

■ INTRODUCTION

The HM1138 series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, ultra low noise, low power consumption and low dropout voltage, which can prolong battery life in portable electronics. The HM1138 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The HM1138 series consume less than 0.1 μ A in shutdown mode and have fast turn-on time less than 50 μ S. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

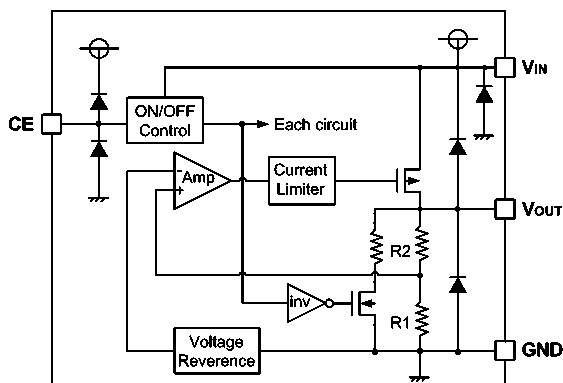
■ APPLICATIONS

- Cellular and Smart Phones
- Laptop, Palmtops and PDA
- Digital Still and Video Cameras

■ FEATURES

- Low Output Noise: 40 μ V_{RMS} (10Hz~100kHz)
- Low Dropout Voltage: 150mV@150mA
- Low Quiescent Current: 50 μ A
- High Ripple Rejection: 75dB@1kHz
- Excellent Line and Load Transient Response
- Operating Voltage Range: 2.0V~6.0V
- Output Voltage Range: 1.0V ~ 5.0V
- High Accuracy: $\pm 2\%$ (Typ.)
- Built-in Current Limiter, Short-Circuit Protection
- TTL- Logic-Controlled Shutdown Input

■ BLOCK DIAGRAM



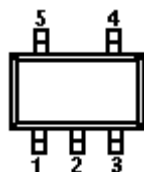
■ ORDER INFORMATION

HM1138B_①_②

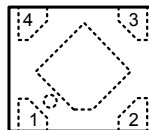
DESIGNATOR	SYMBOL	DESCRIPTION
①	Integer	Output Voltage e.g. 1.8V=18
②	Package:SOT23-5 : MR	
	Package:DFN1×1-4 : DR	

■ PIN CONFIGURATION

SOT23-5



DFN1×1-4



SOT-23-5

PIN NUMBER	SYMBOL	FUNCTION
1	V_{IN}	Power Input Pin
2	V_{SS}	Ground
3	CE	Chip Enable Pin
4	NC	No Connection
5	V_{OUT}	Output Pin

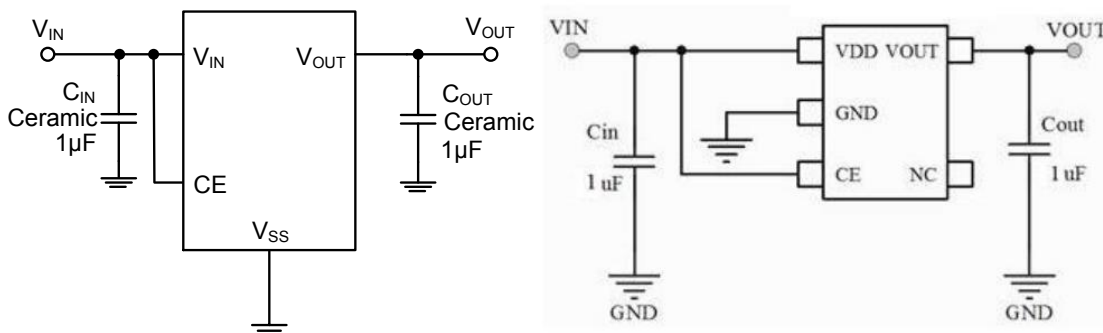
DFN1×1-4

PIN NUMBER	SYMBOL	FUNCTION
1	V_{OUT}	Output Pin
2	V_{SS}	Ground
3	CE	Chip Enable Pin
4	V_{IN}	Power Input Pin

