

## DESCRIPTION

BL8078Q is a group of positive voltage output, low power consumption, low dropout voltage regulator. It can provide output value of 3.3V or 5.0V and output current up to 150mA. It also provides foldback short-circuit protection, thermal protection and output current limit function. The maximum output current(150mA) must be used in the safe operation area. The very low power consumption of BL8078Q( $I_q=2.5\mu A$ ) can greatly improve natural life of batteries.

BL8078Q includes high accuracy voltage reference, error amplifier, current limit circuit and output driver module.

BL8078Q has good load transient response and good temperature characteristics. And it uses trimming technique to guarantee output voltage accuracy within  $\pm 2\%$ .

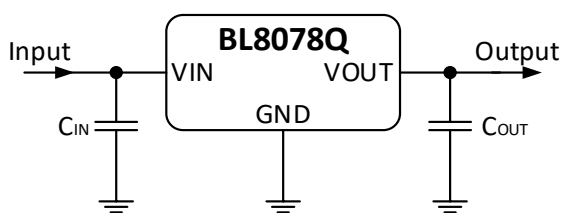
## FEATURES

- Low power consumption: 2.5 $\mu A$ (Typ.)
- Maximum output current: 150mA (must be used in the safe operation area)
- Low dropout voltage:  
240mV@50mA ( $V_{OUT}=5.0V$ )  
335mV@50mA ( $V_{OUT}=3.3V$ )
- Wide input voltage range: 3V~40V
- Output voltage: 3.3V, 5.0V
- Highly accurate:  $\pm 2\%$
- AEC-Q100 Grade2

## APPLICATIONS

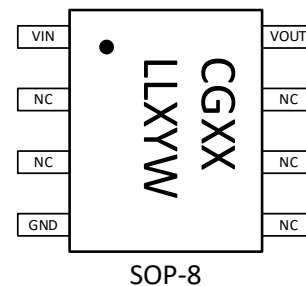
- Automotive
- Battery powered equipment
- Reference voltage source regulation after switching power
- Always-on battery applications
  - door modules
  - remote keyless-entry systems
  - immobilizers

## TYPICAL APPLICATION



**Note:** Input capacitor ( $C_{IN}=1\mu F$ ) and output capacitor ( $C_{OUT}=1\mu F$ ) are recommended in all application circuit. Ceramic capacitor is recommended.

## PIN OUT & MARKING



CG: Product code  
XX: Output voltage  
LL: Lot No.  
X: Fab code  
YW: Date code

# BL8078Q

## ORDERING INFORMATION

Part No.	Package	Tape&Reel
BL8078QCD8TR33	SOP-8	2500/reel
BL8078QCD8TR50	SOP-8	2500/reel

## ABSOLUTE MAXIMUM RATING<sup>1</sup>

Parameter	Value	
Max input voltage	44V	
Operating junction temperature (T <sub>J</sub> )	150°C	
Package thermal resistance (θ <sub>JC</sub> )	SOP-8	40°C/W
Package thermal resistance (θ <sub>JA</sub> )		80°C/W
Storage temperature (T <sub>S</sub> )	-40°C to 150°C	
Lead temperature & time	260°C, 10s	
ESD (HBM <sup>2</sup> )	>2000V	

### Note:

- 1) Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.
- 2) ESD susceptibility, HBM according to ANSI/ESDA/JEDEC JS001 (1.5KΩ, 100pF).

## RECOMMENDED WORK CONDITIONS

Parameter	Min	Recommended	Max	Units
Input voltage range	3		40	V
Ambient temperature (T <sub>A</sub> )	-40		105	°C

## ELECTRICAL CHARACTERISTICS

Test conditions: C<sub>IN</sub>=1μF, C<sub>OUT</sub>=1μF, T<sub>J</sub>=-40°C~+140°C, unless otherwise stated.

