



supportPDMulti-fast charging protocol dual-port charging solution

1. overview

SW3518It is a highly integrated multi-fast charging protocol dual-port charging chip that supportsA+CAny port fast charge output, support dual-port independent current limiting. which integrates5AHigh Efficiency Synchronous Buck Converter SupportingPPS/PD/QC/AFC/FCP/SCP/PE/SFCP/VOOC and other fast charging protocols, CC/CVmode, and dual-port management logic. Only a small number of peripheral components are needed to form a complete high-performance multi-fast charging protocol dual-port charging solution.

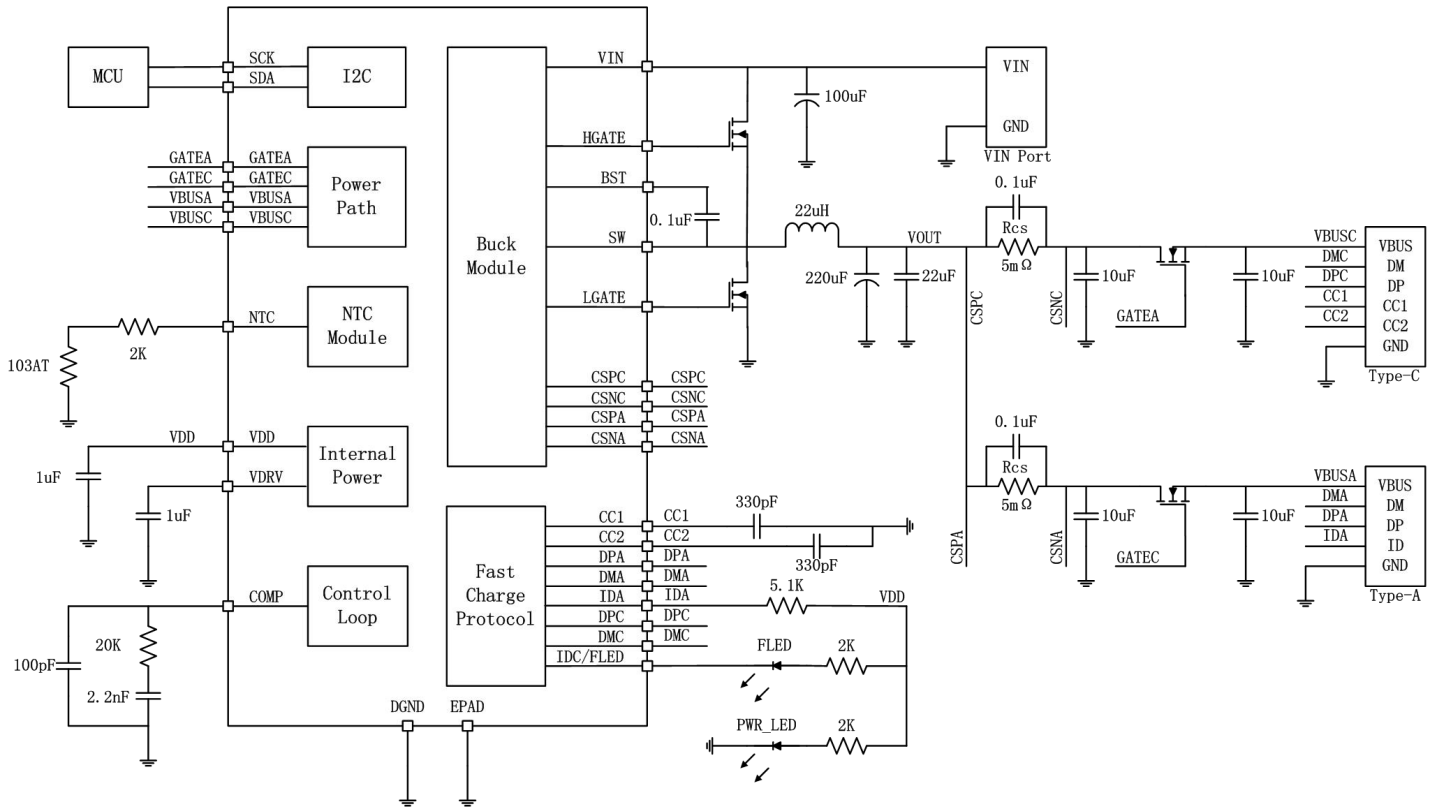
2. Application field

- car charger
- adapter
- Socket

3. Specification

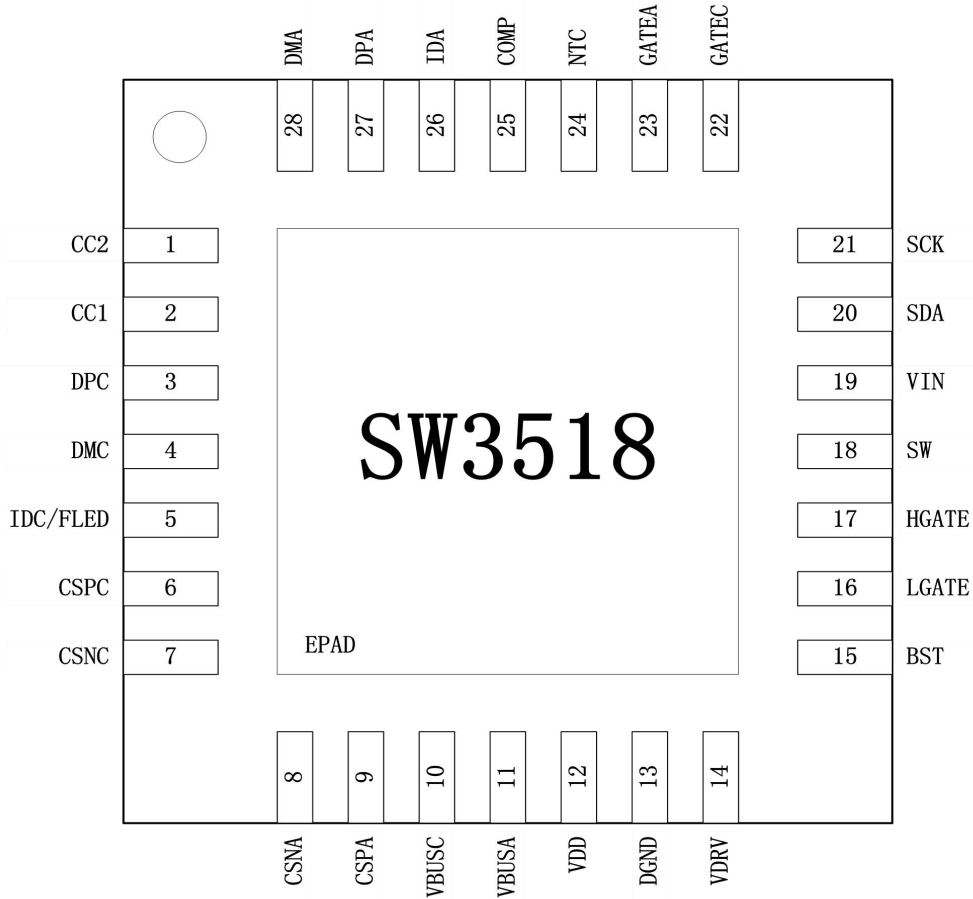
- **Synchronous Buck Converter**
 - Output current up to5A
 - Input voltage range6~40V
 - supportCC/CVmodel
 - Support dual-port independent current limiting
 - Support line loss compensation
 - Support temperature control
- **Fast Charge Protocol**
 - supportPPS/PD3.0/PD2.0
 - supportQC4+/QC4/QC3.0/QC2.0
 - supportAFC
 - supportFCP
 - supportSCP
 - supportPE2.0/PE1.1
 - supportSFCP
 - supportVOOC
- **Type-Cinterface**
 - built-inUSB Type-Cinterface logic
 - supportDFP/SourceRole
- **BC1.2module**
 - supportBC1.2 DCPmodel
 - Support Apple/Samsung high current charging mode identify
- **Fast charge indicator**
 - Built-in fast charging indicator driver
- **protection mechanism**
 - soft start
 - Input Overvoltage Protection
 - Input undervoltage protection
 - Output overcurrent protection
 - Output short circuit protection
 - over temperature protection
- **I2Cinterface**
- **QFN-28(4x4mm)encapsulation**

