■ General Description

The AME8861 family of positive, linear regulators feature low quiescent current (30μA typ.) with low dropout voltage, making them ideal for battery applications. The space-saving SOT-25 package is attractive for "Pocket" and "Hand Held" applications.

These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" of operating conditions.

In applications requiring a low noise, regulated supply, place a 1000 pF capacitor between Bypass and ground.

The AME8861 is stable with an output capacitance of 2.2μF or greater.

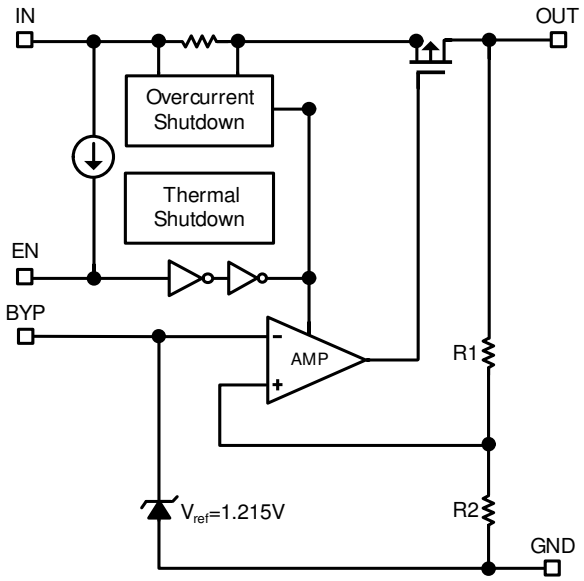
■ Features

- Very Low Dropout Voltage
- 600mA Output
- Accurate to within 1.5%
- 30μA Quiescent Current
- Over-Temperature Shutdown
- Current Limitings
- Short Circuit Current Fold-back
- Noise Reduction Bypass Capacitor
- Power-Saving Shutdown Mode
- Space-Saving SOT-25 Package
- Factory Pre-set Output Voltages
- LLow Temperature Coefficient
- All AME's Lead Free Products Meet RoHS Standards

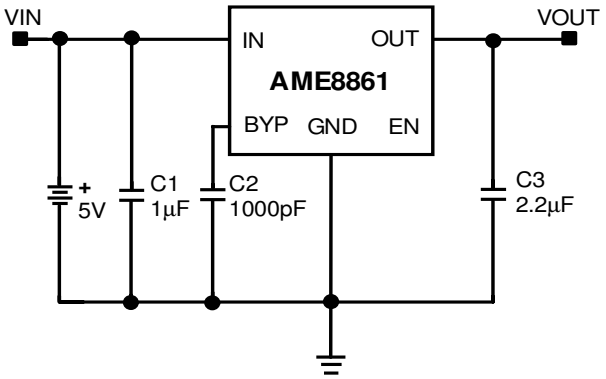
■ Applications

- Instrumentation
- Portable Electronics
- Wireless Devices
- Cordless Phones
- PC Peripherals
- Battery Powered Widgets
- Electronic Scales

■ Functional Block Diagram

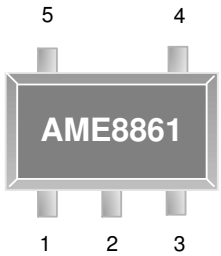


■ Typical Application



■ Pin Configuration

SOT-25
Top View



AME8861

1. IN
2. GND
3. EN
4. BYP
5. OUT

*** Die Attach:**
Conductive Epoxy

■ Ordering Information

AME8861 x x x x x x

- Special Feature
- Voltage
- Number of Pins
- Package Type
- Operating Ambient Temperature Range
- Pin Configuration

Pin Configuration	Operating Ambient Temperature Range	Package Type	Number of Pins	Output Voltage	Special Feature
A: 1. IN (SOT-25) 2. GND 3. EN 4. BYP 5. OUT	E: -40°C to +85°C	E: SOT-2X	V: 5	180: V=1.8V 250: V=2.5V 300: V=3.0V 330: V=3.3V	Z: Lead Free