■ Marking information

MARKING		
VOLTAGE(V)	Package	
	DFN1X1	SOT23-5
1.2	√	√
1.5	√	√
1.8	√	√
2.5	√	√
2.8	√	√
3.0	√	√
3.3	√	√

■ TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

(Unless otherwise specified, $T_A=25^{\circ}\text{C}$)

PARAMETER	SYMBOL	RATINGS	UNITS
Input Voltage ⁽²⁾	V_{IN}	-0.3~ 7	V
Output Voltage ⁽²⁾	V_{OUT}	-0.3~ $V_{IN}+0.3$	V
Output Current	I_{OUT}	500	mA
Power Dissipation	SOT23-5	P_D	0.4
	DFN1X1-4		0.4
Operating free air temperature range	T_A	-40~85	$^{\circ}\text{C}$
Operating Junction Temperature Range ⁽³⁾	T_j	-40~125	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-40~125	$^{\circ}\text{C}$
Lead Temperature(Soldering, 10 sec)	T_{solder}	260	$^{\circ}\text{C}$
Package Thermal Resistance (θ_{JA})	SOT23-5	285	$^{\circ}\text{C} / \text{W}$
	DFN1X1-4	280	$^{\circ}\text{C} / \text{W}$
ESD rating ⁽⁴⁾	Human Body Model -(HBM)	4	kV
	Machine Model- (MM)	200	V

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltages are with respect to network ground terminal.

(3) This IC includes over temperature protection that is intended to protect the device during momentary overload. Junction temperature will exceed 125°C when over temperature protection is active. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

(4) ESD testing is performed according to the respective JESD22 JEDEC standard.

The human body model is a 100 pF capacitor discharged through a $1.5\text{k}\Omega$ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

■ **RECOMMENDED OPERATING CONDITIONS**

PARAMETER	MIN.	NOM.	MAX.	UNITS
Supply voltage at V_{IN}	2		6	V
Operating junction temperature range, T_j	0		125	°C
Operating free air temperature range, T_A	0		85	°C

■ **ELECTRICAL CHARACTERISTICS**

HM1138 Series ($V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$, $T_A=25^\circ C$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP. ⁽⁶⁾	MAX.	UNITS
Output Voltage	$V_{OUT(E)}^{(7)}$	$I_{OUT}=1mA$	$V_{OUT}^{(8)}$ *0.98	$V_{OUT}^{(8)}$	$V_{OUT}^{(8)}$ *1.02	V
Supply Current	I_{SS}	$I_{OUT}=0$		50	100	μA
Standby Current	I_{STBY}	$CE = V_{SS}$			0.1	μA
Output Current	I_{OUT}	—	300			mA
Dropout Voltage	$V_{DO}^{(9)}$	$I_{OUT}=150mA$ $V_{OUT}\geq 2.8V$		150		mV
Load Regulation	ΔV_{OUT}	$V_{IN}=V_{OUT}+1V$, $1mA\leq I_{OUT}\leq 100mA$		10		mV
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	$I_{OUT}=10mA$ $V_{OUT}+1V\leq V_{IN}\leq 6V$		0.01	0.2	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T \times V_{OUT}}$	$I_{OUT}=10mA$ $-40\leq T\leq +85$		100		ppm
Short Current	I_{Short}	$V_{OUT}=V_{SS}$		100		mA
Input Voltage	V_{IN}	—	2.0		6.0	V
Power Supply Rejection Rate	217Hz	$PSRR$ $I_{OUT}=50mA$		-80		dB
	1kHz			-75		
	10kHz			-70		
CE "High" Voltage	$V_{CE"H"}$		1.5		V_{IN}	V
CE "Low" Voltage	$V_{CE"L"}$				0.3	V
C_{OUT} Auto-Discharge Resistance	$R_{DISCHRG}$	$V_{IN}=5V$, $V_{OUT}=3.0V$, $V_{CE}=V_{SS}$		80		Ω

(6) Typical numbers are at 25°C and represent the most likely norm.

