



Current-Limited Power Distribution Switches

General Description

The EM5203 series is an N-channel MOSFET high-side power switch without parasitic body diode between drain and source. The EM5203AJ-20 provides very low on-resistance as 60mΩ and continuously delivers up to 1.5A 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 EM5203 series is available in SOT23-3, SOT23-5 and DFN1.8X2.0-06 package.

- 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

Applications

- USB
- Notebook & Netbook & MB

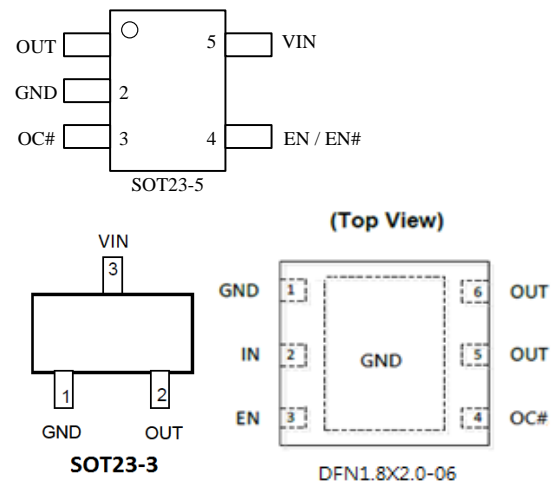
Ordering Information

Part Number	Package	Remark
EM5203BJS-02A	SOT23-3	0.2A
EM5203AJ-02A	SOT23-5	0.2A/Active High
EM5203J-02A	SOT23-5	0.2A/Active Low
EM5203AVK6-02A	DFN1.8X2.0-06	0.2A/Active High
EM5203VK6-02A	DFN1.8X2.0-06	0.2A/Active Low
EM5203AJ-05A	SOT23-5	0.5A/Active High
EM5203J-05A	SOT23-5	0.5A/Active Low
EM5203AVK6-05A	DFN1.8X2.0-06	0.5A/Active High
EM5203VK6-05A	DFN1.8X2.0-06	0.5A/Active Low
EM5203AJ-10A	SOT23-5	1A/Active High
EM5203J-10A	SOT23-5	1A/Active Low
EM5203AJ-15A	SOT23-5	1.5A/Active High
EM5203J-15A	SOT23-5	1.5A/Active Low

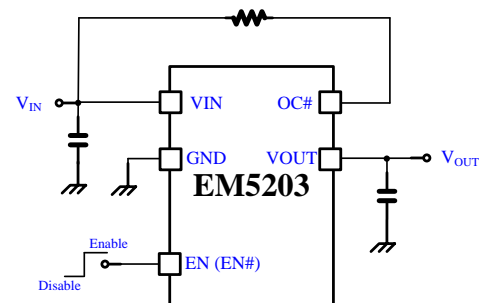
Features

- Wide Input Range 2.5V to 5.5V
- Low MOSFET On Resistance
- 2us Short Protection Response
- Low Quiescent(65uA) & Shutdown Current
- Deglitched Open-Drain Fault Flag Output
- Reverse Current Flow blocking

Pin Configuration



Typical Application Circuit



Note: A low ESR 100uF capacitor between VOUT & GND is recommended.