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME8861AEEV180Z	BFNww	1.8V	SOT-25	- 40°C to + 85°C
AME8861AEEV250Z	AXCww	2.5V	SOT-25	- 40°C to + 85°C
AME8861AEEV300Z	AWGww	3.0V	SOT-25	- 40°C to + 85°C
AME8861AEEV330Z	AXBww	3.3V	SOT-25	- 40°C to + 85°C

Note: ww represents the date code and pls refer to date Code Rule before Package Dimension.
* A line on top of the first character represents lead free plating such as $\overline{B}$FNww.
Please consult AME sales office or authorized Rep./Distributor for the availability of output voltage and package type.

■ Absolute Maximum Ratings

Parameter	Maximum	Unit
Input Voltage	8	V
Output Current	P_D / (V_{IN} - V_O)	A
Input, Output Voltage	GND - 0.3 to V_{IN} + 0.3	V
ESD Classification	B*	

Caution: Stress above the listed absolute maximum rating may cause permanent damage to the device.
* HBM B:2000V~3999V

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Ambient Temperature Range	T_A	- 40 to +85	°C
Junction Temperature Range	T_J	- 40 to +125	°C
Storage Temperature Range	T_{STG}	- 65 to +150	°C

■ Thermal Information

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	SOT-25	Conductive Epoxy	θ_{JC}	81	°C / W
Thermal Resistance (Junction to Ambient)			θ_{JA}	260	
Internal Power Dissipation			P_D	400	mW
Maximum Junction Temperature				150	°C
Solder Iron (10 Sec)**				350	°C

* Measure θ_{JC} on center of molding compound if IC has no tab.
** MIL-STD-202G 210F

■ Electrical Specifications

T_A = 25°C unless otherwise noted.

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
Input Voltage	V_{IN}			Note 1		7	V
Output Voltage Accuracy	V_O	I_O=1mA		-1.5		1.5	%
Dropout Voltage	$V_{DROPOUT}$	I_O=600mA V_O=$V_{O(NOM)}$ -2.0%	1.3V<$V_{O(NOM)}$<=1.4V		See chart	1900	mV
			1.4V<$V_{O(NOM)}$<=2.0V			1400	
			2.0V<$V_{O(NOM)}$<=2.8V			800	
			2.8V<$V_{O(NOM)}$			600	
Output Current	I_O	V_O>1.2V		600			mA
Current Limit	I_{LIM}	V_O>1.2V		600	800		mA
Short Circuit Current	I_{SC}	V_O<0.8V			300	600	mA
Quiescent Current	I_Q	I_O=0mA			30	50	µA
Ground Pin Current	I_{GND}	I_O=1mA to 600mA			35		µA
Line Regulation	REG_{LINE}	I_O=1mA V_{IN}=V_O+1 to V_O+2	1.3V<=V_O<=1.4V	-0.2		0.2	%
			1.4V<V_O <=2.0V	-0.15		0.15	
			2.0V<V_O< 4.0V	-0.1	0.02	0.1	
			V_O>=4.0V	-0.4	0.2	0.4	
Load Regulation	REG_{LOAD}	I_O=1mA to 600mA			0.2	1	%
Over Temperature Shutdown	OTS				150		°C
Over Temperature Hysterisis	OTH				30		°C
V_O Temperature Coefficient	TC				30		ppm/°C
Power Supply Rejection	PSRR	I_O=100mA C_O=2.2µF ceramic C_{BYP}=0.01µF	f=1kHz		75		dB
			f=10kHz		55		
			f=100kHz		30		
Output Voltage Noise	eN	f=10Hz to 100kHz I_O=10mA, C_{BYP}=0.01µF	Co=2.2µF		30		µVrms

