Universidad del País Vasco Euskal Herriko Unibertsitatea
BILBOKO INGENIARITZA ESKOLA
ESCUELA DE INGENIERÍA DE BILBAO

INDUSTRIA ELEKTRONIKAREN ETA AUTOMATIKAREN INGENIARITZAKO GRADUA

GRADU AMAIERAKO LANA

GAILU ELEKTRONIKOAK KARGATZEKO BILTEGIRATZE-SISTEMA FOTOVOLTAIKO ERAMANGARRIA: DISEINUA ETA PROTOTIPAKETA

I. ERANSKINA – *EZAUGARRI ORRIAK*

Ikaslea: Yañez Romo, Asier
Zuzendaria: Otaegi Aizpeolea, Aloña

Ikasturtea: 2021-2022

Data: Bilbo, 2021eko azaroaren 8a

AURKIBIDEA

Xunzel MS6V150

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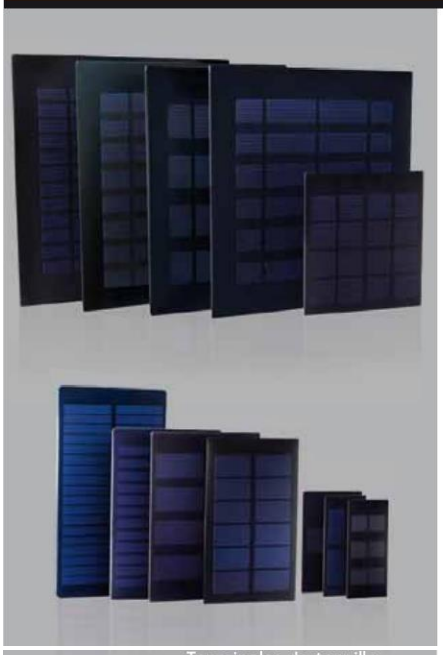
FICHA TÉCNICA

MICROSOLAR™ Series
MICRO PANELES SOLARES
Micro paneles solares fotovoltaicos de alta eficiencia



MICROSOLAR™ Series – MICRO PANELES SOLARES

Micro paneles solares fotovoltaicos de alta eficiencia

Características del Producto

Los **Paneles Solares MICROSOLAR™** están hechos con células solares de alta eficiencia depositadas en una superficie de montaje. Robustos y listos para usar en todo tipo de aplicaciones, carga de baterías y alimentar todo tipo de aparatos electrónicos. Los **Paneles Solares MICROSOLAR™** son ideales para crear prototipos, hacer experimentos y aprender.

Añada la energía solar fotovoltaica a sus creaciones y genere electricidad verde. Haga sus propios inventos solares. Excelentes para educación, ciencia, investigación, diseño, bricolaje, robótica, juguetes y para muchas aplicaciones más.

Alimente dispositivos electrónicos, LEDs, micro-motores y -bombas solares de CC; cargue y mantenga baterías, condensadores y baterías backup de emergencia, de tal manera que la vida de las baterías se prolongue.

También son adecuados para aplicaciones industriales, tales como dispositivos electrónicos inalámbricos, sensores e instrumentos.

El diseño avanzado permite conectar los **Paneles Solares MICROSOLAR™** de una forma muy flexible, siendo en serie y / o paralelo para satisfacer perfectamente las necesidades de las aplicaciones.

Los **Paneles Solares MICROSOLAR™** tienen muy buena respuesta con un amplio rango de longitudes de onda y gran estabilidad.

MICROSOLAR™ Series – MICRO PANELES SOLARES Características y Ventajas

- Células solares de alta eficiencia
- Diodo de protección contra corriente inversa integrado (incluido en ciertos modelos)
- Larga vida útil y salida estable
- Estructura de alta robustez mecánica
- Células solares encapsuladas con PET
- Fácil de conectar gracias a sus terminales de tornillo (4mm2)
- Ideal para múltiples aplicaciones
- Integración flexible en las aplicaciones
- Apropiado para cargar condensadores y baterías recargables de NiCd, NiMH y Litio
- Ideal para los dispositivos alimentados por baterías: GPSs, linternas, microprocesadores como ARDUINO™, RASPBERRY™, etc.

Nota: ARDUINO™ y RASPBERRY™ son marcas registradas.

microsolar
CREATOR SERIES™

ideas technology design

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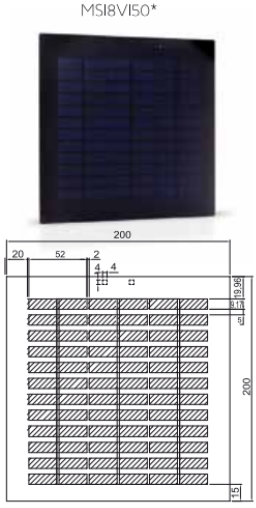
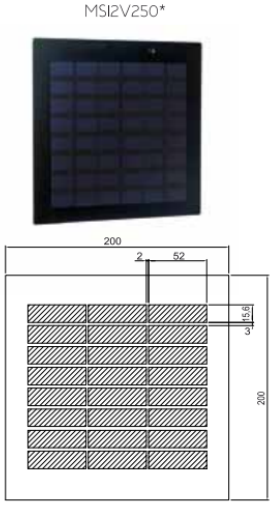
FICHA TÉCNICA

