2A Current-Limited Power Distribution Switches

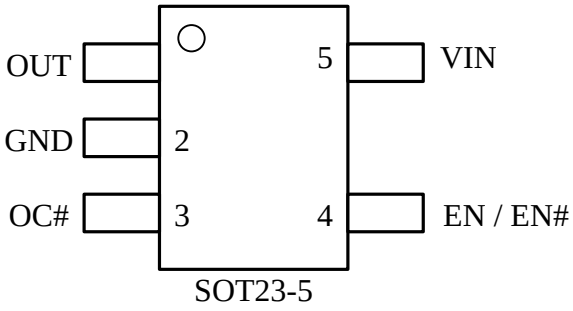
General Description

The EM5203J/AJ is an N-channel MOSFET high-side power switch without parasitic body diode between drain and source. The EM5203J/AJ provides very low on-resistance as 60mΩ and continuously delivers up to 2.1A output current. The fault flag output function indicates fault conditions to the local USB controller. The other features include soft start, current limit protection, Power-On-Reset function, and over temperature protection. The EM5203J/AJ is available in SOT23-5L package.

Applications

- USB
- Notebook & Netbook &MB

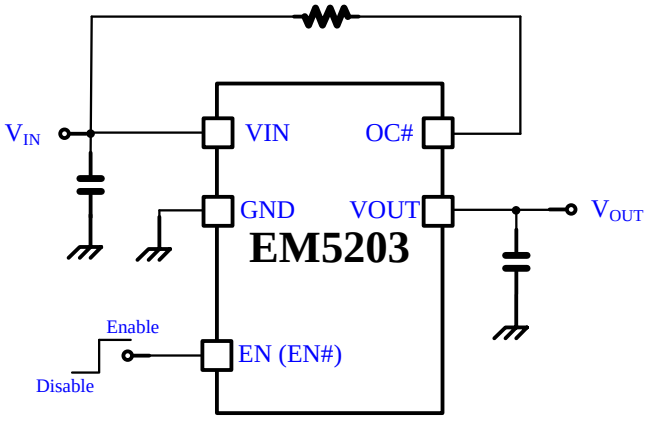
Pin Configuration



Ordering Information

Part Number	Package	Remark
EM5203AJ-20	SOT23-5	2A/Active High
EM5203J-20	SOT23-5	2A/Active Low

Typical Application Circuit



Note: A low ESR 150uF capacitor between VOUT & GND is recommended.