■ Electrical Specifications (Contd.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
EN Input Threshold	V_{EH}	V_{IN}=2.7V to 7V	2.0		Vin	V
	V_{EL}	V_{IN}=2.7V to 7V	0		0.4	V
EN Input Bias Current	I_{EH}	V_{EN}=V_{IN}, V_{IN}=2.7V to 7V			0.1	μA
	I_{EL}	V_{EN}=0V, V_{IN}=2.7V to 7V			0.5	μA
Shutdown Supply Current	I_{SD}	V_{IN}=5V, V_O=0V, V_{EN}<V_{EL}		0.5	1	μA
PG Leakage Current	I_{LC}	V_{PG}=7V			1	μA

Note1: $V_{IN(MIN)}$=V_{OUT}+$V_{DROPOUT}$

Note2: To prevent the Short Circuit Current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.

■ Detailed Description

The AME8861 family of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, and thermal shutdown.

The P-channel pass transistor receives data from the error amplifier, over-current shutdown, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150°C, or the current exceeds 600mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

The AME8861 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The AME8861 also incorporates current foldback to reduce power dissipation when the output is short circuited. This feature becomes active when the output drops below 0.8 volts, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8 volts.

■ External Capacitors

The AME8861 is stable with an output capacitor to ground of 2.2μF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1μF ceramic capacitor with a 10μF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost.

A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 0.1μF to have a beneficial effect.

A third capacitor can be connected between the BYPASS pin and GND. This capacitor can be a low cost Polyester Film variety between the value of 0.001 ~ 0.01μF. A larger capacitor improves the AC ripple rejection, but also makes the output come up slowly. This "Soft" turn-on is desirable in some applications to limit turn-on surges.

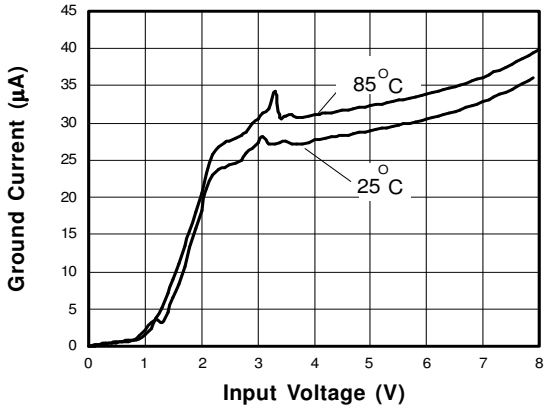
All capacitors should be placed in close proximity to the pins. A "Quiet" ground termination is desirable. This can be achieved with a "Star" connection.

■ Enable

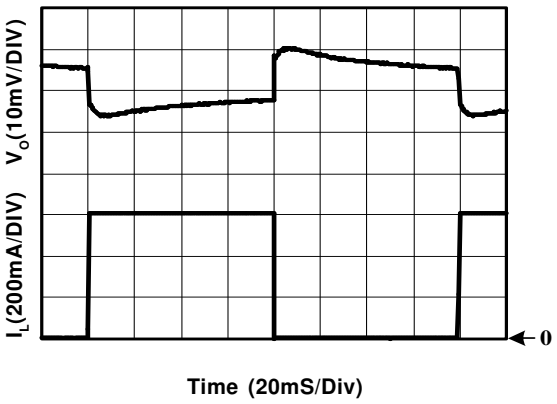
The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1μA. This pin behaves much like an electronic switch.