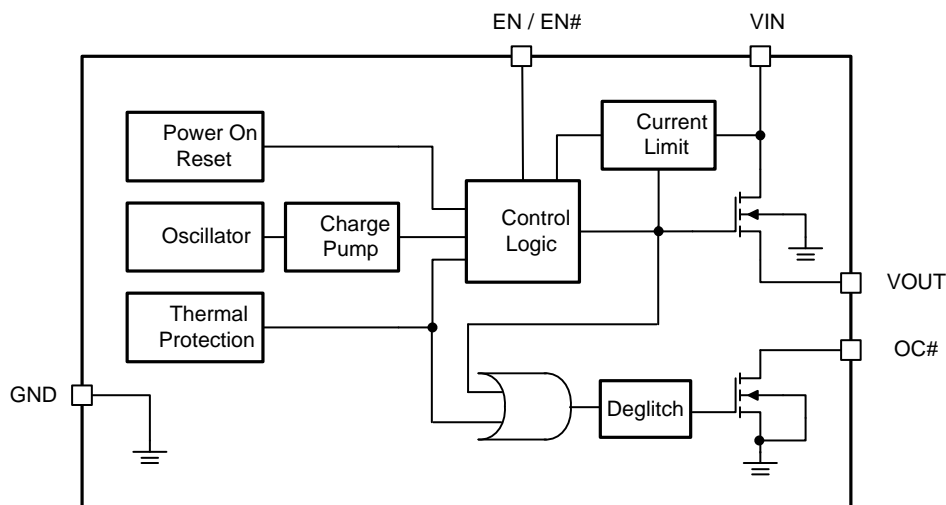
Selection table

Part Number	Current	Discharge Function	Soft-Start Time	EN Function		Package		
				Active High	Active Low	SOT23-3	SOT23-5	DFN1.8X2.0-06
EM5203BJS-02A	0.2A	Y	0.5ms			V		
EM5203AJ-02A	0.2A	Y	0.5ms	V			V	
EM5203J-02A	0.2A	Y	0.5ms		V		V	
EM5203AVK6-02A	0.2A	Y	0.5ms	V				V
EM5203VK6-02A	0.2A	Y	0.5ms		V			V
EM5203AJ-05A	0.5A	Y	0.5ms	V			V	
EM5203J-05A	0.5A	Y	0.5ms		V		V	
EM5203AVK6-05A	0.5A	Y	0.5ms	V				V
EM5203VK6-05A	0.5A	Y	0.5ms		V			V
EM5203AJ-10A	1A	Y	0.5ms	V			V	
EM5203J-10A	1A	Y	0.5ms		V		V	
EM5203AJ-15A	1.5A	Y	0.5ms	V			V	
EM5203J-15A	1.5A	Y	0.5ms		V		V	

Pin Assignment

Pin Name	Pin No. SOT23-5	Pin No. SOT23-3	Pin No. DFN1.8X2.0-06	Pin Function
GND	2	1	1	Ground.
VIN	5	3	2	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	-	3	Chip Enable Input (Active high for EN, Active low for EN#)
OC#	3	-	4	OC Flag Output. This is an open-drain output and is set low impedance once current limit or over temperature protection enabled. No connect is not used.
VOUT	1	2	5, 6	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 @ $T_A = 25^\circ C$, SOT23-5 ----- 0.4W
- Package Thermal Resistance, θ_{JA} , SOT23-5 (Note 2)----- 250°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

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
 $V_{IN}=5V$, $T_A=25^{\circ}C$, 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	120	μA
Shutdown Current	I_{SD}	EN#=5V	-	0.1	1	μA
Output Voltage						
On Resistance	R_{ON}	For EM5203BJS-02A		110	140	$m\Omega$
		For EM5203AJ/J-02A		85	100	$m\Omega$
		For EM5203AVK6/VK6-02A		85	100	$m\Omega$
		For EM5203AJ/J-05A		85	100	$m\Omega$
		For EM5203AVK6/VK6-05A		85	100	$m\Omega$
Reverse Leakage Current	I_{REV}	$V_{OUT}=5V$, $V_{IN}=0V$	-	0.1	2	μA
Soft-Start Time	T_{SS}	Rising from 10% to 90% $C_L=1\mu F$; $R_{LOAD}=10\Omega$		0.5	1.5	ms
Turn On Delay Time	T_d	EN high to V_o 10%, $V_{IN}=5V$, $C_L=1\mu F$; $R_{LOAD}=10\Omega$		200		μs
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	μA
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	μA
OC# Delay Time	T_D		4	8	20	ms
OUT Shutdown Discharge Resistance	R_{DIS}			100		Ω
Protection						
OCP Threshold Level	I_{OCP}	EM5203-02	0.3	0.4	0.65	A
Output Short Circuit Current	I_{SC}				0.3	
OCP Threshold Level	I_{OCP}	EM5203-05	0.6	0.8	1.2	A
Output Short Circuit Current	I_{SC}				0.5	
OCP Threshold Level	I_{OCP}	EM5203-10	1.1	1.3	1.8	A
Output Short Circuit Current	I_{SC}				0.8	
OCP Threshold Level	I_{OCP}	EM5203-15	1.6	1.8	2.4	A
Output Short Circuit Current	I_{SC}				1.2	
Thermal Shutdown Temperature	T_{SD}		-	160	-	$^{\circ}C$
Thermal Shutdown Hysteresis	T_{SDHYS}		-	30	-	$^{\circ}C$

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 $T_A=25^{\circ}C$ on a low effective thermal conductivity test board (Single layout, 1S) of JEDEC 51-3 thermal measurement standard.

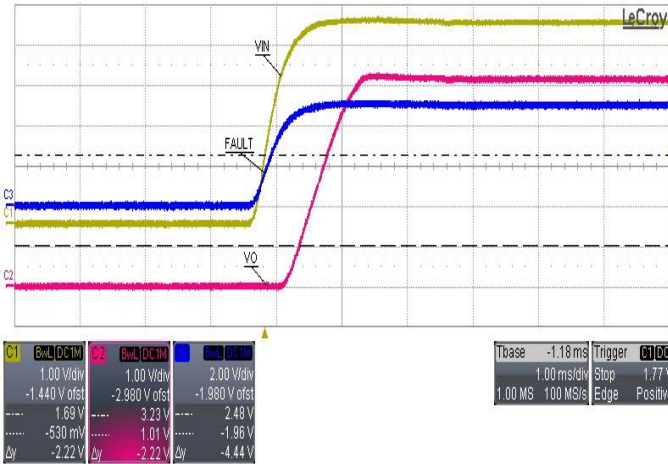
Note 3. Devices are ESD sensitive. Handling precaution is recommended.