Typical values are given at T<sub>A</sub>=25°C.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>IN</sub>	Input Voltage		3		40	V
V <sub>OUT</sub>	Output Voltage	V <sub>IN</sub> -V <sub>OUT</sub> =1V 1mA≤I <sub>OUT</sub> ≤30mA	V <sub>OUT</sub> *0.98	V <sub>OUT</sub>	V <sub>OUT</sub> *1.02	V
I <sub>OUT (Max.)</sub>	Maximum Output Current	V <sub>IN</sub> -V <sub>OUT</sub> =1V	150			mA
V <sub>DROP</sub>	Dropout Voltage <sup>1</sup>	I <sub>OUT</sub> =50mA	V <sub>OUT</sub> =3.3V	335		mV
			V <sub>OUT</sub> =5.0V	240		mV
$\frac{\Delta V_{out}}{\Delta V_{in} \cdot V_{out}}$	Line Regulation	I <sub>OUT</sub> =10mA, V <sub>OUT</sub> +1V≤V <sub>IN</sub> ≤40V		0.2	0.3	%/V
ΔV <sub>out</sub>	Load Regulation	V <sub>IN</sub> =V <sub>OUT</sub> +1V 1mA≤I <sub>OUT</sub> ≤50mA		20	40	mV
I <sub>q</sub>	Quiescent Current	V <sub>IN</sub> =V <sub>OUT</sub> +1V		2.5	5	μA
$\frac{\Delta V_{out}}{\Delta T \cdot V_{out}}$	Output Voltage Temperature Coefficient	I <sub>OUT</sub> =10mA		±100		ppm/°C
PSRR	Ripple rejection	F=100Hz, Ripple=0.5Vp-p V <sub>IN</sub> =V <sub>OUT</sub> +1V		50		dB
T <sub>SD</sub>	Thermal shutdown temp			140		°C
T <sub>SH</sub>	Thermal shutdown hysteresis			10		°C

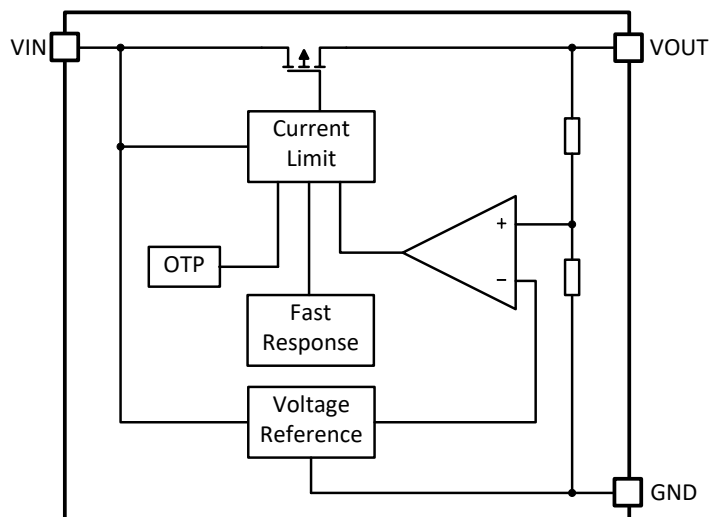
### Note:

- 1) V<sub>DROP</sub>=V<sub>IN</sub>-V<sub>OUT</sub> when V<sub>OUT</sub> drops below 98% of the normal V<sub>OUT</sub>.

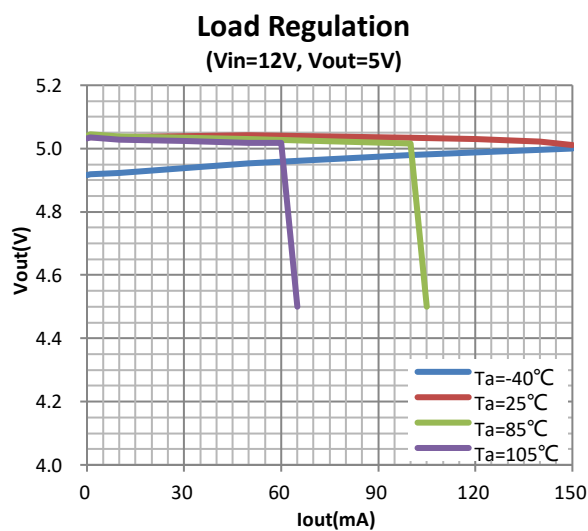
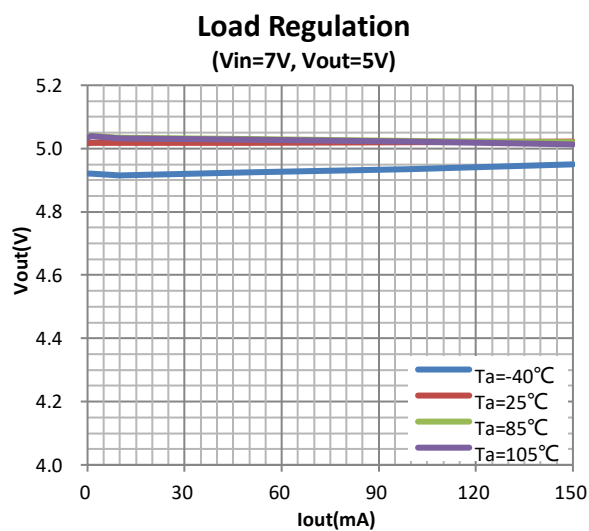
## PIN DESCRIPTION