■ Characterization Curve

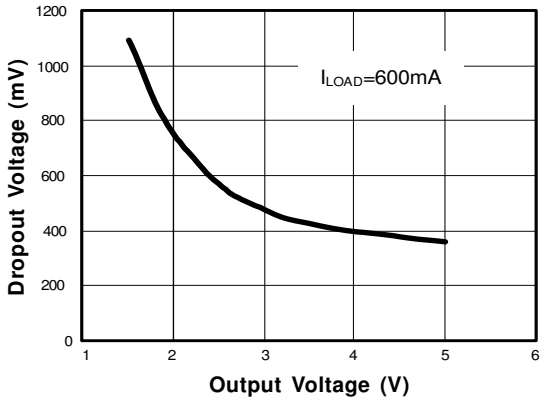
Ground Current vs. Input Voltage



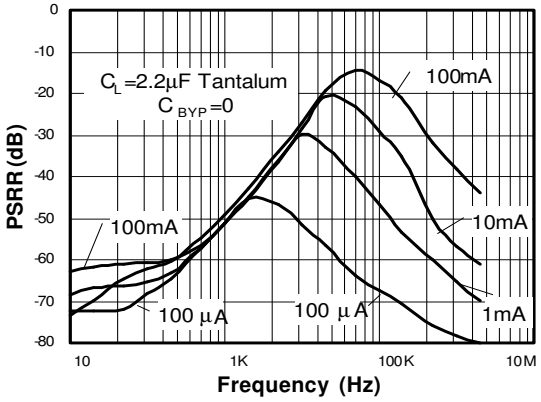
Load Step (1mA-600mA)



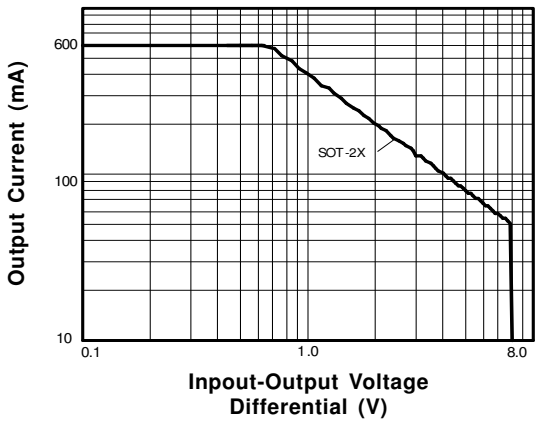
Dropout Voltage vs. Output Voltage



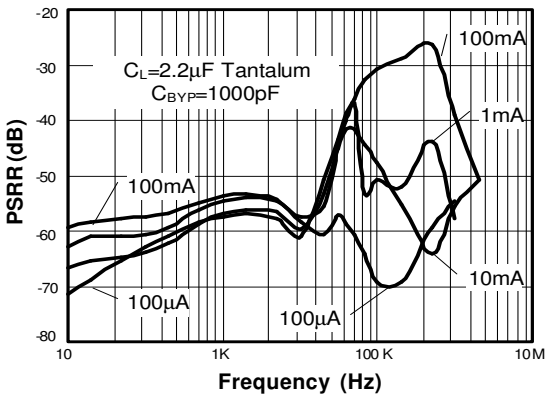
Power Supply Rejection Ratio



Safe Operating Area

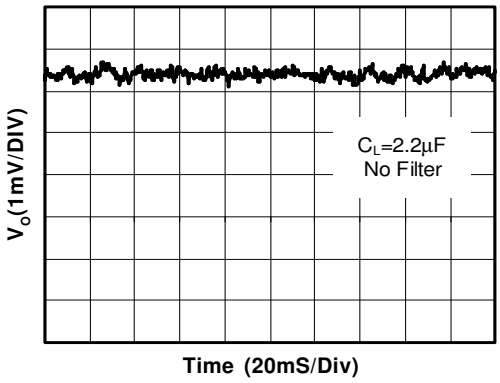


Power Supply Rejection Ratio

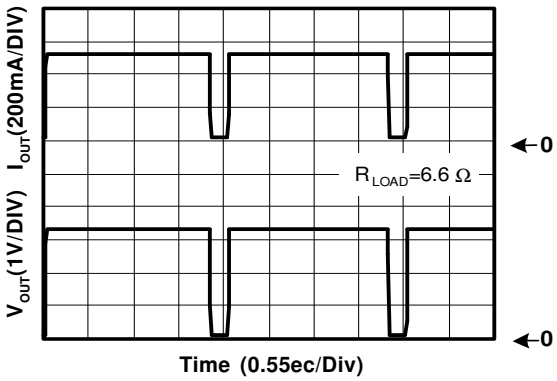


■ Characterization Curve (Contd.)