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

Typical Operating Characteristics

Turn on from VIN#

CH1: VIN, CH2:Vo, CH3:OC#



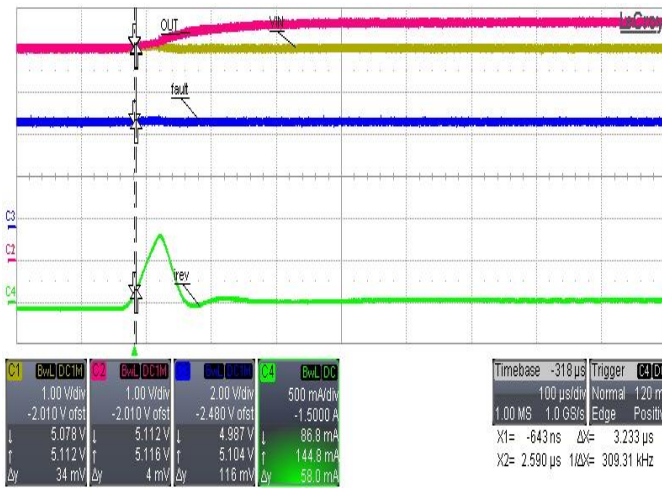
Turn off from VIN#

CH1: VIN, CH2:Vo, CH3:OC#



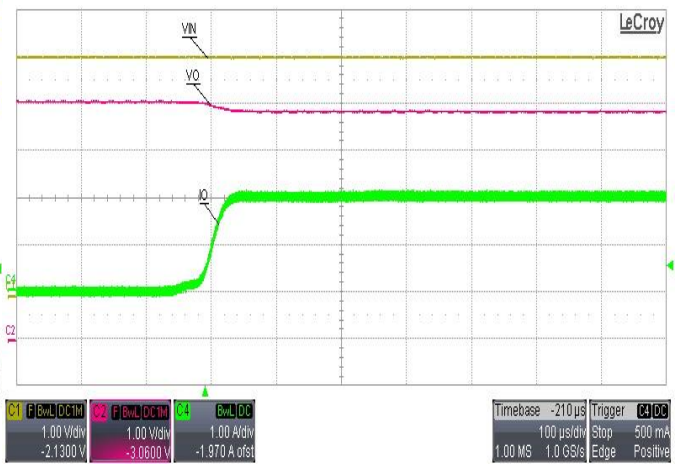
Reverse Voltage Protection

CH1:VIN, CH2:Vo, CH3: OC#, CH4:IREV



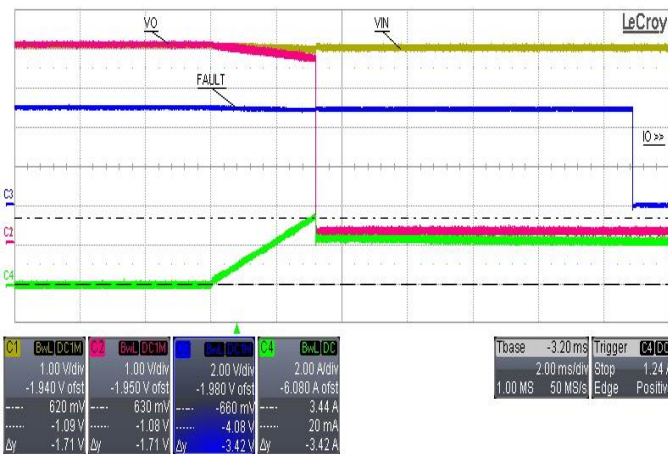