MICROSOLAR™ Series – MICRO PANELES SOLARES Modelos Disponibles
PCB-PET Series

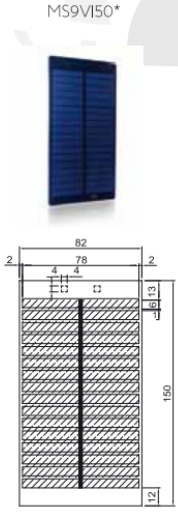
MSI8VI50*



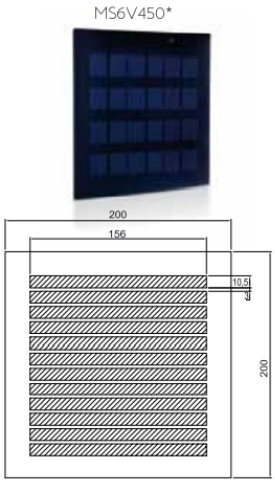
MSI2V250*



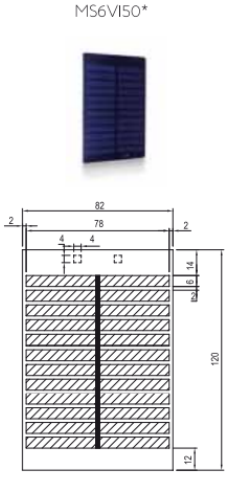
MS9VI50*



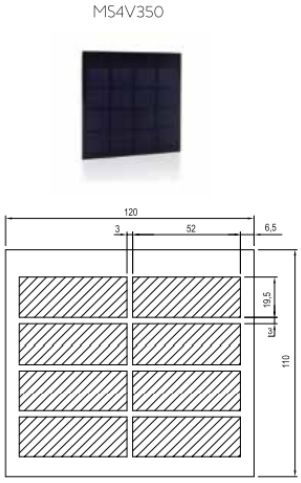
MS6V450*



MS6VI50*



MS4V350



Industry Leading Technology for Off-Grid, Off-Shore and Backup Power Applications

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FICHA TÉCNICA

MICROSOLAR™ Series

MICRO PANELES SOLARES

Micro paneles solares fotovoltaicos de alta eficiencia

MICROSOLAR™ Series – MICRO PANELES SOLARES Especificaciones

PCB-PET Series

Modelo	Código	Pmax [W]	Voc [V]	Isc [A]	Vmpp [V]	Impp [A]	Nº de células	Dimensiones (L x H x W) [mm]	Peso [kg]	Terminales de tornillo (4mm²)	Apropiado para motores y ventiladores CC, baterías recargables (NiCd, NiMH, Litio, Plomo) y condensadores
Micro Panel Solar 18V / 150mA	MS18V150	2.70	18.8	0.165	18	0.150	72	200 x 200 x 3	0.195	Si	11.1V, 12V y 14.4V
Micro Panel Solar 12V / 250mA	MS12V250	3.00	13.2	0.275	12	0.250	48	200 x 200 x 3	0.195	Si	6V, 6.5V, 7V y 9V
Micro Panel Solar 9V / 150mA	MS9V150	1.35	9.90	0.165	9	0.150	36	150 x 82 x 3	0.062	Si	6V, 6.5V, 7V y 7.5V; 4 x AA and 4 x AAA;
Micro Panel Solar 6V / 450mA	MS6V450	2.70	6.60	0.495	6	0.450	24	200 x 200 x 3	0.195	Si	3V, 3.7V y 4V; 2 x AA and 2 x AAA
Micro Panel Solar 6V / 150mA	MS6V150	0.90	6.60	0.165	6	0.150	24	120 x 82 x 3	0.050	Si	3V y 4V; 2 x AA y 2 x AAA
Micro Panel Solar 4V / 350mA	MS4V350	1.40	4.40	0.365	4	0.350	16	110 x 120 x 3	0.065	Si	1 x AA y 1 x AAA
Micro Panel Solar 3V / 850mA	MS3V850	2.55	3.30	0.865	3	0.850	24	200 x 200 x 3	0.226	Si	1 x AA y 1 x AAA
Micro Panel Solar 3V / 250mA	MS3V250	0.75	3.30	0.275	3	0.250	12	120 x 62 x 3	0.035	Si	1 x AA y 1 x AAA
Micro Panel Solar 2V / 450mA	MS2V450	0.90	2.20	0.495	2	0.450	8	82 x 120 x 3	0.045	Si	1 x AA y 1 x AAA
Micro Panel Solar 1.5V / 350mA	MS1P5V350	0.525	1.6	0.385	1.5	0.350	6	62 x 120 x 3	0.035	Si	
Micro Panel Solar 1V / 750mA	MS1V750	0.750	1.1	0.880	1	0.750	4	62 x 120 x 3	0.035	Si	
Micro Panel Solar 0.5V / 350mA	MS05V350	0.175	0.55	0.385	0.5	0.350	2	62 x 80 x 3	0.026	Si	

Transparent Flexible PET Series

Modelo	Código	Pmax [W]	Voc [V]	Isc [A]	Vmpp [V]	Impp [A]	Nº de células	Dimensiones (L x H x W) [mm]	Peso [kg]	Terminales de tornillo (4mm²)	Apropiado para motores y ventiladores CC, baterías recargables (NiCd, NiMH, Litio, Plomo) y condensadores
Micro Panel Solar 6V / 900mA	MS6V900	5.40	6.60	0.980	6	0.900	12	180 x 310 x 2	0.125	No	3V, 3.7V y 4V; 2 x AA y 2 x AAA

Pmax: Potencia máxima; Voc: Voltage de circuito abierto; Isc: Corriente de cortocircuito; Vmpp: Voltaje del punto de máxima potencia; Impp: Corriente del punto de máxima potencia.