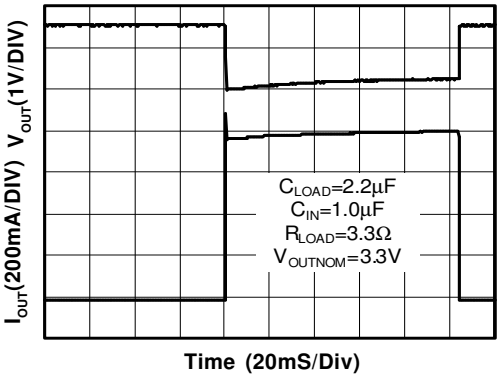
Noise Measurement



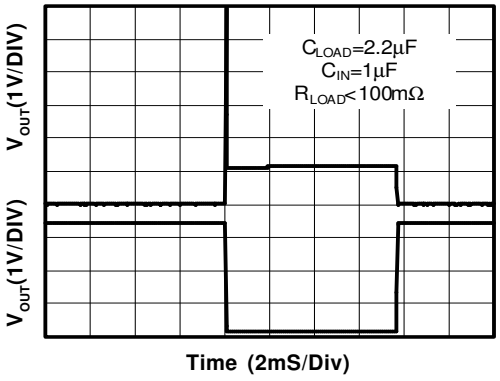
Overtemperature Shutdown



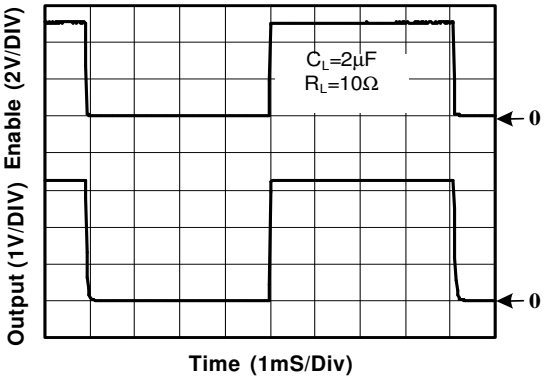
Current Limit Response



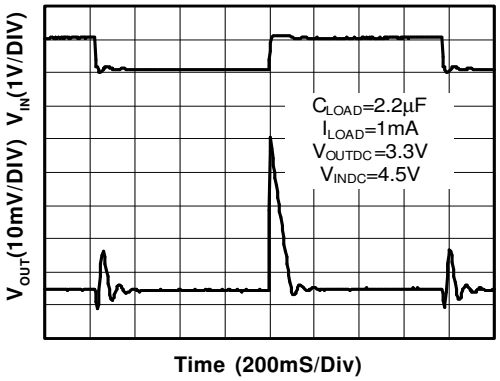
Short Circuit Response



Chip Enable Transient Response



Line Transient Response

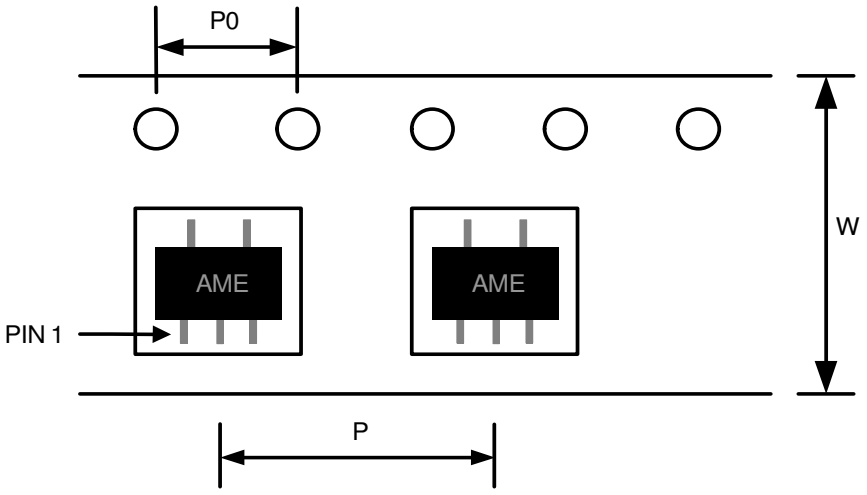


■ Date Code Rule

Marking			Date Code		Year
A	A	A	W	W	xxx0
A	A	A	W	W	xxx1
A	A	A	W	W	xxx2
A	A	A	W	W	xxx3
A	A	A	W	W	xxx4
A	A	A	W	W	xxx5
A	A	A	W	W	xxx6
A	A	A	W	W	xxx7
A	A	A	W	W	xxx8
A	A	A	W	W	xxx9

■ Tape and Reel Dimension

SOT-25

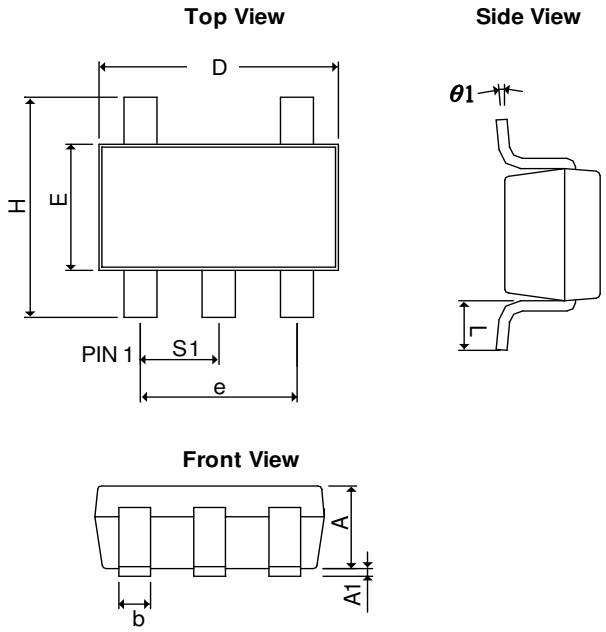


Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