Normal operating 2A output current

CH1:Vo, CH2:Fault, CH4:Io



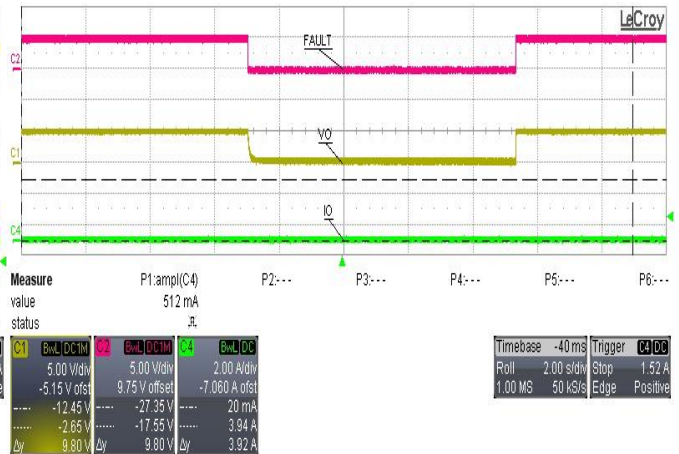
Fault Signal delay time

CH1:VIN, CH2:Vo, CH3:OC#, CH4:Io



Fault Signal during OTP occurs

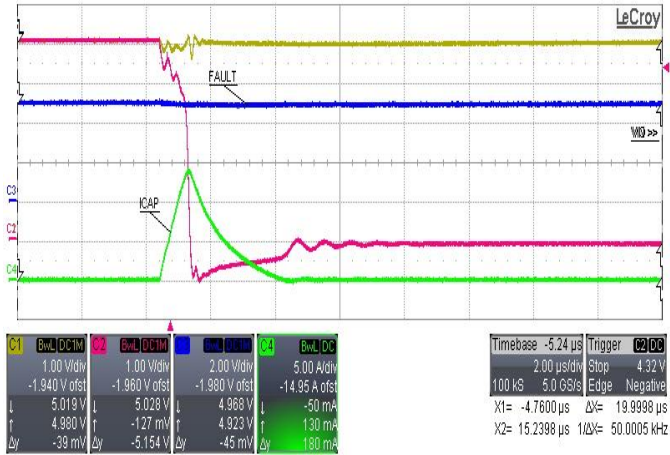
CH1:Vo, CH2:OC#, CH4:Io



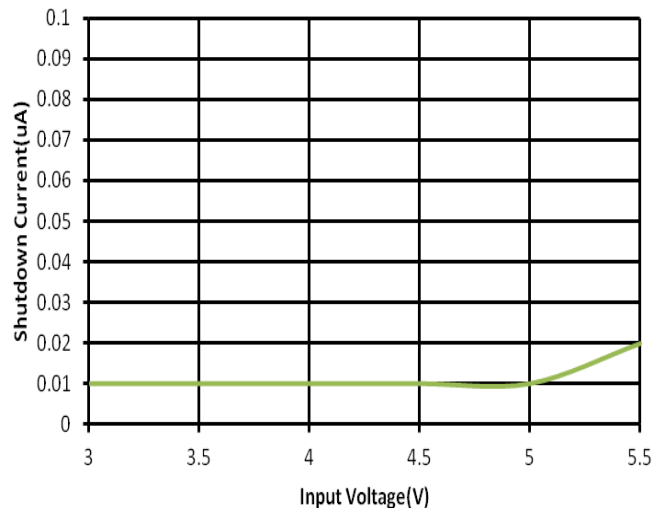
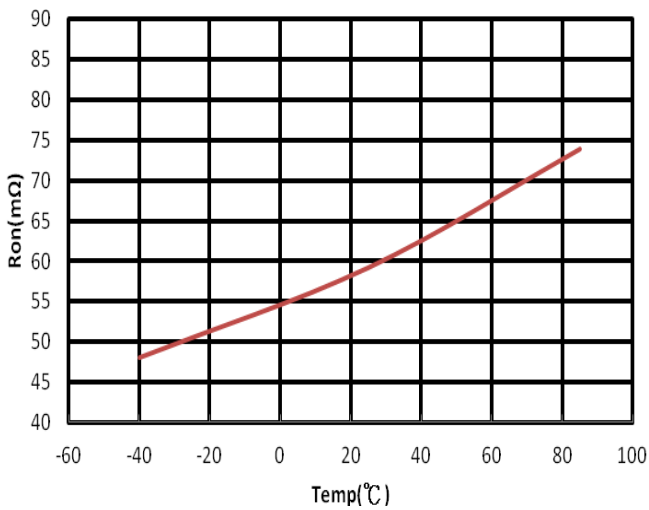
Typical Operating Characteristics