4. Functional block diagram



5.Pin definition and function description

5.1pin definition



5.2Pin description

Pin	name	Function Description
1	CC2	Type-Cconfigure channel2.
2	CC1	Type-Cconfigure channel1.
3	DPC	Type-CmouthDPSignal.
4	DMC	Type-CmouthDMSignal.
5	IDC/FLED	Type-CmouthIDAuthentication and fast charging instructions.
6	CSPC	Type-CPort output current detection positive terminal.
7	CSNC	Type-CPort output current sense negative terminal.
8	CSNA	Type-APort output current sense negative terminal.
9	CSPA	Type-APort output current detection positive terminal.
10	VBUSC	Type-CPort load access detection pin.
11	VBUSA	Type-APort load access detection pin.
12	VDD	Internal working power supply.

13	DGND	digitally.
14	VDRV	drive power.
15	BST	superiorNtube driveBootstrappin.
16	LGATE	DownNTube drive signal.
17	HGATE	superiorNTube drive signal.
18	SW	Switch Node Voltage Sense Pin.
19	VIN	Input power.
20	SDA	I2Cdata signal.
twenty one	SCK	I2Cclock signal.
twenty two	GATEC	Type-COral access control.
twenty three	GATEA	Type-AOral access control.
twenty four	NTC	Board-level temperature sensing pin.
25	COMP	External Compensation Pin.
26	IDA	Type-AmouthIDcertified.
27	DPA	Type-AmouthDPSignal.
28	DMA	Type-AmouthDMSignal.
	EPAD	coolingPAD, to ground.

6.Limit parameter

Parameters	Symbol	MIN	MAX	UNIT
Input voltage	VIN	- 0.3	40	V
The output voltage	CSPA/CSNA/CSPC/ CSNC/VBUSA/VBUSC	- 0.3	twenty two	V
SWpin voltage	SW	- 0.3	40	V
BST/HGATEpin voltage	BST/HGATE-SW	- 0.3	6	V
access control voltage	GATEA/GATEC	- 0.3	27	V
Other pin voltage		- 0.3	6	V
temperature control		- 40	+ 150	°C
storage temperature		- 60	+ 150	°C
ESD(HBM)		- 4	+ 4	KV

【Remarks】 Conditions such as voltage, current and temperature exceeding this range may cause permanent damage to the device.

7.Recommended parameters

Parameters	Symbol	MIN	Typical	MAX	UNIT
Input voltage	VIN	5		36	V
Operating temperature		- 40		+85	°C

8.electrical characteristics

($V_{IN}=12V$, $T_A=25^{\circ}C$, Unless otherwise specified.)