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ATmega328P

Atmel

ATmega328P

8-bit AVR Microcontroller with 32K Bytes In-System Programmable Flash

DATASHEET

Features

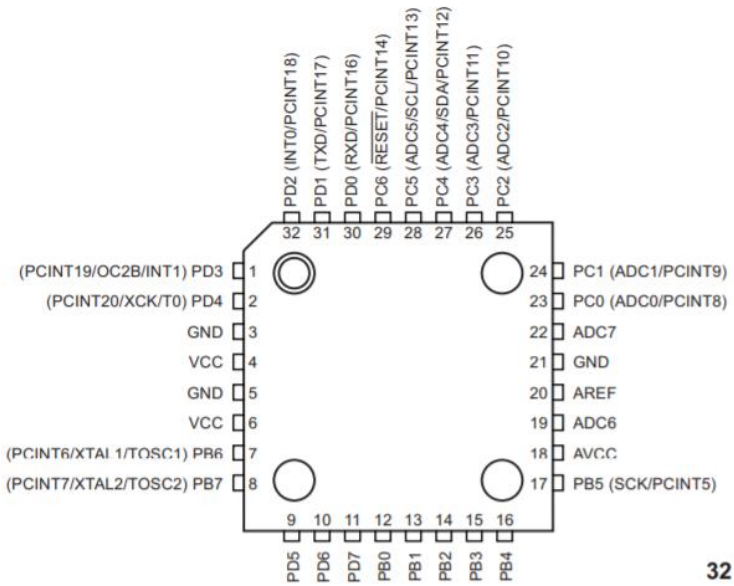
- High performance, low power AVR® 8-bit microcontroller
- Advanced RISC architecture
  - 131 powerful instructions – most single clock cycle execution
  - 32 × 8 general purpose working registers
  - Fully static operation
  - Up to 16MIPS throughput at 16MHz
  - On-chip 2-cycle multiplier
- High endurance non-volatile memory segments
  - 32K bytes of in-system self-programmable flash program memory
  - 1Kbytes EEPROM
  - 2Kbytes internal SRAM
  - Write/erase cycles: 10,000 flash/100,000 EEPROM
  - Optional boot code section with independent lock bits
    - In-system programming by on-chip boot program
    - True read-while-write operation
  - Programming lock for software security
- Peripheral features
  - Two 8-bit Timer/Counters with separate prescaler and compare mode
  - One 16-bit Timer/Counter with separate prescaler, compare mode, and capture mode
  - Real time counter with separate oscillator
  - Six PWM channels
  - 8-channel 10-bit ADC in TQFP and QFN/MLF package
    - Temperature measurement
  - Programmable serial USART
  - Master/slave SPI serial interface
  - Byte-oriented 2-wire serial interface (Phillips I^2C compatible)
  - Programmable watchdog timer with separate on-chip oscillator
  - On-chip analog comparator
  - Interrupt and wake-up on pin change

- Special microcontroller features
  - Power-on reset and programmable brown-out detection
  - Internal calibrated oscillator
  - External and internal interrupt sources
  - Six sleep modes: Idle, ADC noise reduction, power-save, power-down, standby, and extended standby
- I/O and packages
  - 23 programmable I/O lines
  - 32-lead TQFP, and 32-pad QFN/MLF
- Operating voltage:
  - 2.7V to 5.5V for ATmega328P
- Temperature range:
  - Automotive temperature range: –40°C to +125°C
- Speed grade:
  - 0 to 8MHz at 2.7 to 5.5V (automotive temperature range: –40°C to +125°C)
  - 0 to 16MHz at 4.5 to 5.5V (automotive temperature range: –40°C to +125°C)
- Low power consumption
  - Active mode: 1.5mA at 3V - 4MHz
  - Power-down mode: 1µA at 3V

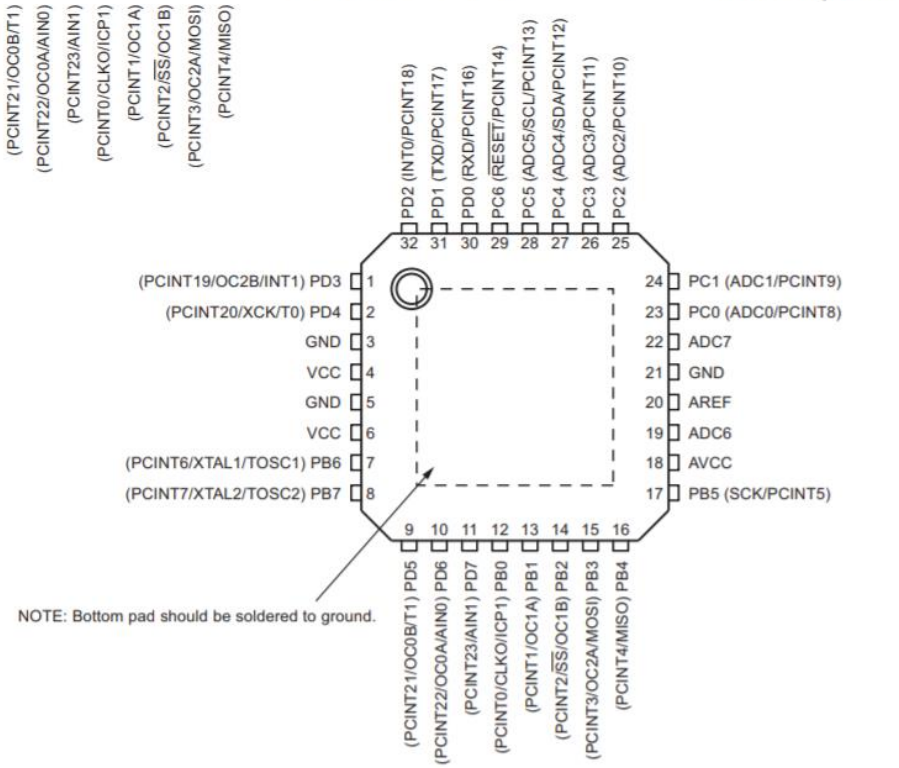
1. Pin Configurations

Figure 1-1. Pinout

TQFP Top View



32 MLF Top View



1.1 Pin Descriptions

1.1.1 VCC

Digital supply voltage.

1.1.2 GND

Ground.

1.1.3 Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Depending on the clock selection fuse settings, PB6 can be used as input to the inverting oscillator amplifier and input to the internal clock operating circuit.

Depending on the clock selection fuse settings, PB7 can be used as output from the inverting oscillator amplifier.

If the internal calibrated RC oscillator is used as chip clock source, PB7..6 is used as TOSC2..1 input for the asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

The various special features of port B are elaborated in Section 13.3.1 “Alternate Functions of Port B” on page 65 and Section 8. “System Clock and Clock Options” on page 24.

1.1.4 Port C (PC5:0)

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5..0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

1.1.5 PC6/$\overline{\text{RESET}}$

If the RSTDISBL fuse is programmed, PC6 is used as an input pin. If the RSTDISBL fuse is unprogrammed, PC6 is used as a reset input. A low level on this pin for longer than the minimum pulse length will generate a reset, even if the clock is not running. The minimum pulse length is given in Table 28-4 on page 261. Shorter pulses are not guaranteed to generate a reset.