2uS Response for Output short Protection

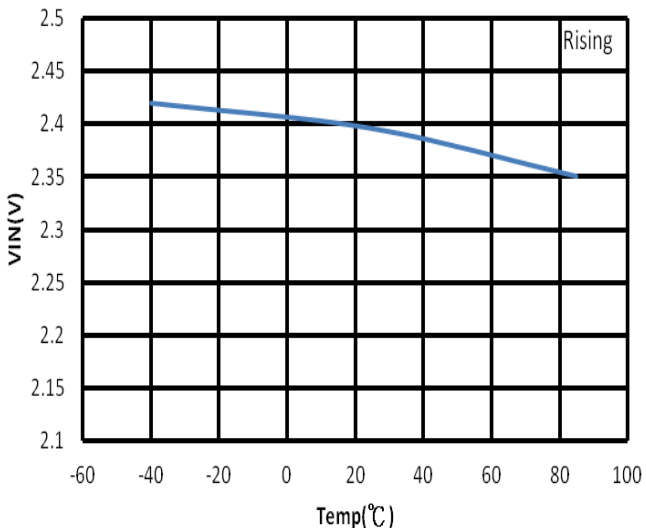
CH1:VIN, CH2:Vo, CH3:OC#, CH4: IO



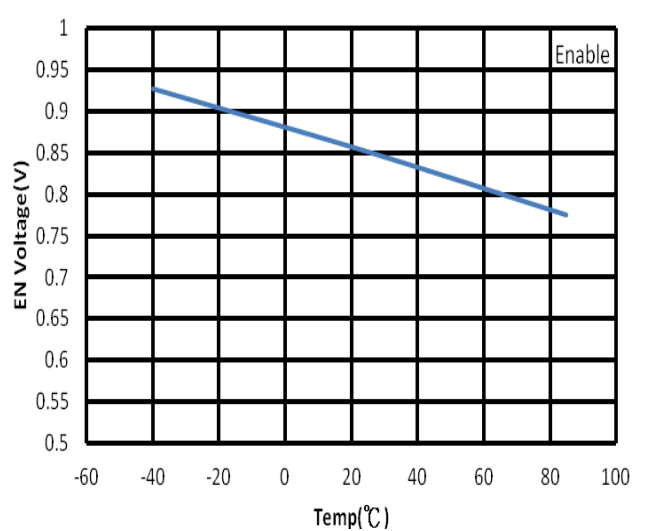
RON Performance VS Temperature
EM5203-20 series