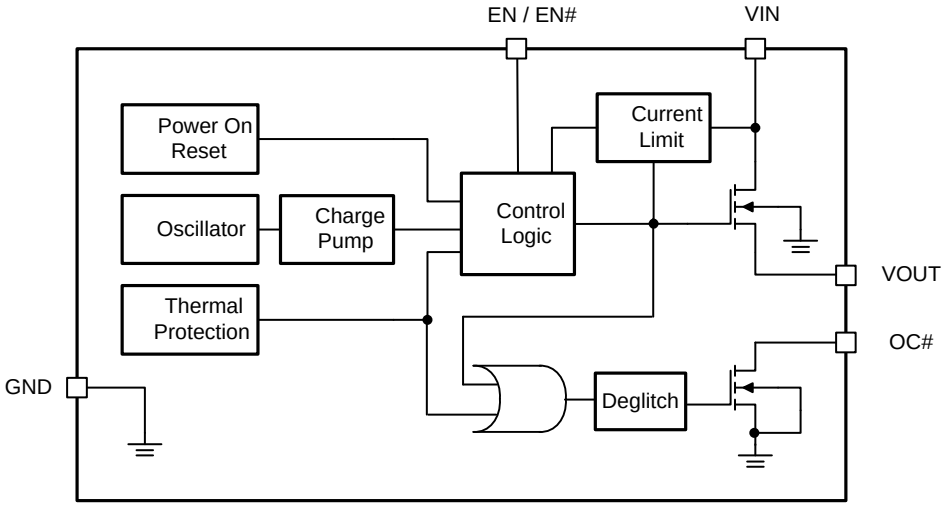
Features

- Wide Input Range 2.5V to 5.5V
- Low MOSFET On Resistance(60mΩ)
- 2us Short Protection Response
- Low Quiescent(65uA) & Shutdown Current
- Deglitched Open-Drain Fault Flag Output
- Reverse Current Flow blocking
- Power On Reset Function
- Current Limit Protection
- Over Temperature Protection
- Soft Start and Fast turn off
- Reverse Voltage Protection
- Enable Active High or Active Low
- UL Recognized, File No.E468218

Pin Assignment

Pin Name	Pin No.	Pin Function
GND	2	**Ground.**
VIN	5	**Input Voltage.** This is the drain input to the power device that supplies current to the output pin. Minimum 1uF low ESR ceramic capacitor is recommended at this pin.
EN / EN#	4	**Chip Enable Input** (Active high for EN, Active low for EN#)
OC#	3	**OC Flag Output.** This is an open-drain output and is set low impedance once current limit or over temperature protection enabled.
VOUT	1	**Output Voltage.** VOUT is power output pin.

Function Block Diagram



Absolute Maximum Ratings (Note1)

- V_{IN} ---------- -0.3V to +6.0V
- Other Pins---------- -0.3V to (V_{IN}+0.3V)
- Power Dissipation, P_D @ T_A = 25°C, SOT23-5 ---------- 0.4W
- Thermal Resistance Junction to Ambient, θ_{JA}, SOT23-5 (Note 2)---------- 250°C/W
- Thermal Resistance Junction to Case, θ_{JC}, SOT23-5 (Note 2)---------- 60°C/W
- Junction Temperature---------- 150°C
- Lead Temperature (Soldering, 10 sec.)---------- 260°C
- Storage Temperature ---------- –65°C to 150°C
- ESD susceptibility (Note3)
  HBM (Human Body Mode)---------- 2KV
  MM (Machine Mode)---------- 200V
  CDM (Charged-Device Model)---------- 1KV

Recommended Operating Conditions (Note4)

- Supply Input Voltage, V_{IN} ---------- +2.5V to +5.5V
- Junction Temperature ---------- –40°C to 125°C
- Ambient Temperature ---------- –40°C to 85°C

Electrical Characteristics

V_{IN}=5V, T_A=25℃, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Section						
POR Threshold	V_{PORTH}		-	2.2	2.5	V
Quiescent Current	I_Q	I_{OUT}=0A	-	65	95	uA
Shutdown Current	I_{SD}	EN#=5V	-	0.1	1	uA
Output Voltage						
On Resistance	R_{ON}	I_{OUT}=0.5A	-	60	80	mΩ
Reverse Leakage Current	IRev	V_{OUT}=5V , V_{IN}=0V	-	0.1	2	uA
Soft-Start Time		Rising from 10% to 90% C_L =1uF ； R_{LOAD} =10Ω	-	1.5	2	ms
Enable						
Enable High Level	V_{EN}		1.2	-	-	V
Disable Low Level	V_{SD}		-	-	0.5	V
EN Input Current	I_{EN}		-	0.1	1	uA
OC# Flag Output						
OC# Output Resistance	R_{FLGB}	I_{SINK}=1mA	-	20	80	Ω
OC# Off Current	I_{FLGB_OFF}	V_{FLGB}=5V	-	0.1	1	uA
OC# Delay Time	T_D		8	15	22	ms
OUT Shutdown Discharge Resistance	RDIS			100		Ω
Protection						
OCP Threshold Level	I_{OCP}		2.4	3.2	4.2	A
Output Short Circuit Current	I_{SC}		1.2	1.7	3.1	A
Thermal Shutdown Temperature	T_{SD}		-	160	-	°C
Thermal Shutdown Hysteresis	T_{SDHYS}		-	30	-	°C
Output Reverse Voltage Protection						
Output Reverse Voltage Protection	RVP	VOUT – VIN (internal spec)	100		200	mV
Recovery Voltage	ROV	VIN – VOUT (internal spec)	0		+60	mV
Recovery Voltage for FT		VIN – VOUT (FT spec)	-10		+60	mV
De-bounce time		(internal spec)		9		us