Parameters	Symbol	Test Conditions	MIN	TYP	MAX	UNIT
Power supply						
VINinput power	V_{IN}		5		36	V
VINInput Undervoltage Threshold	V_{IN_UVLO}	VINInput voltage drop		5		V
VINInput Undervoltage Threshold Hysteresis	$V_{IN_UVLO_HYS}$	VINInput voltage rises		1		V
VINInput Overvoltage Threshold	V_{IN_OVP}	VINInput voltage rises		37.5		V
VINInput Overvoltage Threshold Hysteresis	$V_{IN_OVP_HYS}$	VINInput voltage drop		1.5		V
VDDThe output voltage	V_{DD}	$V_{IN}=12V$		5		V
VDDOutput current	I_{DD}	$V_{IN}=12V$		50		mA
VDRVThe output voltage	V_{DRV}	$V_{IN}=12V$		5		V
No-load current	I_Q	$V_{IN}=12V$, $I_{out}=0mA$		2		mA
buck converter						
On-off level	f_{CHG}			125		KHz
The output voltage	V_{out}	$V_{out}=5V$		5.05		V
		$V_{out}=9V$		9.05		V
		$V_{out}=12V$		12.05		V
		$V_{out}=20V$		20.05		V
CCcurrent limiting	I_{CC}	$R_{cs}=5m\Omega$	single port output		3.3	A
			When dual port output		2.7	A
Line Loss Compensation	V_{OUT_WDC}	$R_{cs}=5m\Omega$			200	mV
constant temperature value	T_{REGU_CHG}			120		$^{\circ}C$
Light load detection						
Light load current detection threshold	I_{LIGHT_LOAD}	$R_{cs}=5m\Omega$		15		mA
Light load detection shutdown time	t_{LIGHT_LOAD}			2		S
Type-Cinterface						
CCPin output current	I_{CC_SOURCE}	Power Level=3.0A		330		μA
BC1.2						
DP/DMVoltage	DP	Apple 2.4AMode		2.7		V
	DM	Apple 2.4AMode		2.7		V

PE						
current threshold	I _{REF}			300		mA
exit time	t _{PLUG_OUT}			200		M
I2C						
rate	f _{CLK}			400		Kbit/S
Thermal Shutdown Protection						
Thermal Shutdown Threshold	T _{SHDT}	The temperature rises		150		°C
Thermal Shutdown Hysteresis	T _{SHDT_HYS}	Temperature drop		50		°C

9. Functional description

9.1 buck converter

SW3518 integrates a high efficiency switching buck converter. External dual N Power tube, load capacity up to 5A, efficiency >95% (VIN=12V, VOUT=5V, IOU=5A).

Buck Converter Switching Frequency 125KHz. use PFM/PWM Automatic switching mode, working at light load PFM mode, working at medium load and heavy load PWM mode.

Buck Converter Support CC/CV model. When the load current is less than CC, when the current is limited, the step-down circuit outputs the set voltage. When the load reaches CC current limit value, will limit the output current at CC current limit value, the output voltage will drop. When single port output, CC limiting 3.3A; When the two ports output at the same time, each port has a separate current limit 2.7A.

The buck converter supports line loss compensation. The output compensation voltage increases linearly according to the load current, when reaching CC maximum compensation at current limit 200mV.

The buck converter supports temperature control when the die temperature exceeds 120°C, the output voltage begins to drop; if the over-temperature continues to exceed 150°C, the chip enters the over-temperature shutdown mode. After entering the over-temperature shutdown mode, when the temperature drops below the over-temperature threshold, the chip will automatically power on, and the buck converter will start back to the default state.

The buck converter includes protections such as input overvoltage/input undervoltage/output overcurrent/output short circuit.

9.2 access control

SW3518 support Type-A+Type-C Dual port output, any port supports fast charge output.

Type-A port support QC3.0/QC2.0/AFC/FCP/SCP/PE2.0/PE1.1/SFCP/VOOC Fast charge output.

Type-C port support PPS/PD3.0/PD2.0/QC4+/QC4/QC3.0/QC2.0/AFC/FCP/SCP/PE2.0/PE1.1/SFCP/VOOC Fast charge output.

By default, Type-A port output 5V, Type-C no output. When single-port output, it supports fast charge output. When dual port output, support 5V output, while each port is individually limited.

load access open Type-A Port external discharge, no-load detection off Type-A port, the no-load detection current threshold is about 15mA. UFP set up

standby access openType-CThe mouth discharges externally,UFPDevice removed and closedType-Cmouth at the same timeType-Cport is also closed when emptyType-C Oral access.

9.3 Type-Cinterface

SW3518IntegratedType-Cinterface controller, supportsDFP/Sourcerole whenUFPAutomatically discharge the device when it is connected,UFP The access is automatically closed when the device is removed.

whenUFPWhen the device is connected,SW3518will be atCCbroadcast on pin3Acurrent capability.