UVLO ON Voltage VS Temperature

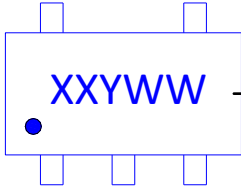


Enable Voltage VS Temperature



Ordering & Marking Information

Device Name: EM5203 for SOT23-5

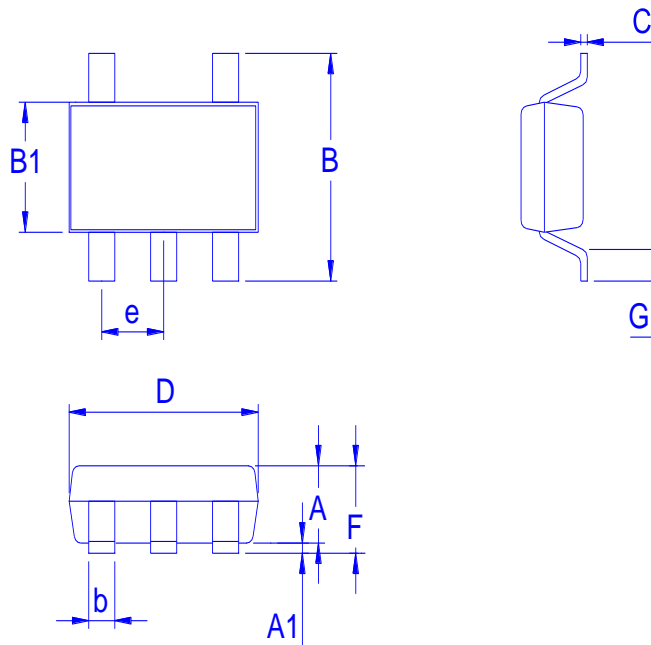


XX : Device Code
YYW: Date Code

Device Code

XX	Part Number
KQ	EM5203AJ-02A
KM	EM5203AJ-05A
KK	EM5203AJ-10A
KP	EM5203J-02A
KN	EM5203J-05A
KL	EM5203J-10A

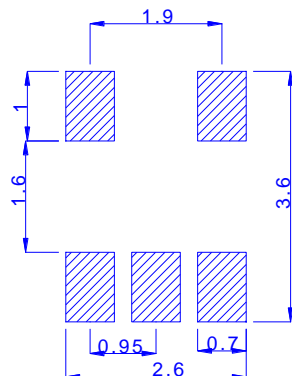
Outline Drawing



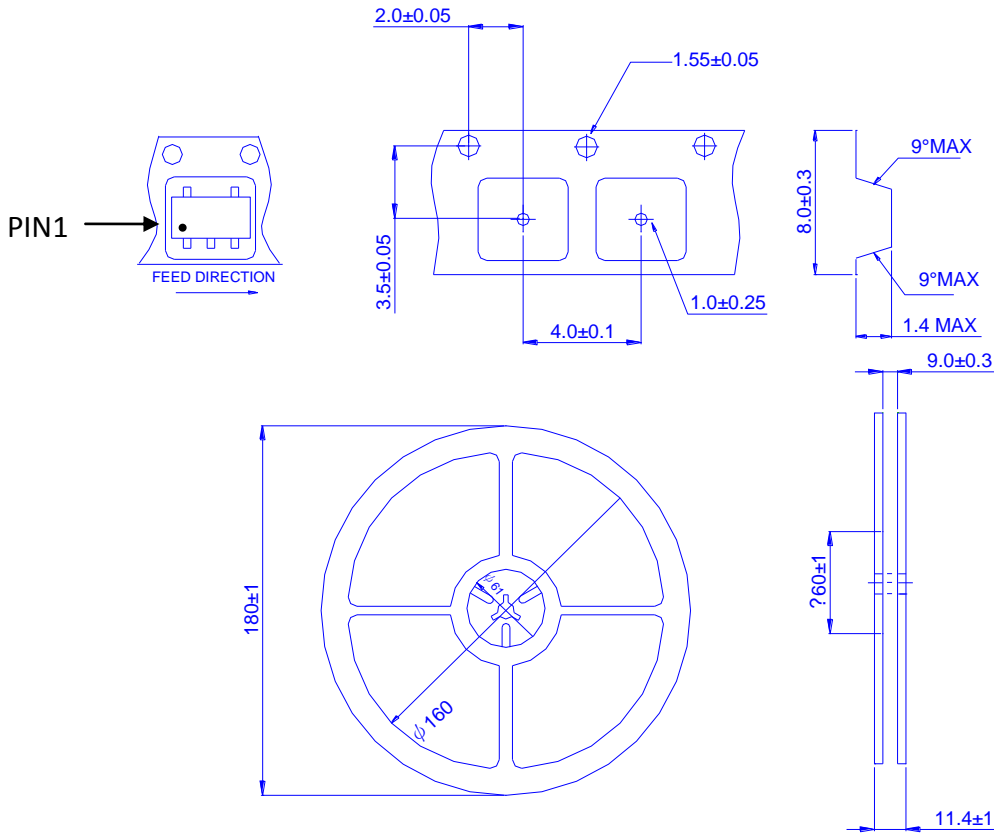
Dimension in mm

Dimension	A	A1	B	B1	b	C	D	e	F	G
Min.	0.9	0	2.6	1.5	0.3	0.08	2.8	0.87	1	0.3
Typ.	1.1	0.04	2.8	1.6	0.4	0.127	2.9	0.95	1.225	0.45
Max.	1.3	0.15	3	1.726	0.5	0.22	3.026	1.03	1.45	0.6

Recommended minimum pads



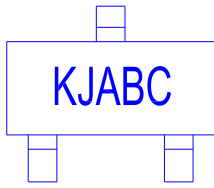
◆ Tape&Reel Information:3000pcs/Reel(Dimension in millimeter)



Package	SOT23-5
Reel Dimensions	7"
Pin1 Orientation	<p>FEED DIRECTION</p>
Leader Empty Pockets	50
Trailer Empty Pockets	50
Quantity per Reel	3K
Reel / Inner Box	5 : 1
Quantity per Inner Box	15K
Inner Box/ Outer Carton	12 : 1
Quantity per Outer Carton	180K

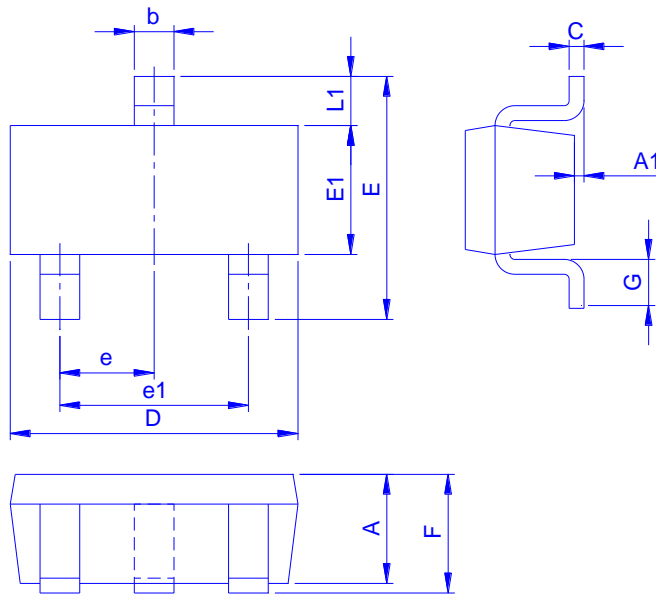
Ordering & Marking Information:

Device Name: EM5203BJS for SOT23-3



→ KJ: Device Code, KJ for EM5203BJS-02A
ABC: Date Code

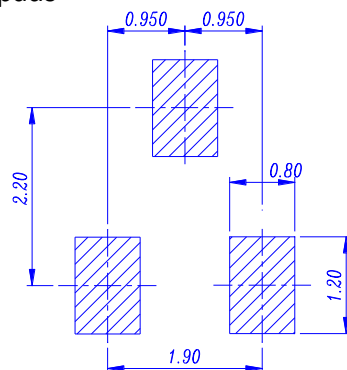
Outline Drawing



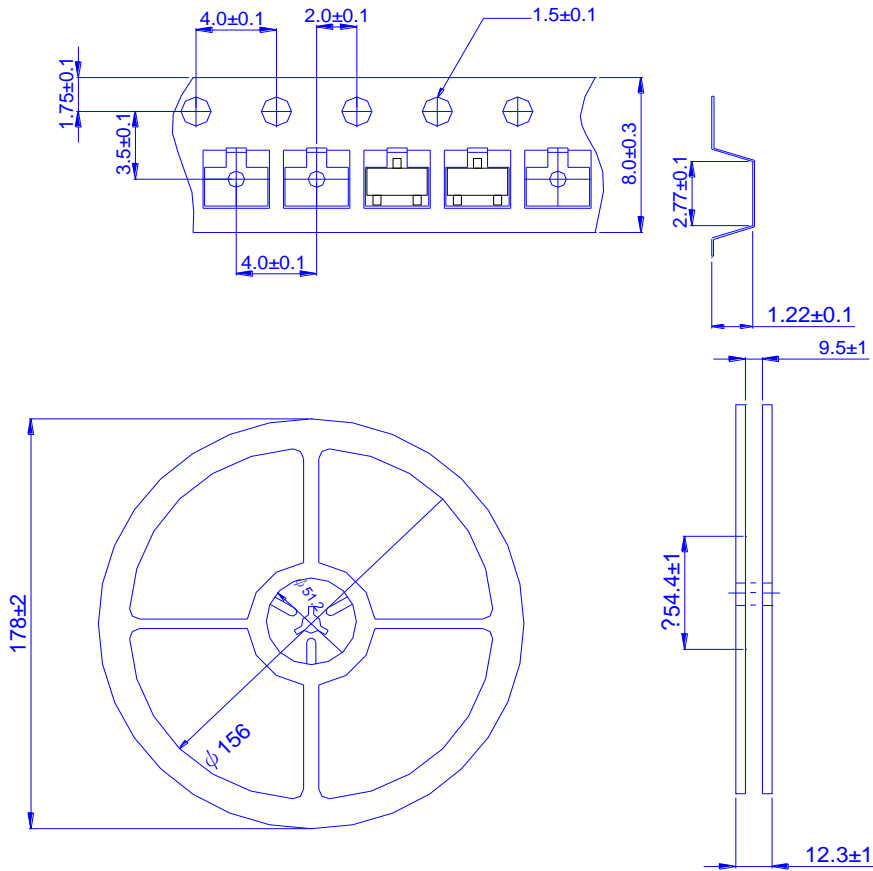
Dimension in mm

Dimension	A	A1	b	C	D	E	E1	e	e1	F	G	L1
Min.	0.70	0	0.3	0.08	2.80	2.25	1.2	0.90		0.80	0.3	0.50
Typ.					2.90			0.95	1.9			
Max.	1.15	0.1	0.5	0.20	3.02	3.00	1.7	1.00		1.25	0.6	0.75

Recommended minimum pads



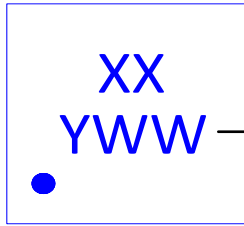
◆ Tape&Reel Information:3000pcs/Reel(Dimension in millimeter)



Package	SOT23-3
Reel Dimensions	7"
Pin1 Orientation	<p>FEED DIRECTION</p>
Leader Empty Pockets	50
Trailer Empty Pockets	50
Quantity per Reel	3K
Reel / Inner Box	5 : 1
Quantity per Inner Box	15K
Inner Box/ Outer Carton	12 : 1
Quantity per Outer Carton	180K

Ordering & Marking Information:

Device Name: EM5203 for DFN1.8X2.0-06

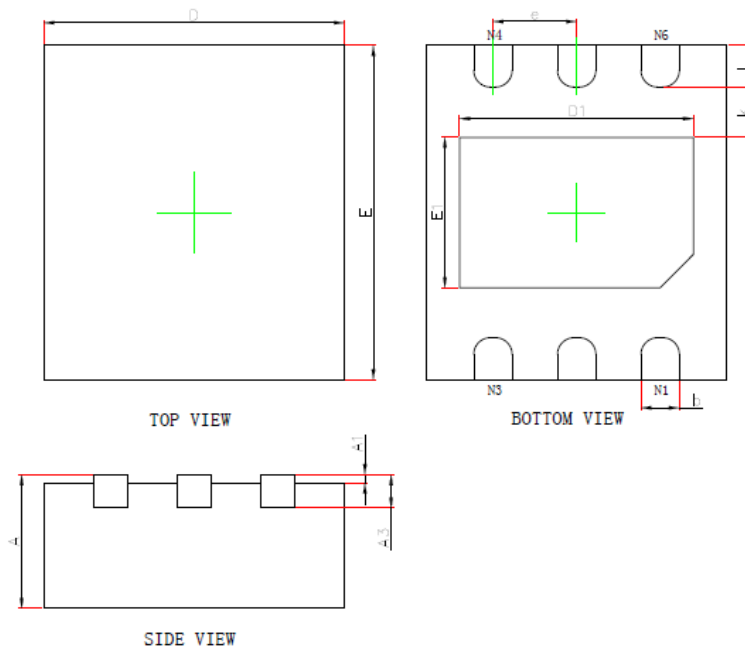


XX : Device Code
 YWW : Date Code

Device Code

XX	Part Number
KV	EM5203AVK6-02A
KW	EM5203VK6-02A
KX	EM5203AVK6-05A
KY	EM5203VK6-05A

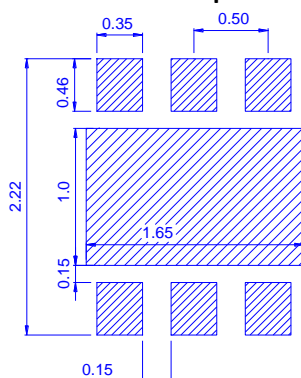
Outline Drawing



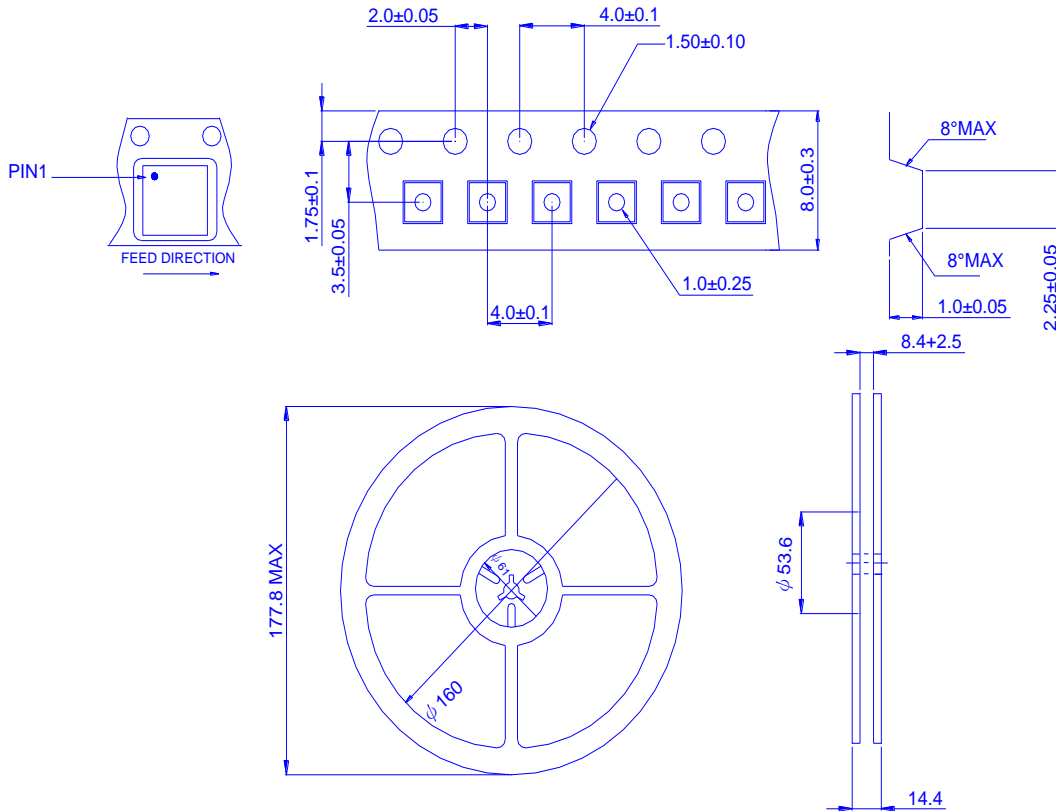
Dimension in mm

Dimension	A	A1	A3	b	D	E	D1	E1	e	K	L
Min.	0.5	0		0.15	1.7	1.9	1.3	0.8			0.174
Typ.	0.55	0.02	0.1	0.25	1.8	2	1.45	0.9	0.5	0.2	0.25
Max.	0.6	0.05		0.35	1.9	2.1	1.6	1.0			0.326

Recommended minimum pads



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



Package	DFN1.8X2.0-06
Reel Dimensions	7"
Pin1 Orientation	<p>FEED DIRECTION</p>
Leader Empty Pockets	50
Trailer Empty Pockets	50
Quantity per Reel	3K
Reel / Inner Box	5 : 1
Quantity per Inner Box	15K
Inner Box/ Outer Carton	12 : 1
Quantity per Outer Carton	180K