Pin #	Name	Description
1	VIN	Supply voltage input.
2,3,5,6,7	NC	No connection.
4	GND	Ground.
8	VOUT	Output voltage.

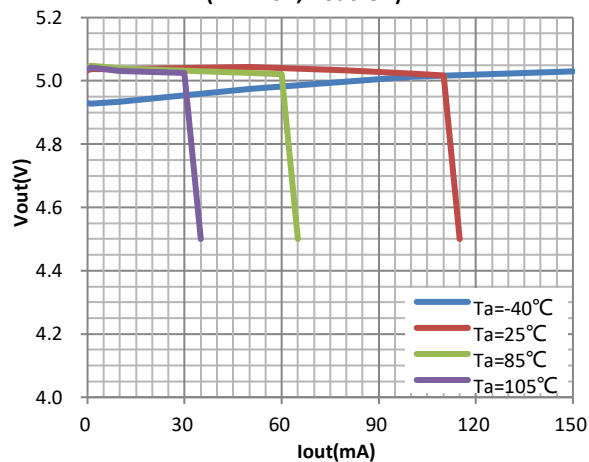
## BLOCK DIAGRAM



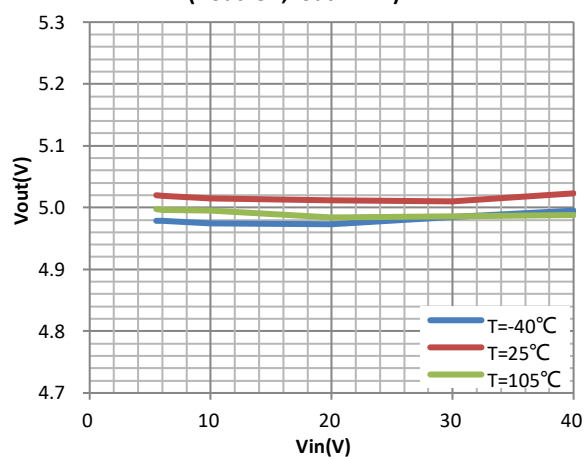
## TYPICAL PERFORMANCE CHARACTERISTICS



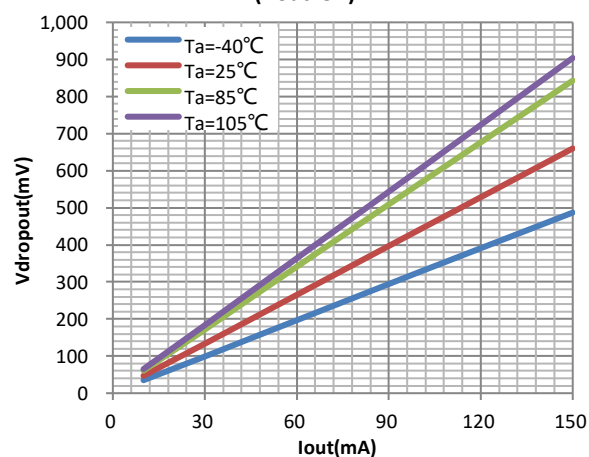
**Load Regulation**  
( $V_{in}=16V$ ,  $V_{out}=5V$ )