(7) $V_{OUT(E)}$: Effective Output Voltage (i.e. The output voltage when $V_{IN} = (V_{OUT} + 1.0V)$ and maintain a certain I_{OUT} Value).

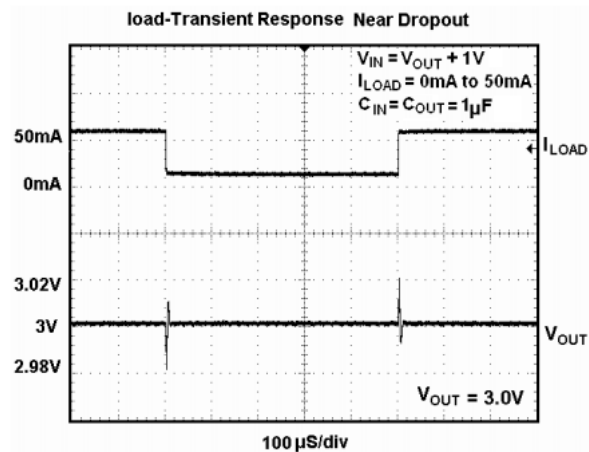
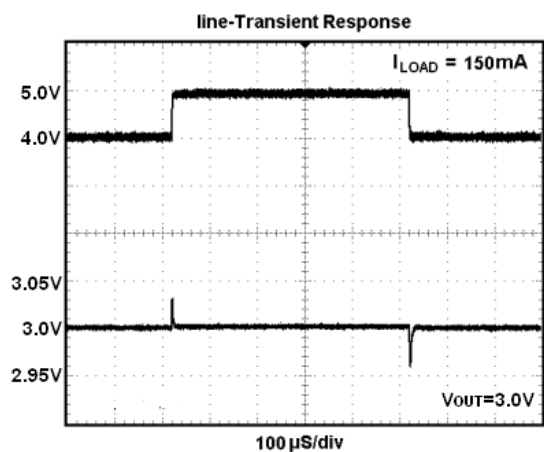
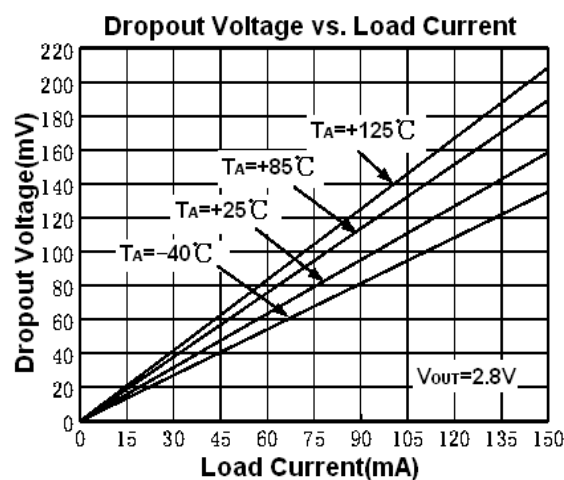
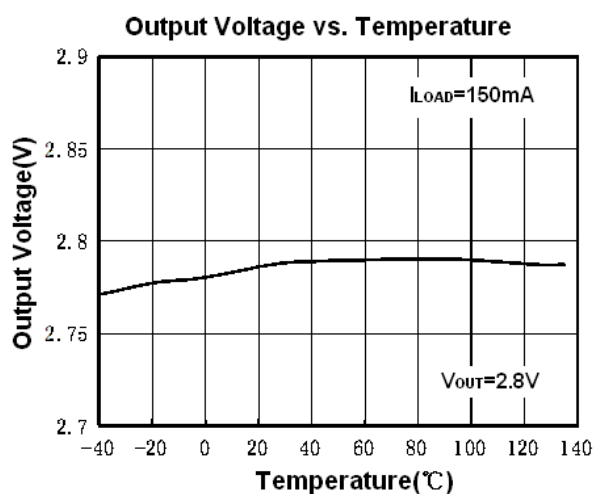
(8) V_{OUT} : Specified Output Voltage.