The various special features of port C are elaborated in Section 13.3.2 “Alternate Functions of Port C” on page 68.

1.1.6 Port D (PD7:0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, port D pins that are externally pulled low will source current if the pull-up resistors are activated. The port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

The various special features of port D are elaborated in Section 13.3.3 “Alternate Functions of Port D” on page 70.

1.1.7 AV_{CC}

AV_{CC} is the supply voltage pin for the A/D converter, PC3:0, and ADC7:6. It should be externally connected to V_{CC}, even if the ADC is not used. If the ADC is used, it should be connected to V_{CC} through a low-pass filter. Note that PC6..4 use digital supply voltage, V_{CC}.

1.1.8 AREF

AREF is the analog reference pin for the A/D converter.

1.1.9 ADC7:6 (TQFP and QFN/MLF Package Only)

In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

1.2 Disclaimer

Typical values contained in this datasheet are based on simulations and characterization of actual ATmega328P AVR® microcontrollers manufactured on the typical process technology. automotive min and max values are based on characterization of actual ATmega328P AVR microcontrollers manufactured on the whole process excursion (corner run).

1.3 Automotive Quality Grade

The ATmega328P have been developed and manufactured according to the most stringent requirements of the international standard ISO-TS-16949. This data sheet contains limit values extracted from the results of extensive characterization (temperature and voltage). The quality and reliability of the ATmega328P have been verified during regular product qualification as per AEC-Q100 grade 1. As indicated in the ordering information paragraph, the products are available in only one temperature.

Table 1-1. Temperature Grade Identification for Automotive Products

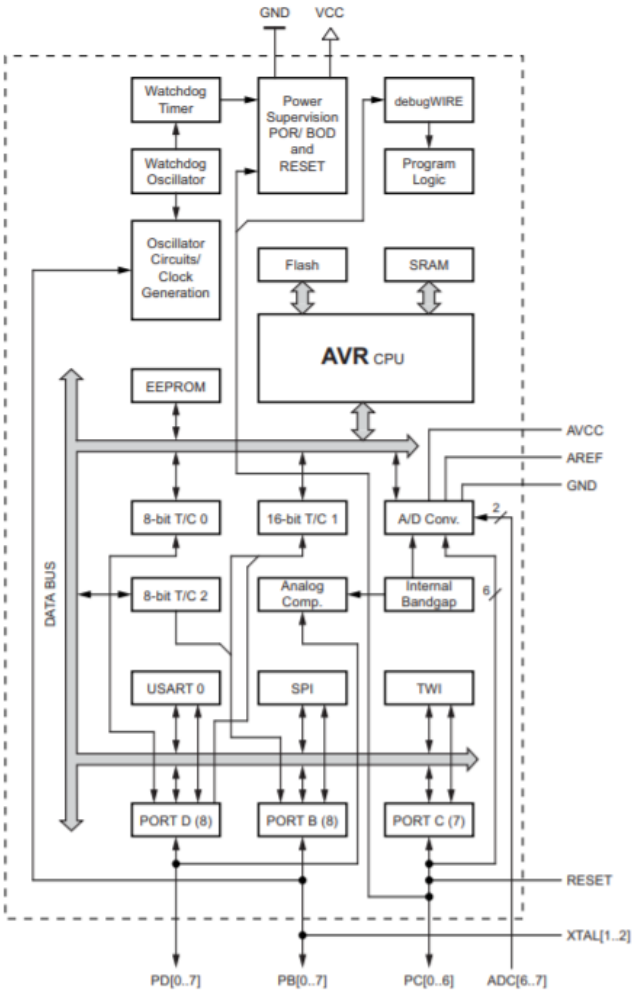
Temperature	Temperature Identifier	Comments
–40°C; +125°C	Z	Full automotive temperature range

2. Overview

The Atmel® ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs approaching 1MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

2.1 Block Diagram

Figure 2-1. Block Diagram



The AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the arithmetic logic unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The Atmel® ATmega328P provides the following features: 32K bytes of in-system programmable flash with read-while-write capabilities, 1K bytes EEPROM, 2K bytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte-oriented 2-wire serial interface, an SPI serial port, a 6-channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The idle mode stops the CPU while allowing the SRAM, Timer/Counters, USART, 2-wire serial interface, SPI port, and interrupt system to continue functioning. The power-down mode saves the register contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset. In power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC noise reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC, to minimize switching noise during ADC conversions. In standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption.

The device is manufactured using Atmel high density non-volatile memory technology. The on-chip ISP flash allows the program memory to be reprogrammed in-system through an SPI serial interface, by a conventional non-volatile memory programmer, or by an on-chip boot program running on the AVR core. The boot program can use any interface to download the application program in the application flash memory. Software in the boot flash section will continue to run while the application flash section is updated, providing true read-while-write operation. By combining an 8-bit RISC CPU with in-system self-programmable flash on a monolithic chip, the Atmel ATmega328P is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications.

The ATmega328P AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/simulators, in-circuit emulators, and evaluation kits.

BD139

BD135
BD139

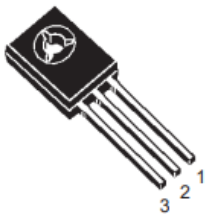
NPN SILICON TRANSISTORS

- STMicroelectronics PREFERRED SALESTYPES

DESCRIPTION

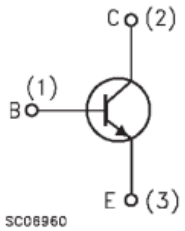
The BD135 and BD139 are silicon epitaxial planar NPN transistors in Jedec SOT-32 plastic package, designed for audio amplifiers and drivers utilizing complementary or quasi compementary circuits.

The complementary PNP types are BD136 and BD140 respectively.