9.4 PDfast charge

SW3518IntegratedPPS/PD3.0/PD2.0fast charge protocol,PPSoutput support3~5.9V@5A,3~20V@3A,PD3.0/PD2.0 output support5V/9V/12V/15V/ 20V@3A.

9.5 QCfast charge

SW3518IntegratedQCFast charging protocol, supportQC4+/QC4/QC3.0/QC2.0,supportClass A/Class B.QC2.0output support5V/9V/12V/20V.QC3.0output support3.6V~20V,200mV/Step.

QC2.0/QC3.0according toDP/DMThe corresponding output voltage of the voltage request is as follows:

access device		SW3518	
DP	DM	VOUT	note
3.3V	3.3V	20V	
0.6V	0.6V	12V	
3.3V	0.6V	9V	
0.6V	3.3V	continuous mode	0.2V/Step
0.6V	GND	5V	

9.6 AFCfast charge

SW3518IntegratedAFCFast charging protocol, output support5V/9V.

9.7 FCPfast charge

SW3518IntegratedFCPFast charging protocol, output support5V/9V/12V.

9.8 SCPfast charge

SW3518IntegratedSCPFast charging protocol, output support5V@4.5A,4.5V@5A.

9.9 PEfast charge

SW3518IntegratedPE2.0andPE1.1fast charge protocol,PE2.0output support5V~20V,500mV/Step.PE1.1output support 5V/7V/9V/12V.

9.10 SFCPfast charge

SW3518IntegratedSFCPFast charging protocol, output support5V/9V/12V.

9.11 VOOCfast charge

SW3518IntegratedVOOCFast charging protocol, output support5V@4A.

9.12 BC1.2Function

SW3518containsUSBIntelligent adaptive function module, which not only supportsBC1.2Function, as well as the Chinese mobile phone charger standard, can also be well compatible with Apple and Samsung's high-current output identification:

Apple 2.4A mode: DP=2.7V, DM=2.7V;

Samsung 2A mode: DP=1.2V, DM=1.2V;

9.13Fast charge indicator

SW3518Internally integrated fast charging indicator driverIDC/FLED Pin, at fast charge output,IDC/FLED Pull low to turn on the fast charge indicator.

9.14 ADCs

SW3518internally integrated12 bit ADC, can collect input voltage/output voltage/Type-Aport output current/Type-CPort output current/board temperature. The board level temperature is collected by103AT NTCThe voltage of the resistor is converted by connecting in series2KResistance, improve the detection accuracy at high temperature.

Specifically:

ADCpath	scope	step
Input voltage	0~40.96V	10mV
The output voltage	0~24.576V	6mV
Type-Aport output current	0~10.24A	2.5mA
Type-Cport output current	0~10.24A	2.5mA
NTCVoltage	0~2.048V	0.5mV