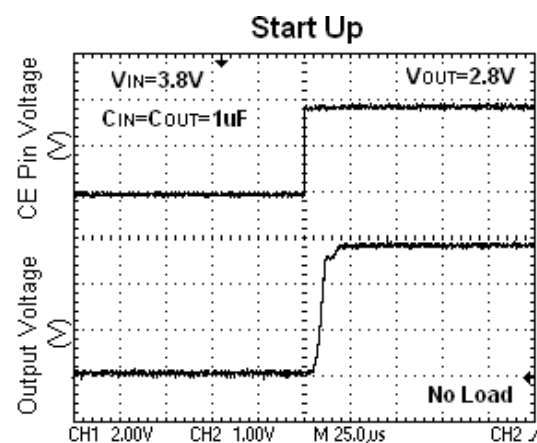
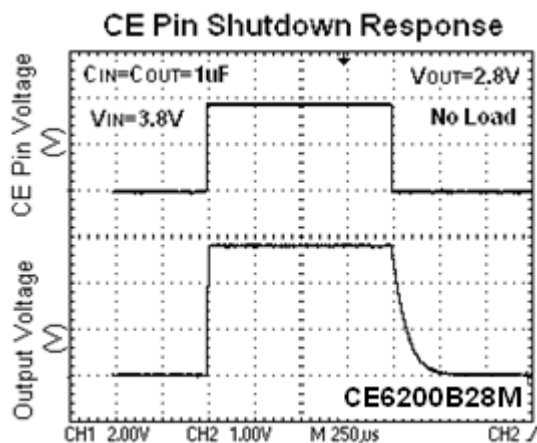
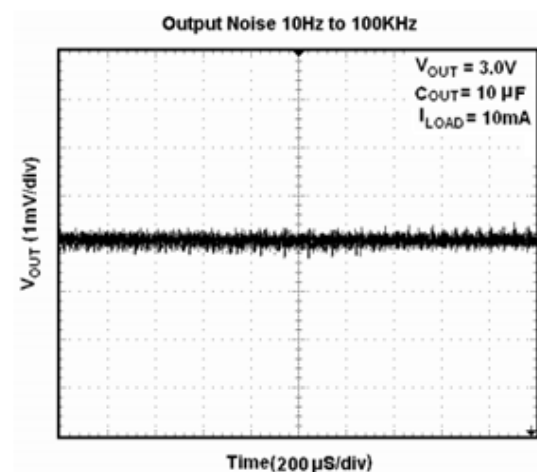
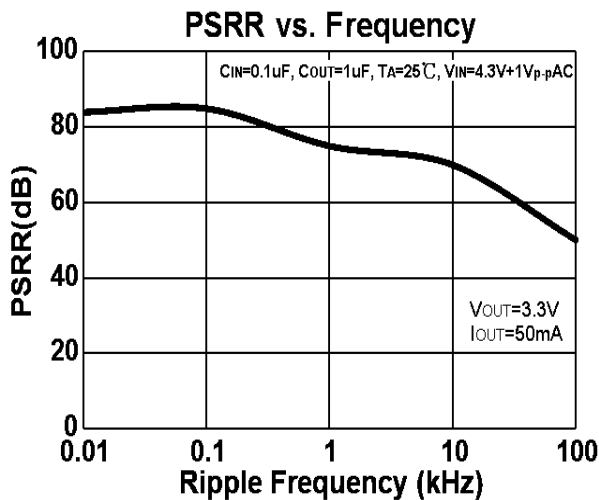
(9) V_{DO} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of $V_{OUT(E)}$.