SOT-32

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BD135	BD139	
V_{CBO}	Collector-Base Voltage (I_E = 0)	45	80	V
V_{CEO}	Collector-Emitter Voltage (I_B = 0)	45	80	V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	5		V
I_C	Collector Current	1.5		A
I_{CM}	Collector Peak Current	3		A
I_B	Base Current	0.5		A
P_{tot}	Total Dissipation at $T_c \leq 25$ °C	12.5		W
P_{tot}	Total Dissipation at $T_{amb} \leq 25$ °C	1.25		W
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

May 1999

BD135 / BD139

THERMAL DATA

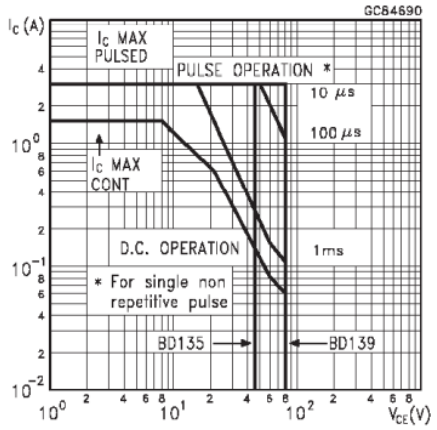
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	10	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cut-off Current (I_E = 0)	V_{CB} = 30 V V_{CB} = 30 V T_C = 125 °C			0.1 10	µA µA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	V_{EB} = 5 V			10	µA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage	I_C = 30 mA for **BD135** for **BD139**	 45 80			 V V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 0.5 A I_B = 0.05 A			0.5	V
V_{BE}*	Base-Emitter Voltage	I_C = 0.5 A V_{CE} = 2 V			1	V
h_{FE}*	DC Current Gain	I_C = 5 mA V_{CE} = 2 V I_C = 0.5 A V_{CE} = 2 V I_C = 150 mA V_{CE} = 2 V	25 25 40		 250	
h_{FE}	h_{FE} Groups	I_C = 150 mA V_{CE} = 2 V for BD139 group 10	 63		 160	

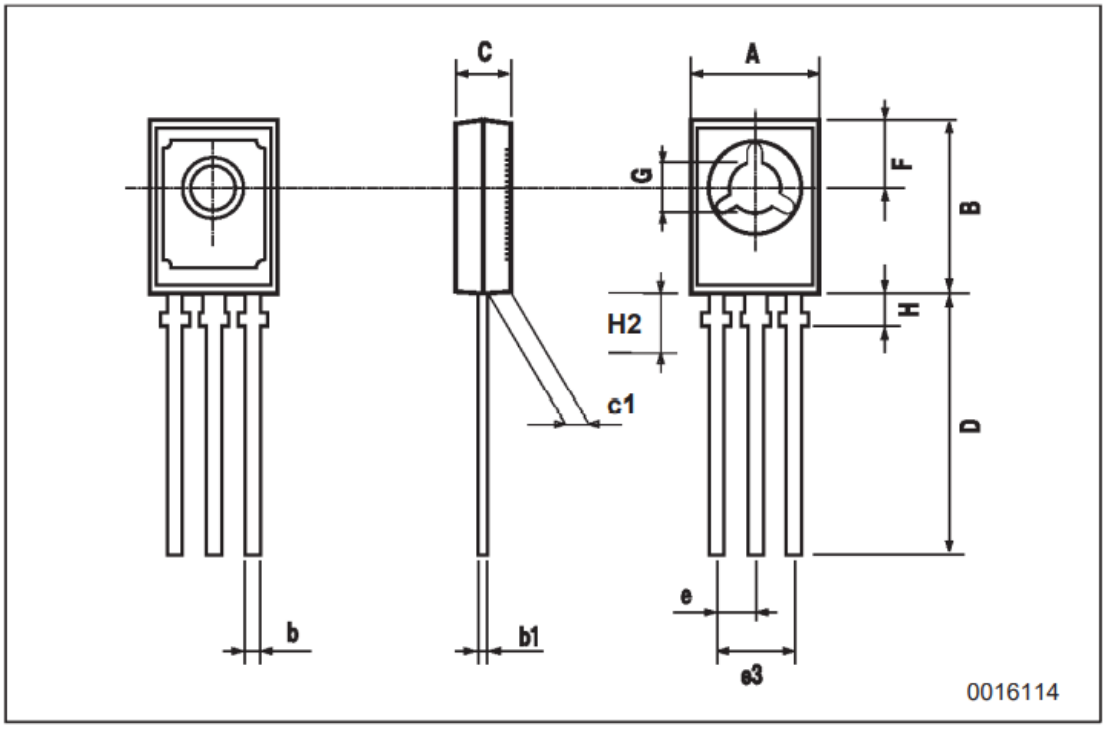
* Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

Safe Operating Area



SOT-32 (TO-126) MECHANICAL DATA

DIM.	mm			Inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		10.8	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.040		0.106
c1	1.0		1.3	0.039		0.050
D	15.4		16.0	0.606		0.629
e		2.2			0.087	
e3	4.15		4.65	0.163		0.183
F		3.8			0.150	
G	3		3.2	0.118		0.126
H			2.54			0.100



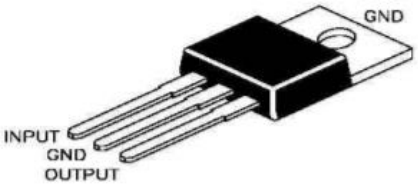
LM7805

Continental Device India Limited
An ISO/TS 16949, ISO 9001 and ISO 14001 Certified Company

3-TERMINAL POSITIVE VOLTAGE REGULATOR

LM7805

TO-220
Plastic Package



The Voltages Available allow these Regulators to be used in Logic Systems, Instrumentation, Hi-Fi Audio Circuits and other Solid State Electronic Equipment

ABSOLUTE MAXIMUM RATINGS

DESCRIPTION	SYMBOL	VALUE	UNIT
Input Voltage	V_{IN}	35	V
Continuous Total Dissipation at T_a=25°C free air Temperature	P_D	2.0	W
Continuous Total Dissipation at T_c=25°C case Temperature	P_D	15	W
Operating free-air, case, or Virtual Junction Temperature Range	T_{OPR}	0 to 150	°C
Storage Temperature Range	T_{stg}	- 65 to +150	°C
Lead Temperature 1.6mm (1/16 inch) from Case for 10 seconds	T_L	260	°C

