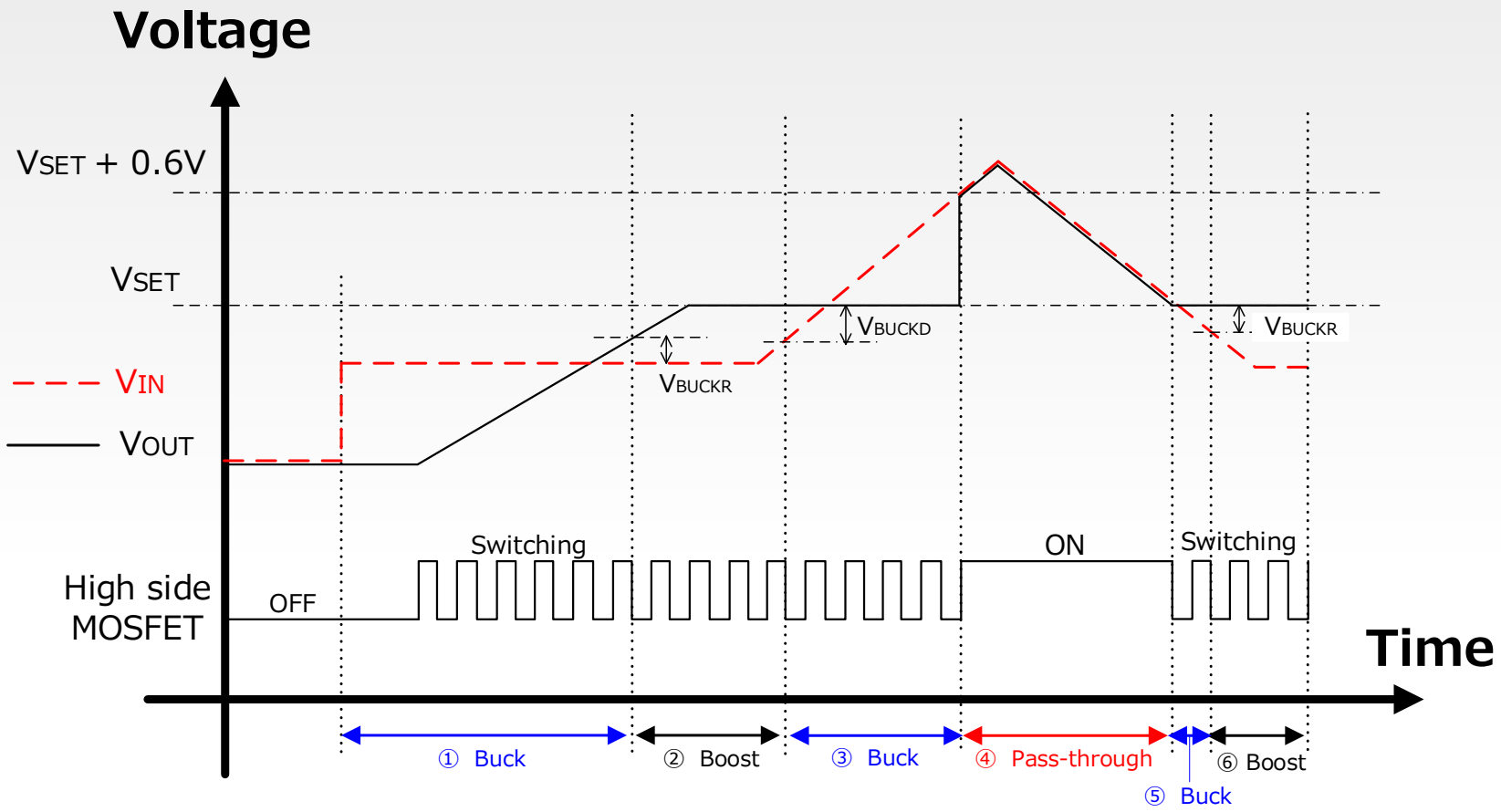
●Low Ripple & ●Fast Response



V_{IN} = 1.8 V, I_{OUT} = 10 μA ⇔ 200 mA, t_R = t_F = 1 μs,

The low ripple mode with manual switching reduces noise at zero current or light-load is realized. Mode-changing between sleep mode and active mode is performed with fast dynamic response.