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2. θ_{JA} is measured in the natural convection at T_A=25°C on a low effective thermal conductivity test board (Single layout, 1S) of JEDEC 51-3 thermal measurement standard.

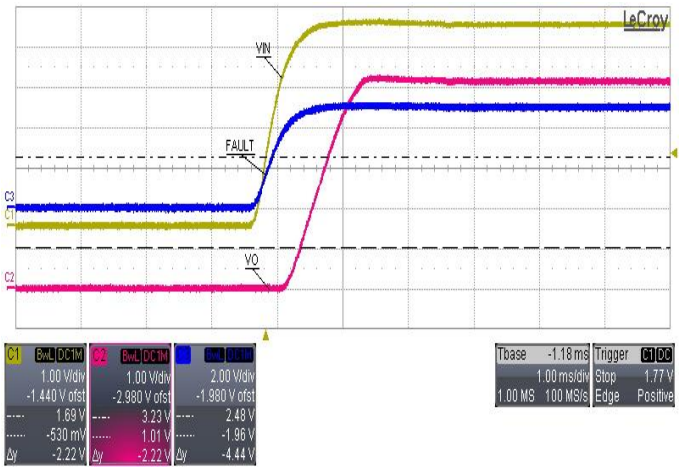
Note 3. Devices are ESD sensitive. Handling precaution is recommended.

Note 4. The device is not guaranteed to function outside its operating conditions.

Note 5. EMC will review datasheet by quarter, and update new version.