ELECTRICAL CHARACTERISTICS (T_j=25°C unless specified otherwise)

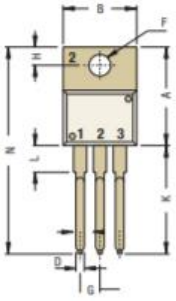
V_I=10V, I_O=500mA

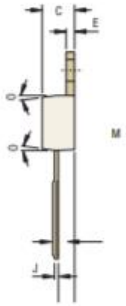
DESCRIPTION	SYMBOL	TEST CONDITION		MIN	TYP	MAX	UNIT
Output Voltage	V_O		T_j=25°C	4.80		5.20	V
		I_O=5mA ~ 1A V_I=7V ~ 20V, P≤ 15W	T_j=0 ~ 125°C	4.75		5.25	V
Line Regulation	R_{EGV}	V_I=7.0 ~ 25V	T_j=25°C			100	mV
		V_I=8.0 ~ 12V				50	mV
Ripple Rejection	R_R	V_I=8.0 ~ 18V, f=120Hz	T_j=0 ~ 125°C	62			dB
Load Regulation	R_{EGL}	I_O=5mA ~ 1.5A	T_j=25°C			100	mV
		I_O=250mA ~ 750mA				50	mV
Output Resistance	R_O	f=1KHz	T_j=0 ~ 125°C		0.017		Ω
Output Voltage Drift	$\Delta V_O/\Delta T$	I_O=5mA	T_j=0 ~ 125°C		- 1.1		mV/°C
Output Noise Voltage	V_{NO}	f=10Hz ~ 100KHz	T_j=25°C		40		µV
Dropout Voltage	V_d	I_O=1A	T_j=25°C		2.0		V
Quiescent Current	I_Q		T_j=25°C			8.0	mA
Quiescent Current Change	ΔI_Q	V_I=7.0 ~ 25V	T_j=0 ~ 125°C			1.3	mA
		I_O=5mA ~ 1A				0.5	mA
Short Circuit Output Current	I_{SC}		T_j=25°C		750		mA
Peak Output Current	I_{PK}		T_j=25°C		2.2		A

LM7805

TO-220
Plastic Package

TO-220
Leaded Plastic Package





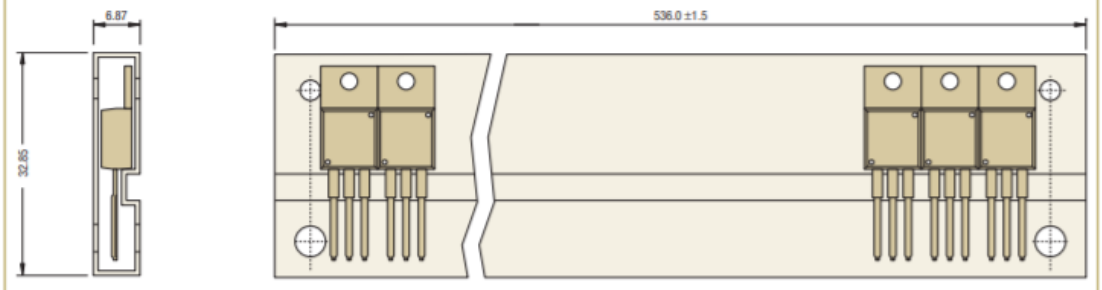
DIM	Min	Max
A	14.42	16.51
B	9.63	10.67
C	3.56	4.83
D	—	0.90
E	1.15	1.50
F	3.53	4.10
G	2.29	2.79

DIM	Min	Max
H	2.54	3.43
J	0.36	0.61
K	12.00	14.73
L	2.80	6.35
M	2.00	2.92
N	—	31.24
Q	7°	

Pin Configurations

Regulators **Pin 1: In** **Pin 2: Ground** **Pin 3: Out**

TO-220 Series Packaging Tube



Qty: 50 Pcs/Tube

Packaging dimensions, tube dimensions and quantity/tube are approximate and subject to change.

… Packaging Specifications

T & A: Tape and Ammo Pack; **T & R:** Tape and Reel; **Bulk:** Loose in Poly Bags; **Tube:** Tube and Carton; **K:** 1,000

Package / Case Type	Packaging Type	Std. Packing	Inner Carton			Outer Carton		
		Qty	Qty	Size L x W x H (cm)	Gross Weight (Kg)	Qty	Size L x W x H (cm)	Gross Weight (Kg)
TO-220	Bulk	1,000	1K	19 x 19 x 8	2.0	10K	46 x 38 x 22	21.6
	Tube	1,000 (50 pcs/tube)	1K	55 x 8 x 10	2.8	10K	55 x 35 x 27	28.3

AZDelivery OLED 0,96

1. Basic Specifications

- Module dimensions: 36 mm x 34 mm x 3 mm
- Dot Matrix: 128 x 64
- Pixel size: 0.21 mm × 0.21 mm
- Pixel pitch: 0.23 mm × 0.23 mm
- Display Mode: Passive Matrix
- Duty: 1/64 Duty
- Display Color: White
- Interface: I2C
- Power consumption: Less then 11mA
- Size: 1.3 inch

2. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	5.5	V	1,2
Operating Temperature	Top	-40	+85	°C	
Storage Temperature	Tstg	-40	+85	°C	3
Life Time (120cd/□)	--	10.000	--	hour	4
Life Time (80cd/□)	--	30.000	--	hour	4
Life Time (60cd/□)	--	50.000	--	hour	4

Note 1: All the above voltages are on the basis of "VSS = 0V".

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur.

Note 3: The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80 °C.

Note 4: Ta=25 °C., 50% Checkerboard.