SOT-25	8.0±0.1 mm	4.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

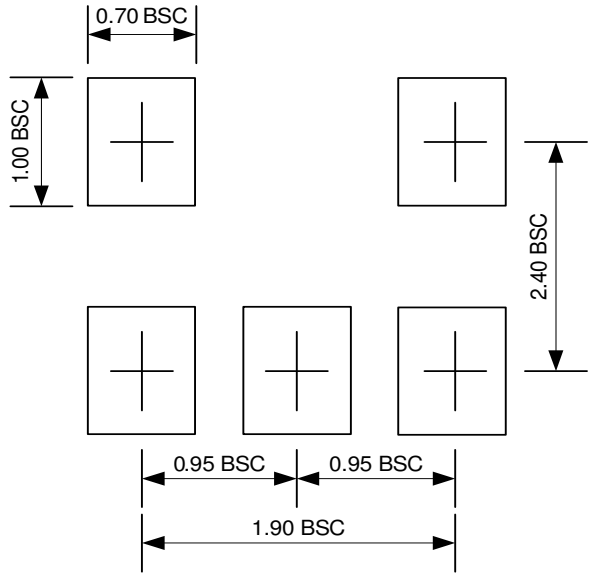
■ Package Dimension

SOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.30	0.0354	0.0512
A_1	0.00	0.15	0.0000	0.0059
b	0.30	0.55	0.0118	0.0217
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.0748 BSC	
H	2.60	3.00	0.1024	0.1181
L	0.37 BSC		0.0146 BSC	
θ1	0°	10°	0°	10°
S_1	0.95 BSC		0.0374 BSC	

■ Lead Pattern



Note:

1. Lead pattern unit description:
   BSC: Basic. Represents theoretical exact dimension or dimension target.
2. Dimensions in Millimeters.
3. General tolerance ±0.05mm unless otherwise specified.

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