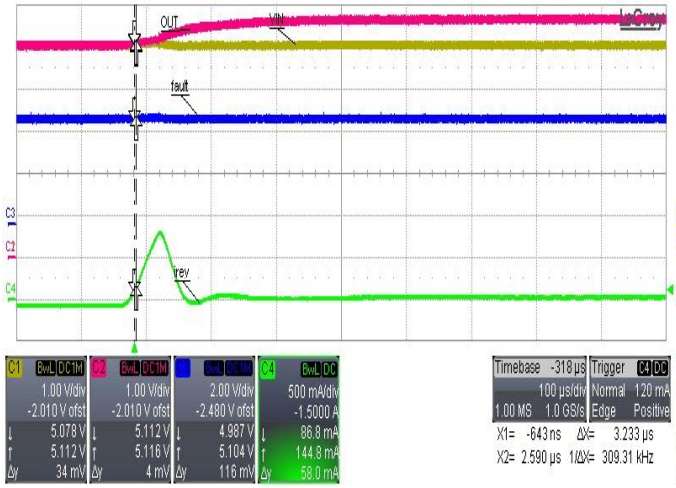
Typical Operating Characteristics

Turn on from VIN#
CH1: VIN, CH2:Vo, CH3:OC#

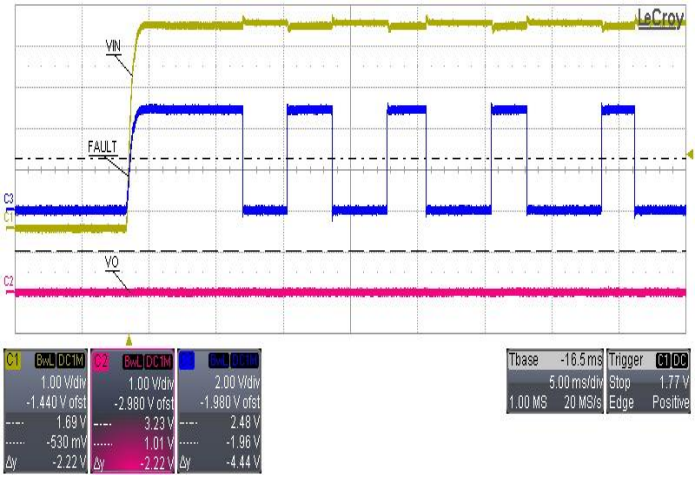


Turn off from VIN#
CH1: VIN, CH2:Vo, CH3:OC#

Reverse Voltage Protection
CH1:VIN, CH2:Vo, CH3: OC# ,CH4:IREV

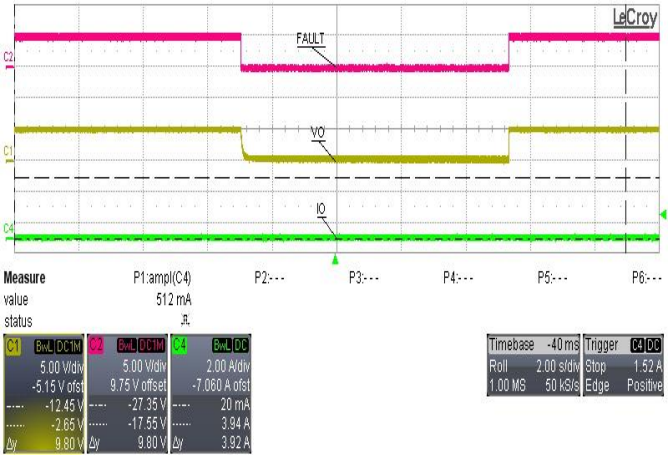


Short then power on into OT cycle
CH1:VIN, CH2:Vo, CH3:OC#



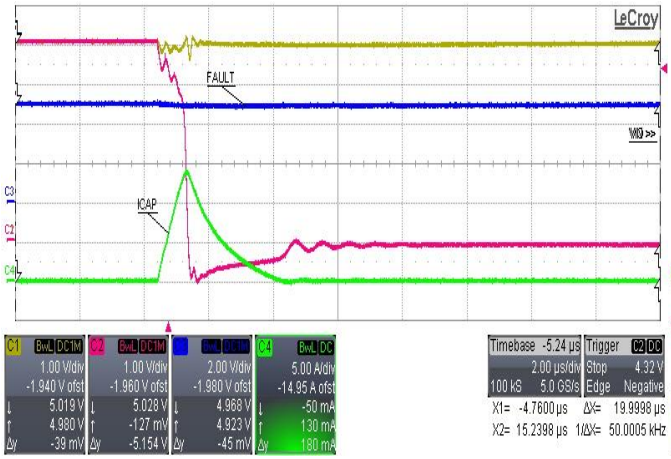
Fault Signal delay time
CH1:VIN, CH2:VO, CH3:OC#,CH4:Io