End of lifetime is specified as 50% of initial brightness reached. The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

Page 3

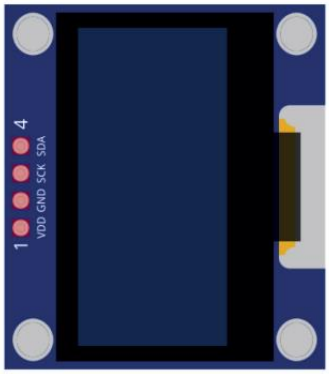
3. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage for Logic	V_{DD}	External Supply	3.0	3.3	5.0	V
Supply Voltage for Logic IO	V_{DDIO}	Internal Supply	3.0	--	3.3	V
High Level Input	V_{IH}	-	0.8xV_{DDIO}	--	V_{DDIO}	V
Low Level Input	V_{IL}	-	0	--	0.2xV_{DDIO}	V
High Level Output	V_{OH}	I_{OL} = 0.5 mA	0.8xV_{DDIO}	--	V_{DDIO}	V
Low Level Output	V_{OL}	I_{OH} = -0.5 mA	0	--	0.2xV_{DDIO}	V
Operating Current for V_{DD}	I_{DD}	Note 5	--	40	45	mA
Sleep Mode Current for V_{DD}	I_{DD}, Sleep	--	--	-	1	mA

Note 5: V_{DD} = 3.3V, 100% Display Area Turn on.

4. Pinout

I2C Serial Data Line - SDA
I2C Serial Clock Line - SCK
Ground - GND
Power Supply - VDD



These displays have an on-board 3.3V voltage regulator.

The pins of 1.3 inch OLED display can be connected to either 3.3V or 5V logic and power supply without risk of damaging display.

NOTE: When using these displays with Raspberry Pi, power supply is 3.3V.

MT3608

1. Features

- 2V to 24V Input Voltage
- 1.2MHz Fixed Switching Frequency
- Internal 4A Switch Current Limit
- Adjustable Output Voltage
- Internal Compensation
- Up to 28V Output Voltage
- Automatic Pulse Frequency Modulation Mode at Light Loads
- Up to 97% Efficiency
- Maximum output current: 2A
- Maximum output voltage: > 5V-28 v

Notes:
1. Input voltage should not exceed the maximum input voltage

2. Peak current output current does not exceed 2A

Page 3

2. Absolute Maximum Ratings

VIN, EN Voltages	-0.3V to 26V
FB Voltages	-0.3V to 6V
SW Voltage	-0.3V to 30V
Power Dissipation	0.6W
Thermal Resistance θ_{JC}	130 °C/W
Thermal Resistance θ_{JA}	250 °C/W
Junction Temperature	160 °C
Operating Temperature Range	-40 °C to 85 °C
Storage Temperature Range	-65 °C to 150 °C

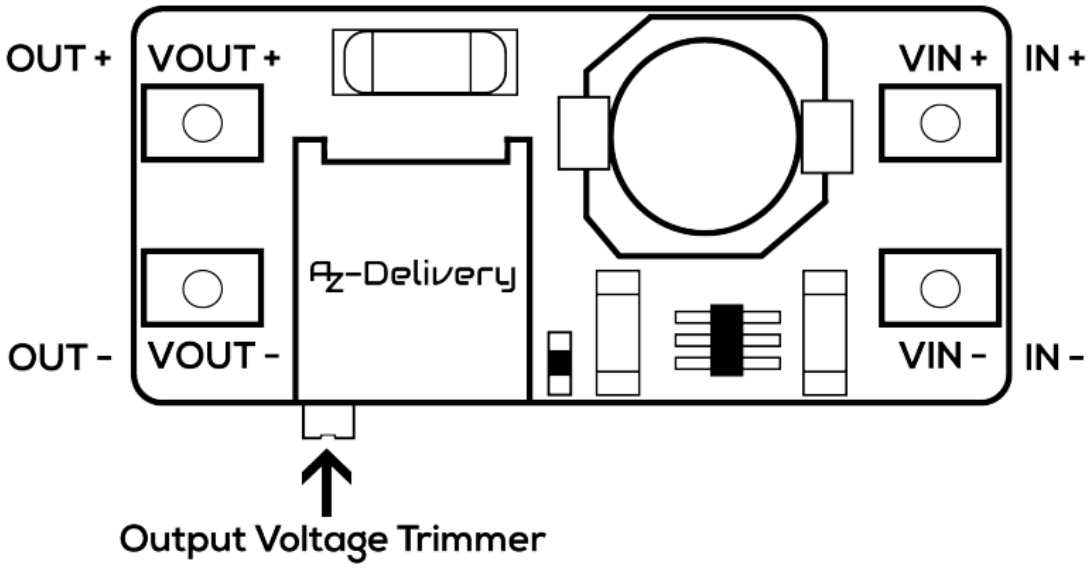
Page 4

3. Electrical Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Input Voltage		2		24	V
Under Voltage Lockout				1.98	V
Under Voltage Lockout Hysteresis			100		mV
Current (Shutdown)	V_{EN} = 0V		0.1	1	µA
Quiescent Current (PFM)	V_{FB} = 0.7V, No Switch		100	200	µA
Quiescent Current (PWM)	V_{FB} = 0.5V, Switch		1.6	2.2	mA
Switching Frequency			1.2		MHz
Maximum Duty Cycle	V_{FB} = 0V	90			%
EN Input High Voltage		1.5			V
EN Input Low Voltage				0.4	V
FB Voltage		0.588	0.6	0.612	V
FB Input Bias Current	V_{FB} = 0.6V	-50	-10		nA
SW On Resistance			80	150	mΩ
SW Current Limit	V_{IN} = 5V, Duty Cycle = 50%		4		A
SW Leakage	V_{SW} = 20V			1	µA
Thermal Shutdown			155		°C

Page 5

4. Module Pinout



Note:
Output Voltage Trimmer adjusts Voltage after 20 laps of screw turning.