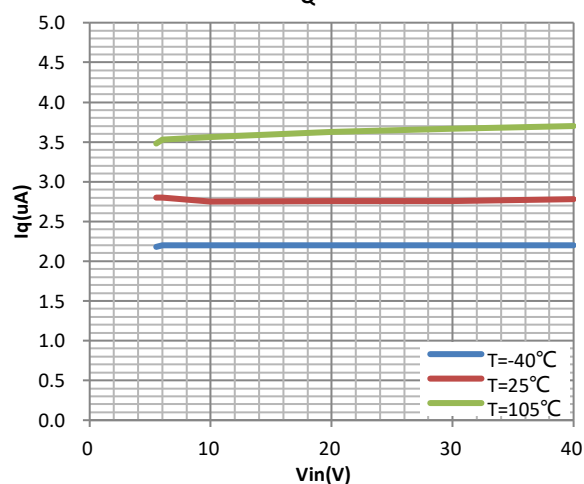
**Line Regulation**  
( $V_{out}=5V$ ,  $I_{out}=1mA$ )



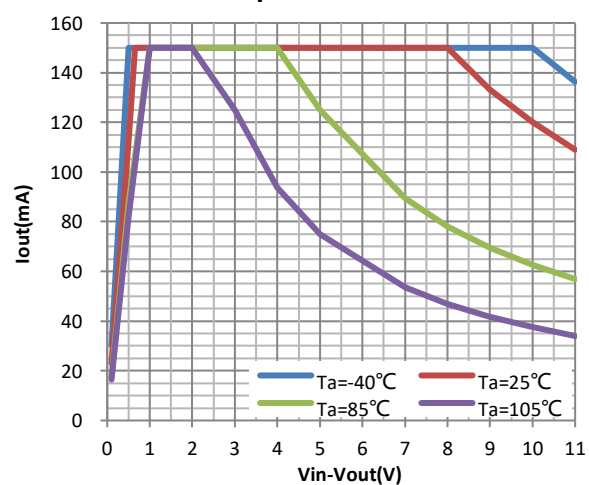
**Dropout Voltage**  
( $V_{out}=5V$ )



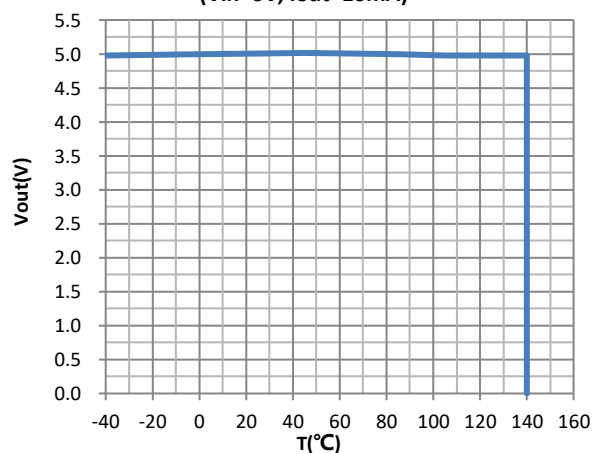
$I_Q$



**Safe Operation Area**



**Output Voltage vs. Temp.**  
( $V_{in}=6V$ ,  $I_{out}=10mA$ )



# BL8078Q

## EXPLANATION

BL8078Q is a series of low dropout voltage and low power consumption regulator. Its application circuit is very simple, which only needs two outside capacitors. It is composed of these modules: high accuracy voltage reference, current limit circuit, error amplifier, output driver and power transistor.

Current limit module can keep chip and power system away from danger when load current is more than 180mA.

BL8078Q uses trimming technique to assure the accuracy of output value within  $\pm 2\%$ . At the same time, temperature compensation is elaborately considered in this chip, which makes BL8078Q's temperature coefficient within  $\pm 100\text{ppm}/^\circ\text{C}$ .

## THERMAL CONSIDERATIONS

Knowing the input voltage, the output voltage and the load profile of the application, the total power dissipation can be calculated:

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT} + V_{IN} \times I_Q$$

with

- $P_D$ : continuous power dissipation
- $V_{IN}$ : input voltage
- $V_{OUT}$ : output voltage
- $I_{OUT}$ : output current
- $I_Q$ : quiescent current

The maximum acceptable thermal resistance  $R_{\theta JA}$  can then be calculated:

$$R_{\theta JA, max} = \frac{T_{J, max} - T_A}{P_D}$$

with

- $T_{J, max}$ : maximum allowed junction temperature
- $T_A$ : ambient temperature

## PACKAGE OUTLINE