■ DROPOUT VOLTAGE CHART

Setting Output Voltage	Dropout Voltage(mV)@ $I_{OUT}=150mA$	
$V_{OUT}(V)$	Typ.	Max.
1.2	380	600
1.5	270	600
1.8	230	600
2.5	180	400
2.8	160	220
3.0	155	220

■ TYPICAL PERFORMANCE CHARACTERISTICS





COUT Auto-Discharge Function

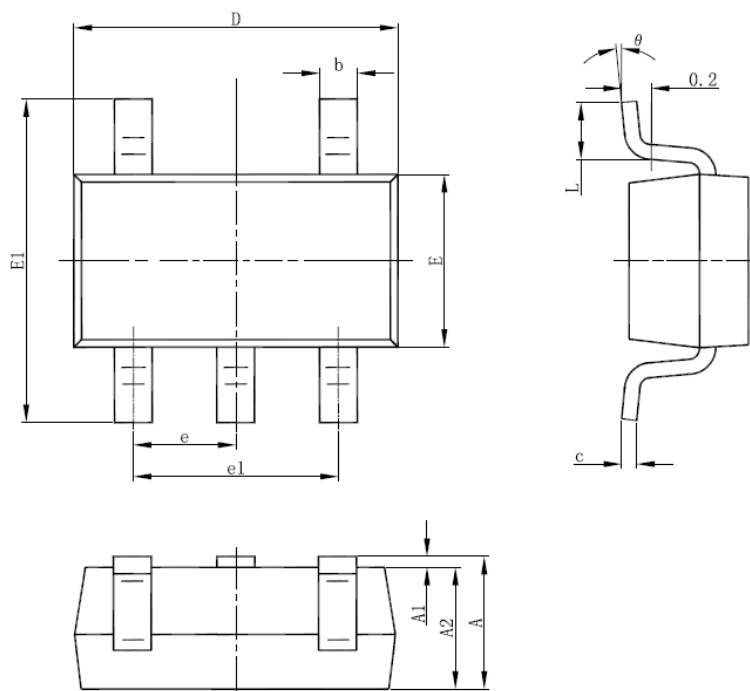
HM1138 with enable series can discharge the electric charge in the output capacitor (COUT), when a low signal to the CE pin, which enables a whole IC circuit turn off, is inputted via the N-channel transistor located between the VOUT pin and the VSS pin (cf. BLOCK DIAGRAM). The COUT auto-discharge resistance value is set at 80Ω (VOUT=3.0V @ VIN=5.0V at typical). The discharge time of the output capacitor (COUT) is set by the COUT auto-discharge resistance (R) and the output capacitor (COUT). By setting time constant of a COUT auto-discharge resistance value [RDISCHRG] and an output capacitor value (COUT) as τ ($\tau = C \times R_{DISCHRG}$), the output voltage after discharge via the N-channel transistor is calculated by the following formulas.

$$V = V_{OUT(E)} \times e^{-t/\tau}, \text{ or } t = \tau \ln(V / V_{OUT(E)})$$

(V : Output voltage after discharge, VOUT(E) : Output voltage, t: Discharge time,

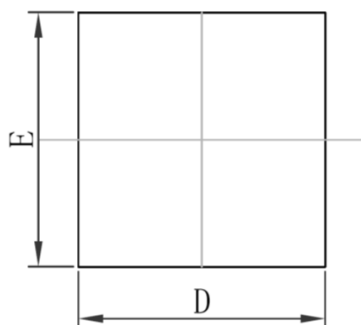
τ : COUT auto-discharge resistance RDISCHRG×Output capacitor (COUT) value C)

• SOT-23-5 PACKAGE OUTLINE DIMENSIONS

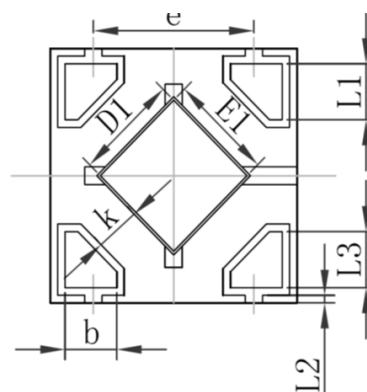


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

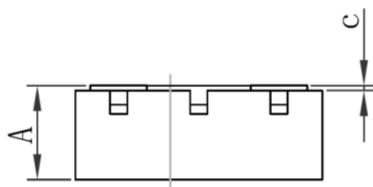
● DFN1×1-4 PACKAGE OUTLINE DIMENSIONS



TOP VIEW
[顶视图]