Two modes of Trimmer adjustment are available:
1. Clockwise: Buck
2. Counterclockwise: Boost

Page 6

Li-Ion 18650

Li-ion Battery Technology Specification

Customer _____

Part name Li-ion Battery

Model No ICR18650 1800mAh 3.7V

Serial No _____

Produce No ***BAT-562***

Approved by		**Drafted by**	
Checked by		**Signed by**	
Prepared by		**Valid Date**	2017-06-29

- 1 - **If manufacturer want to modify the product technology specification, we won't inform you additionally)**

1. SCOPE

This specification governs the performance of the following battery Cylindrical Cell and its stack-up batteries.

2.SPECIFICATION

No.	Item	Characteristics	Remarks
1	Nominal Capacity	Minimum: 1710mAh Typical: 1800mAh	Standard discharge （0.2C_5A) after Standard charge
2	Nominal Voltage	3.7V	—
3	Charging Cut-off Voltage	4.2V	—
4	Discharge Cut-off Voltage	3.0V	—
5	Standard Charge	Constant Current 0.5C_5A Constant Voltage 4.2V 0.01 C_5A cut-off	Charge Time : Approx 4.0h
6	Maximum Constant Charging Current	1800mA	—
7	Standard Discharge	Discharge at 0.2 C_5A to 3.0V	—
8	Maximum Continuous Discharging Current	2700mA	
9	Operating Temperature	Charge 0～45℃ Discharge –20～60℃	—
10	Storage Temperature	-20～45℃ for 1Month -10～35℃ for 6Months	—
11	Storage Voltage	3.7-3.85V	—
12	Environmental request	RoHS	If the materials of the product and packaging accord with RoHS standard，there will be a RoHS Id on the box.

3. Dimensions

Please refer the drawing in appendix.

4. Appearance

No scratches, dirt, defect, leakage of electrolyte or gassing should be observed as a new product.

5. Standard Testing Environment

Temperature : 25±2℃
Relative humidity : 65±20%（unless specially requested）

6. Characteristics

6.1 Electrochemical performance characteristics

No.	Item	Testing Method	Requirements
1	Fully Charged State	CCCV or Constant current charge to 4.2V @0.5C follow by a constant voltage holding at 4.2V until current drops below 18±2mA.	—
2	Rated Capacity	0.5c CCCV 0.01c at 4.2V (per 6.1.1) at room temp. (20±5C), rest for 1-2 hrs then discharge at a constant current of 0.2C to 3.0V, testing will be terminated by either 5 cycles or any one discharge time exceeds 5 hrs	≥1710mAh
3	Cycle Life @25℃	Discharge to 3.0V @0.2C, then 0.5c CCCV 0.01C charge to 4.2V, rest for 10 min. discharge @ 0.2C to 3.0V and rest for 10 min. Continue the charge/discharge cycles until discharge capacity lower than 70% of rated capacity.	Cycle life ≥500
4	Internal Impedance	Internal impedance is measured on a 50% charged battery at 1KHz AC at ambient temperature（20±2）℃	—
5	Capacity Retention	Fully charge cells per 6.1.1, store them at (20±2)℃ for 28 days, then discharge the cells to 3.0V at 0.2C.	Discharge Capacity≥1440mAh
6	High Temperature Characteristics	Fully charge cells per 6.1.1, store them at (55±2)℃ for 2 hours, then discharge the cells to 3.0V at 0.2C.	Discharge Capacity≥1440mAh
7	Low Temperature Characteristics	Fully charge cells per 6.1.1, store them at (-10±2)℃ for 16~24 hours, then discharge the cells to 3.0V at 0.2C.	Discharge Capacity≥1080mAh
8	Cell Voltage during Transportation	Check open circuit voltage (OCV) of cells prior to the delivery to customers	≥3.75V

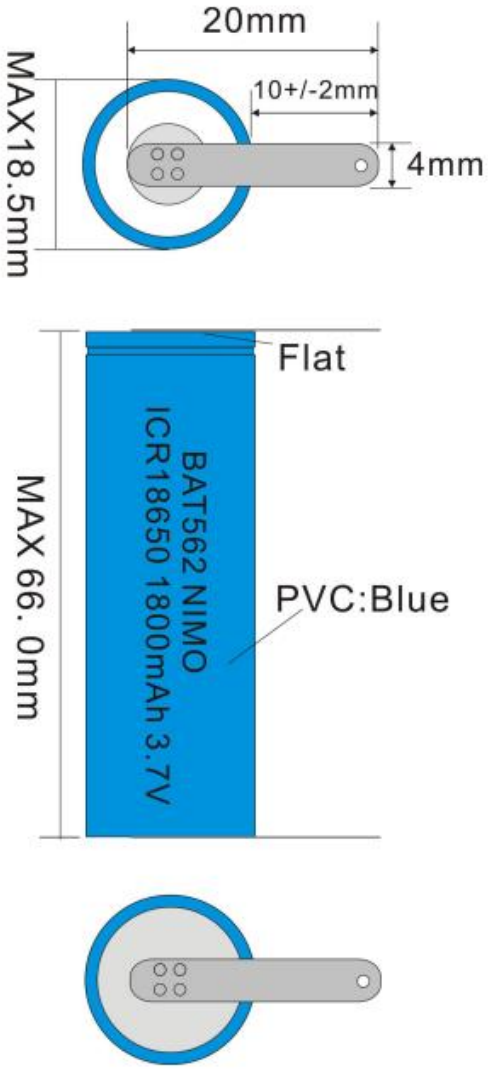
- 3 -

6.2 Safety characteristic

No.	Item	Test Method	Requirements
1	Over charge	Discharge cells to 2.4V at 0.2C, then charge to 4.45V at 3C and rest for 8 hours.	No fire No explosion No leakage
2	Overdischarge	Fully charge cells per 6.1.1, then discharge the battery to 3.0V with 0.2CmA at room temperature, connect with external load of 30Ω for 24 hours.	No fire No explosion No leakage
3	Hot Oven Test	Put a fully charged battery in a forced air oven and raise the temperature at 5±2℃/min. to130±2℃ Rest for10 minutes.	No fire No explosion No leakage

- 3 - **If manufacturer want to modify the product technology specification, we won't inform you additionally)**

11. Dimensions



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