Buck Mode and Pass-Through Mode



- When Vin > Vout:
  operates in buck (step-down) mode, maintaining Vout (see diagrams ①③⑤)
- When Vin > Vout + 0.6V (typ.):
  switches to pass-through mode (VIN ≈ VOUT, see diagram ④)
- See the datasheet for details.

NC4650

Ultra-Low Quiescent Current (Iq = 70nA)
Boost Switching Regulator with Low Ripple Mode

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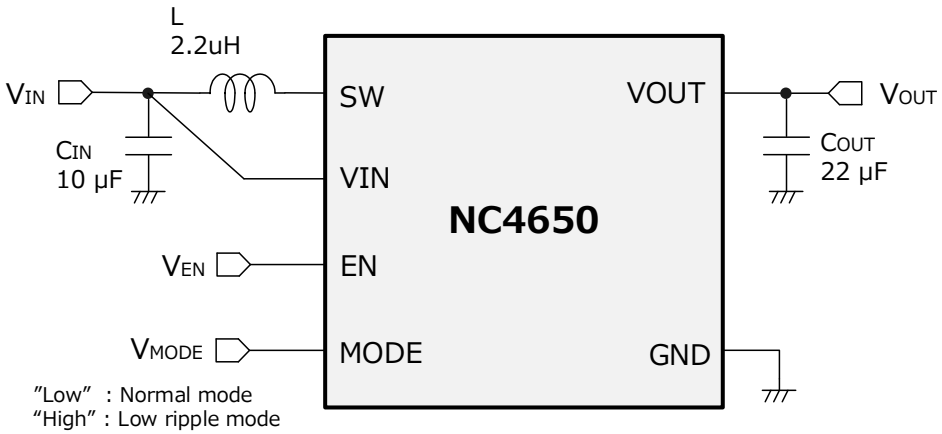
- **Realizes ultra-low consumption that contributes to long battery life and battery cost reduction (Iq=70nA)**
- **Intermittent operation Provides high efficiency for systems with long sleep (floor current) periods**
- **Provides low ripple mode with manual switching to reduce noise at light load (Sleep mode) and improve dynamic response at active mode**
- **Multiple code variations to support various system configurations**

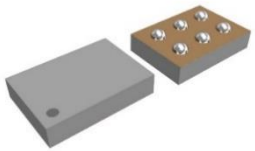
KEY SPECIFICATIONS

- Operating Junction Temperature Range: -40℃ to 125℃
- Input Voltage Range (Maximum Rating): 0.6V to 5.5V(6.5V)
- Startup Voltage: Typ.0.8V
- Output Voltage Range: 1.8V to 5.0V(Int.Fixed)
- Quiescent Current (V_{OUT}): Normal Mode: Typ. 70nA
  Low Ripple Mode: Typ. 90μA
- Shutdown Current: Typ.50nA
- Efficiency(V_{IN}=1.5V,V_{OUT}=3.3V,I_{OUT}=10μA): Typ. 85%
- Switch Current Limit: Typ. 1A(V_{SET}≥2.5V)
  Typ.0.65A(V_{SET}＜2.5V)
- Thermal Shutdown Function:
  Detection Temperature: Typ. 150℃
  Release Temperature: Typ. 100℃
- Soft Start Function
- Buck Operation or Pass-Through when V_{IN}>V_{OUT}
- Manual switching between Normal Mode and Low Ripple Mode via MODE Pin
- Multiple types for shutdown behavior

TYPICAL APPLICATIONS



PACKAGE（UNIT:mm）



WLCSP-6-ZA1
1.3×0.92×0.4

APPLICATIONS

- IoT Edge Devices
- Devices Powered by Coin/Button/Dry Batteries
- Alarms(Fire etc.), Smartwatches etc.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