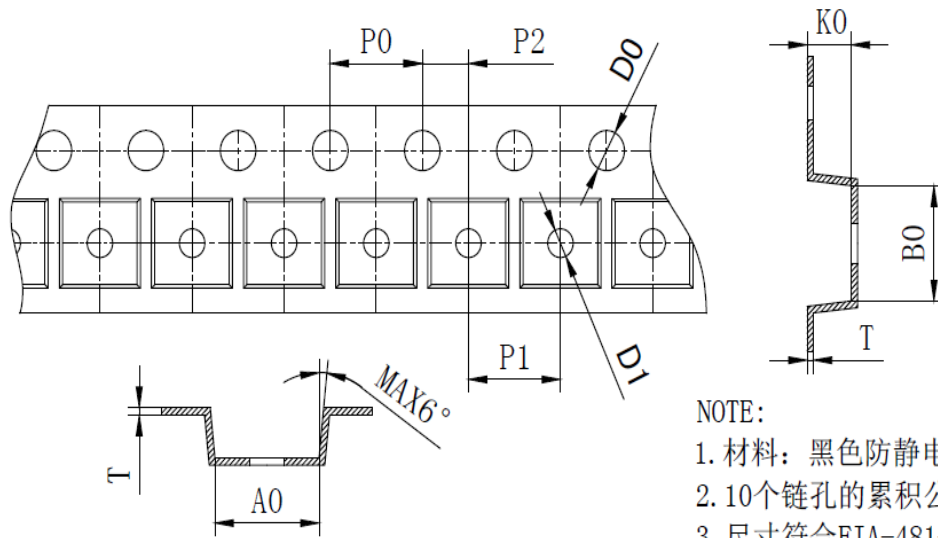


BOTTOM VIEW
[背视图]



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.335	0.405	0.013	0.016
D	0.950	1.050	0.037	0.041
E	0.950	1.050	0.037	0.041
D1	0.370	0.470	0.015	0.019
E1	0.370	0.470	0.015	0.019
k	0.17MIN.		0.007MIN.	
b	0.160	0.260	0.006	0.010
c	0.010	0.090	0.000	0.004
e	0.600	0.700	0.024	0.028
L1	0.185	0.255	0.007	0.010
L2	0.030 REF.		0.001 REF.	
L3	0.185	0.255	0.007	0.010

● Taping dimension



NOTE:

1. 材料：黑色防静电材料；
2. 10个链孔的累积公差不能超过 ± 0.2 ；
3. 尺寸符合EIA-481-E的要求。

SYMBOL	A0	B0	K0	P0	P1	P2
SPEC	3.30 ± 0.10	3.20 ± 0.10	1.50 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05
SYMBOL	T	E	F	D0	D1	W
SPEC	0.20 ± 0.05	1.75 ± 0.10	3.50 ± 0.05	1.55 ± 0.05	$1.10^{+0.10}_{-0}$	$8.00^{+0.2}_{-0.1}$