Fault Signal during OTP occurs
CH1:Vo, CH2:OC#, CH4:Io

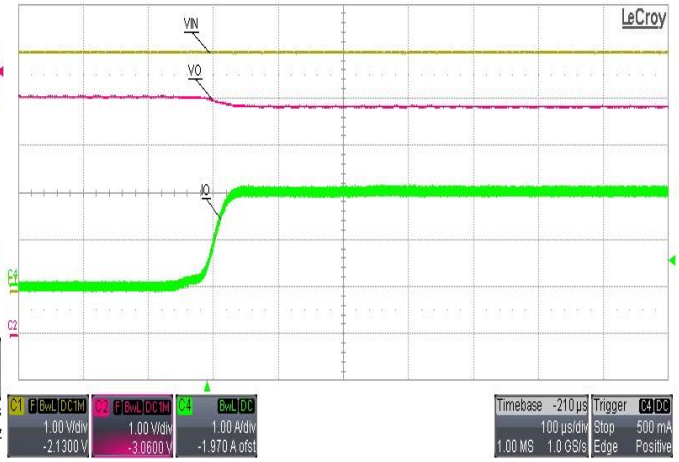


Typical Operating Characteristics

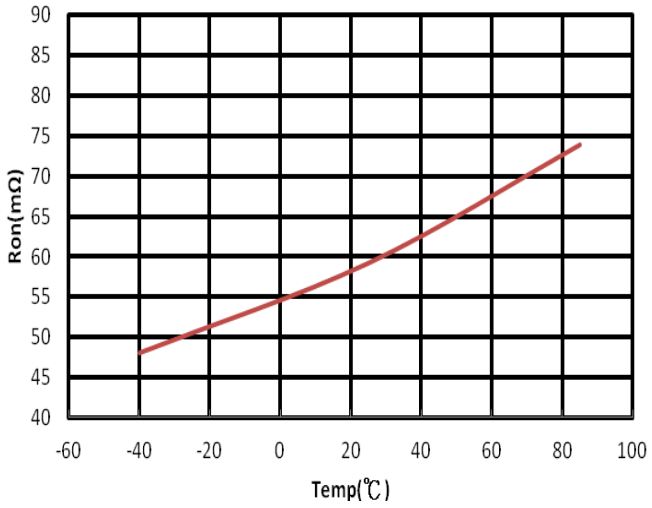
2uS Response for Output short Protection
CH1:VIN, CH2:Vo, CH3:OC#, CH4: IO



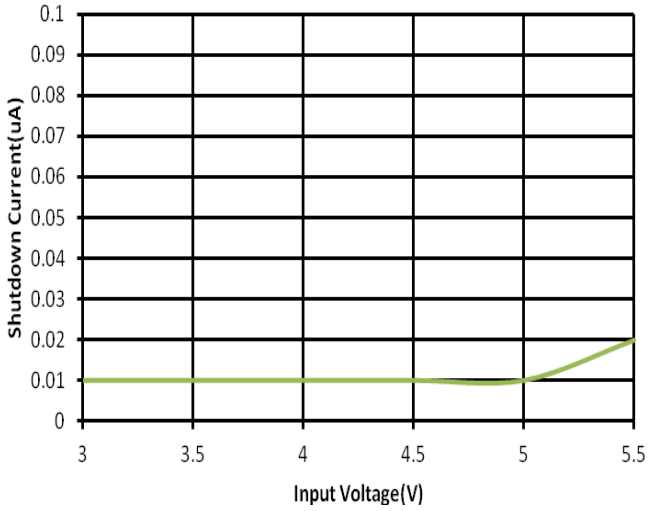
Normal operating 2A output current
CH1:Vo, CH2:Fault, CH4:Io