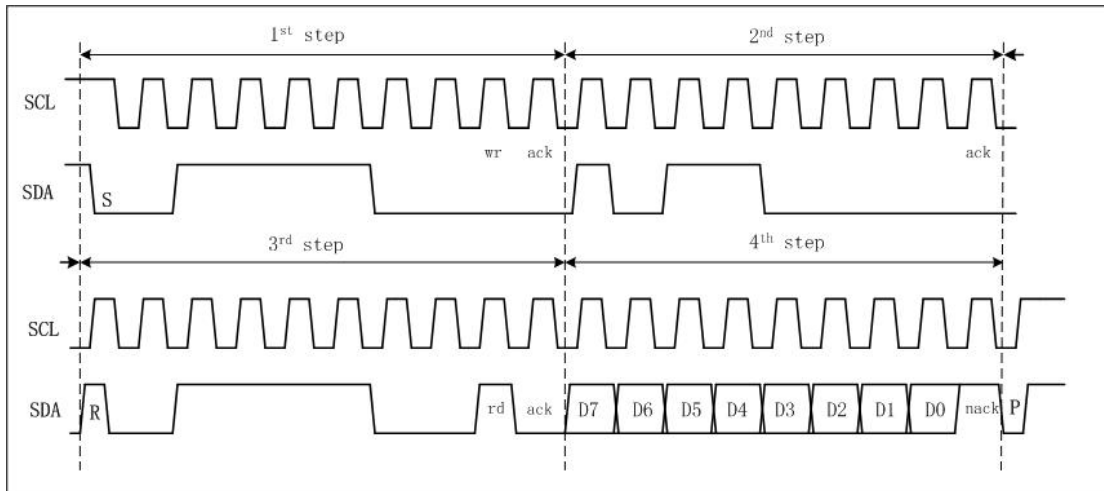
9.15 I2Cinterface

SW3518supportI2Cinterface, support100K/400Kcommunication rate.MasteraccessibleI2CThe interface reads the status information of the chip.

Read operation:

Slave address:0x3C

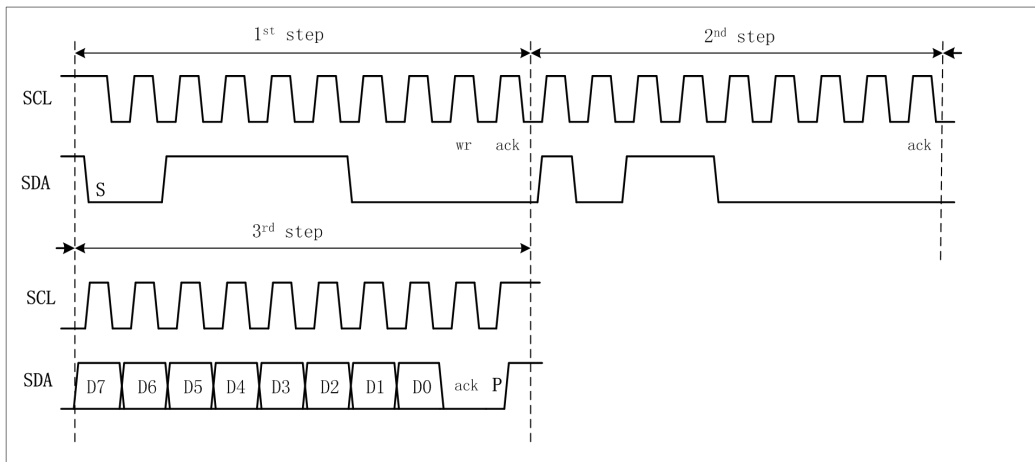
Register address:0xB0



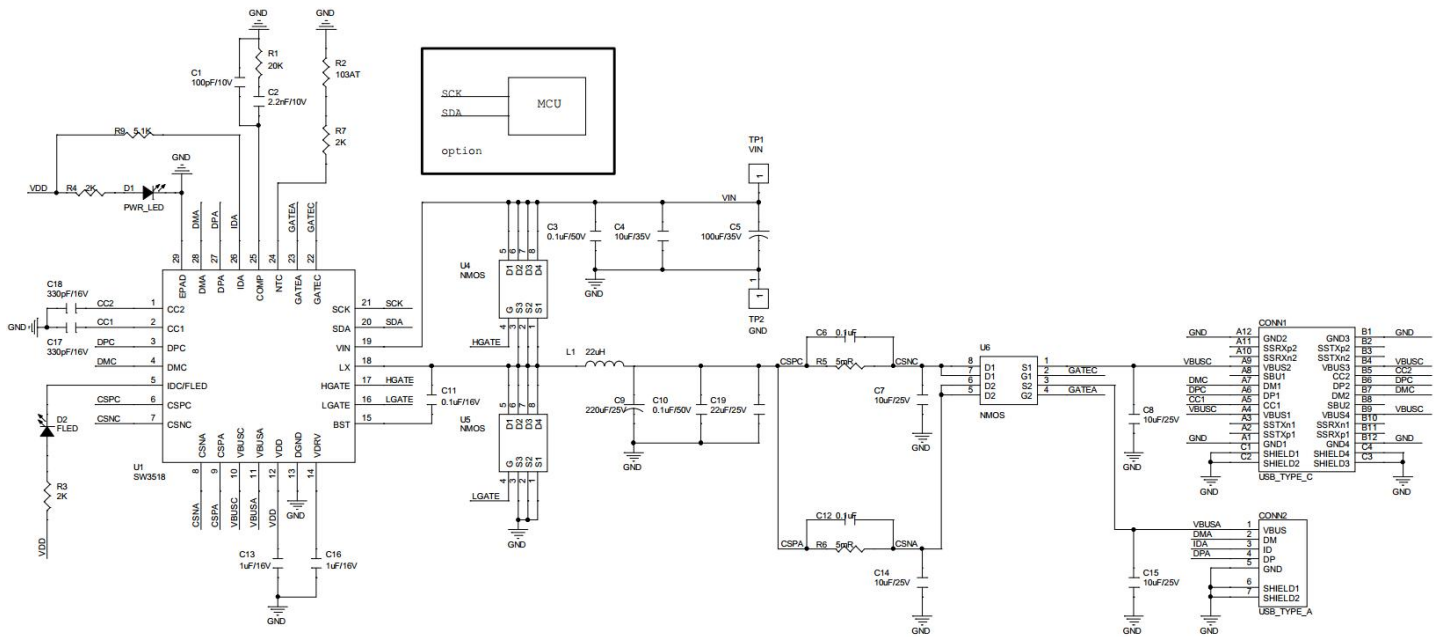
Write operation:

Slave address:0x3C

Register address:0xB0

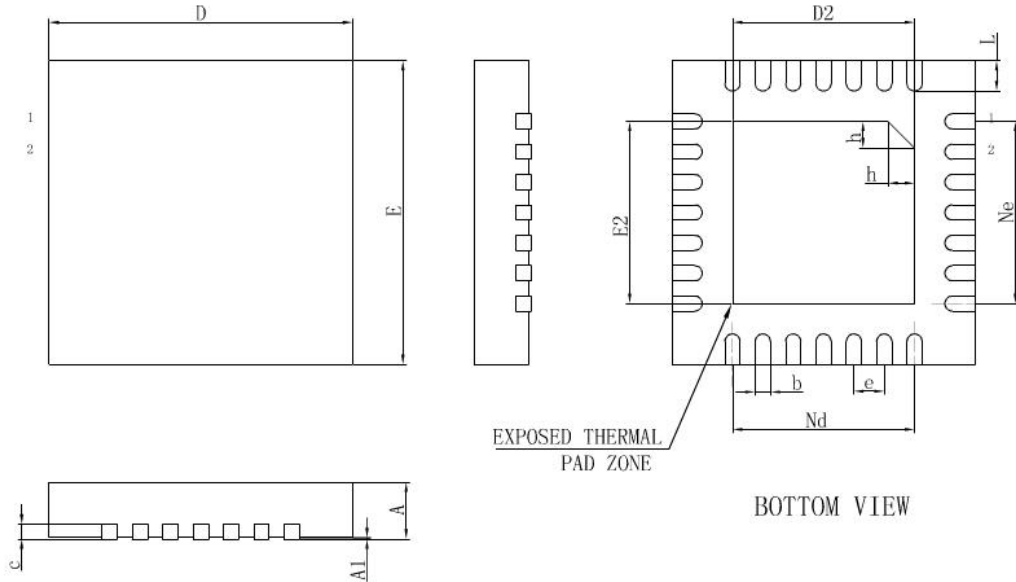


10. Typical application circuit diagram



11. Mechanical Dimensions

11.1 Package diagram



11.2 package size

Symbol	Dimension in Millimeters		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D.	3.90	4.00	4.10
D2	2.30	2.40	2.50
e	0.40BSC		
Nd	2.40BSC		
E.	3.90	4.00	4.10
E2	2.30	2.40	2.50
Ne	2.40BSC		
L	0.35	0.40	0.45
h	0.30	0.35	0.40

12.version history

V1.0initial version;