8mm&12mm 7" 英寸卷盘
8mm&12mm 7" carrier tape reel

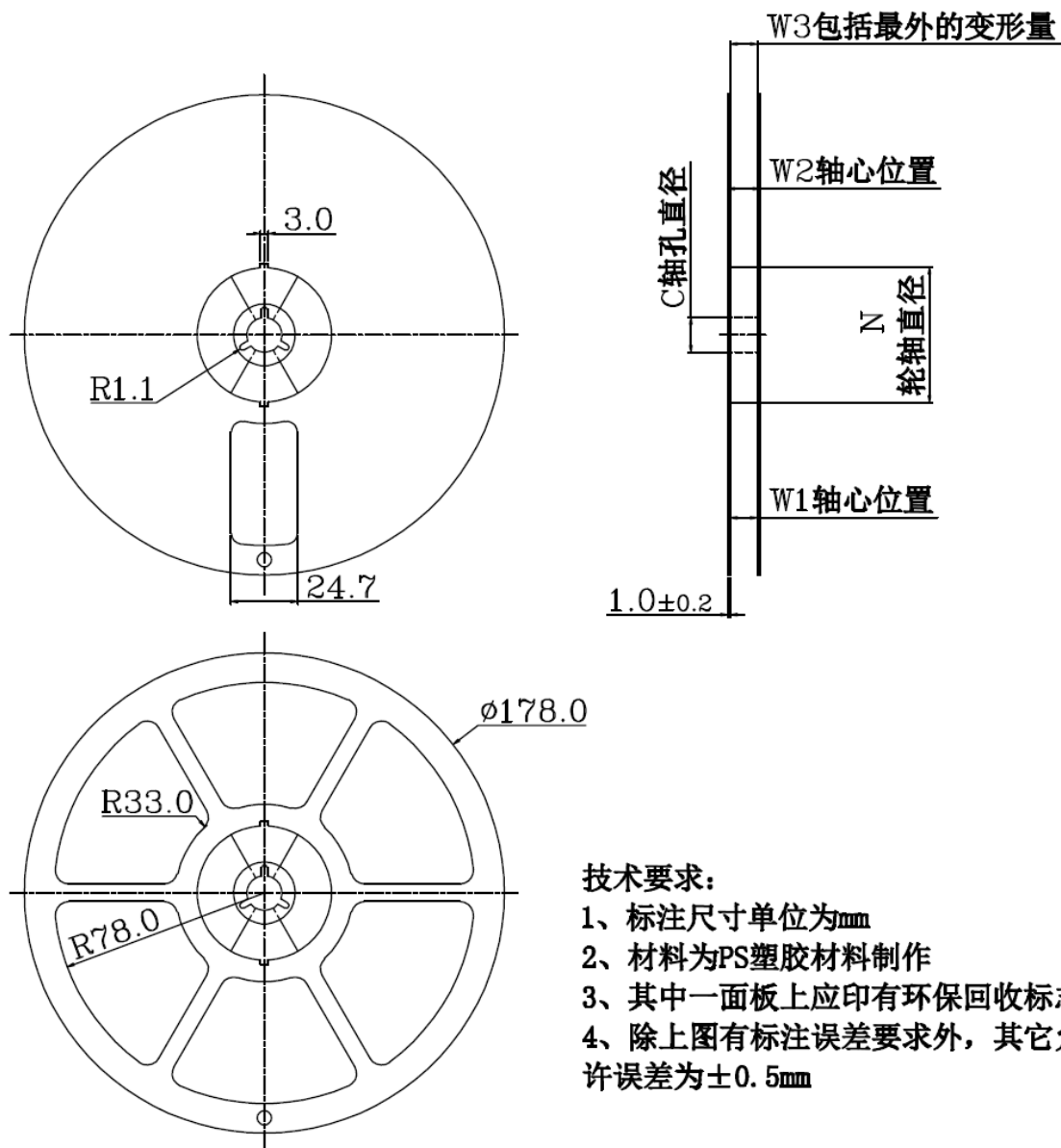
规格:蓝色7寸*8mm

DWG NO. 2014080501

TOOLLING NO. : _____

DATE : 20140805

Tape Size	A Max	B Min	C	D Min	N Min	W1	W2 Max	W3
8 mm	178	1.5	13.0±0.20	20.2	50	8.4 ^{+1.6} _{-0.0}	14.4	7.9Min 10.9Max
12 mm						12.4 ^{+2.0} _{-0.0}		7.9Min 10.9Max



比例: 1:6