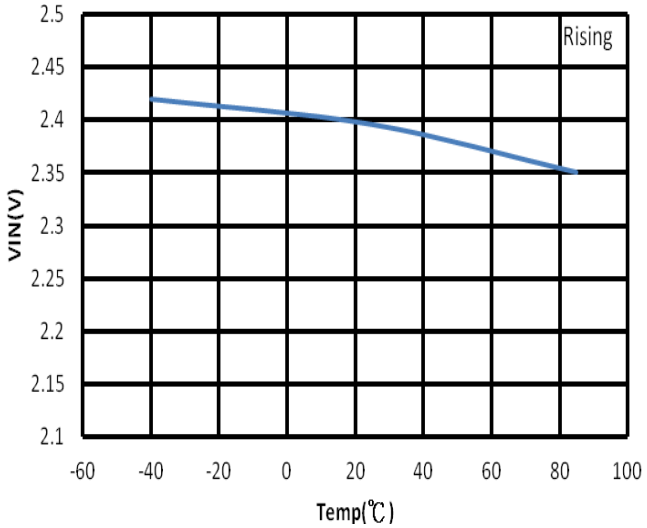
RON Performance VS Temperature



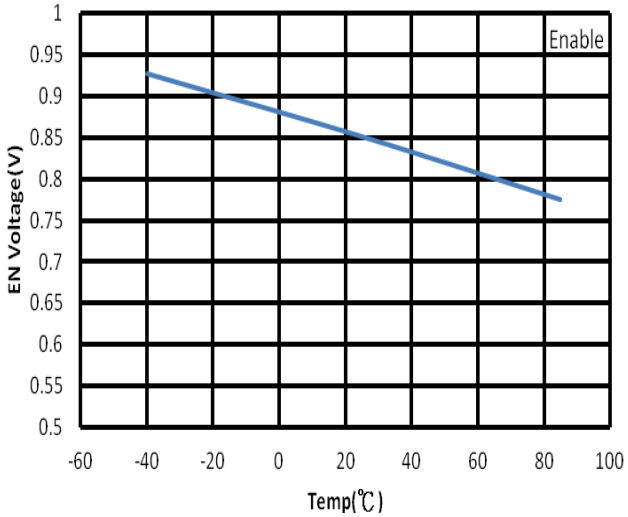
Shutdown current VS Input Voltage



UVLO ON Voltage VS Temperature

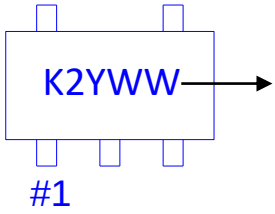


Enable Voltage VS Temperature



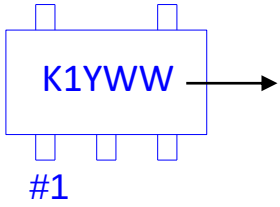
Ordering & Marking Information

Device Name: EM5203AJ-20 for SOT-23-5



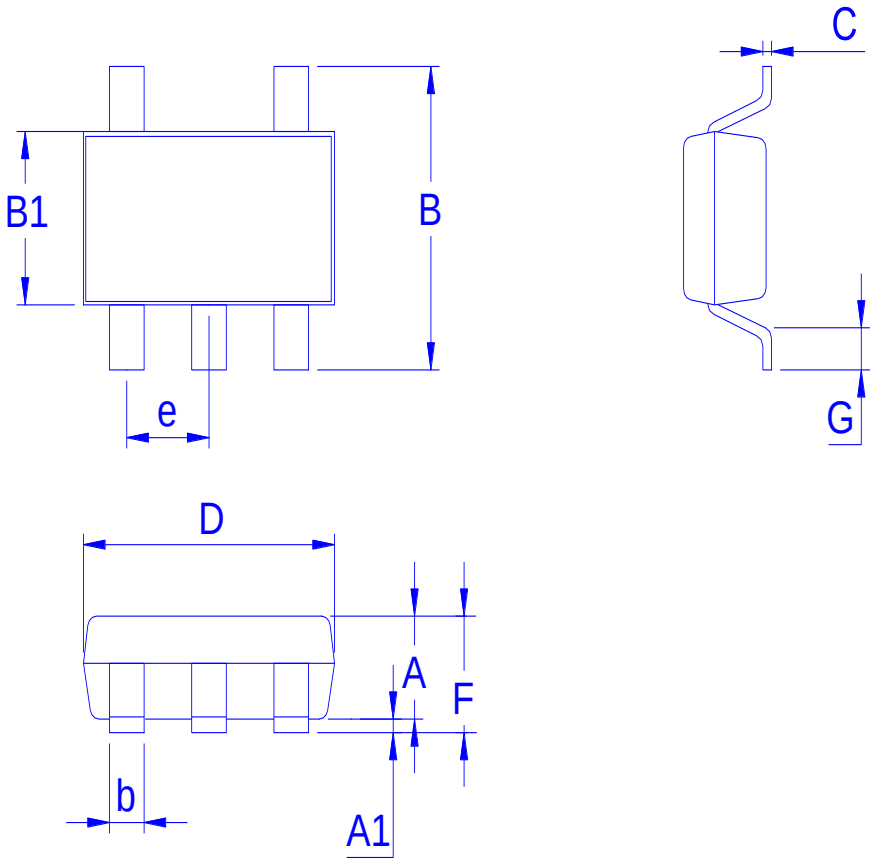
K2: Device Code, K2 for EM5203AJ-20
YWW: Date Code

Device Name: EM5203J-20 for SOT-23-5



K1: Device Code, K1 for EM5203J-20
YWW: Date Code

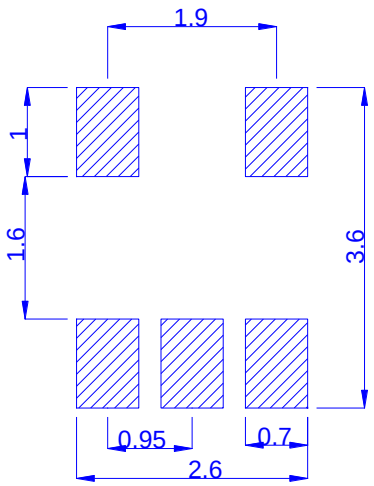
Outline Drawing



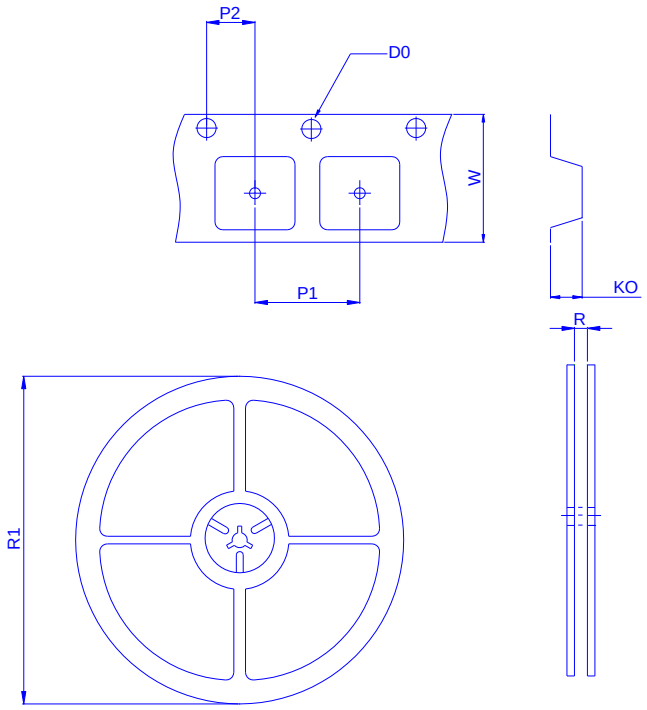
Dimension in mm

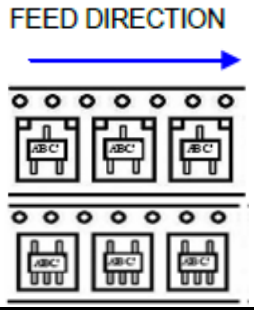
Dimension	A	A1	B	B1	b	C	D	e	F	G
Min.	0.90	0.00			0.30	0.08				0.30
Typ.	1.15		2.80	1.60			2.90	0.95		0.45
Max.	1.30	0.15			0.50	0.22			1.45	0.60

Recommended minimum pads



◆ Tape&Reel Information:3000pcs/Reel(Dimension in millimeter)



Package	SOT23-5
Reel Dimensions	7”
Pin1 Orientation	

Dimension in mm

Dimension	Carrier tape					Reel	
	D0	K0	P1	P2	W	R	R1
Typ.	1.53	1.40	4.00	2.00	8.00	8.50	178.00
±	0.20	0.30	0.20	0.20	0.50	REF	REF