

## 2A/2.5A Current-Limited Power Distribution Switches

### General Description

The EMS6030 is an N-channel MOSFET high-side power switch without parasitic body diode between drain and source. The EMS6030 provides very low on-resistance as 60mΩ and continuously delivers up to 2A(EMS6030A/B) and 2.5A(EMS6030C/D) 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 EMS6030 is available in SOT-23-5L package.

### 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

### Ordering Information

Part Number	Package	Remark
EMS6030A	SOT-23-5	2A Active Low
EMS6030B	SOT-23-5	2A Active High
EMS6030C	SOT-23-5	2.5A Active Low
EMS6030D	SOT-23-5	2.5A Active High

### Applications

- USB
- Notebook & Netbook & MB

### Typical Application

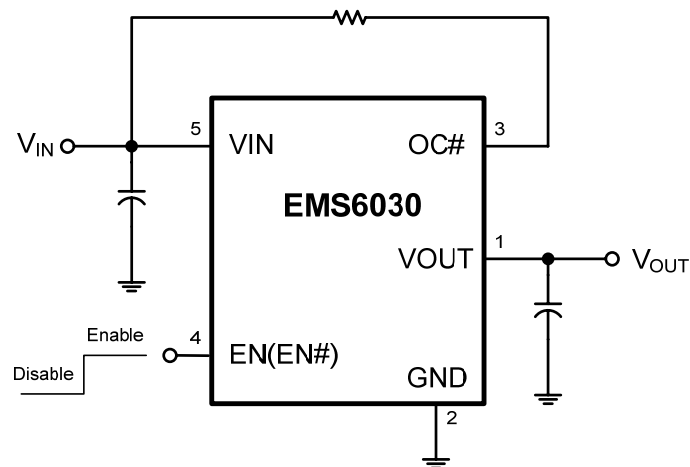
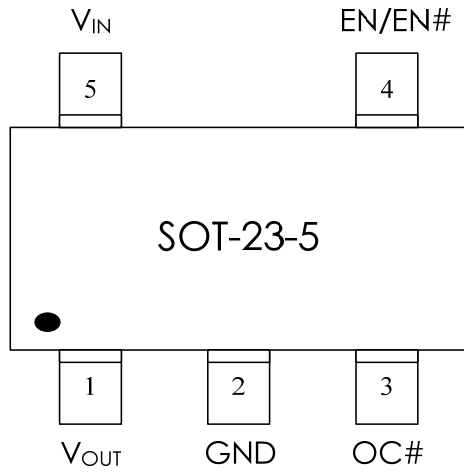


Fig. 1

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

## Package Configuration



EMS6030X-VN05NRR

- X Output current
- VN05 SOT-23-5 Package
- NRR RoHS & Halogen free package  
Rating: -40 to 85°C  
Package in Tape & Reel

## Order, Mark & Packing information

Package	Iout(A)	Product ID	Marking	Packing /MPQ
SOT-23-5	2.0	EMS6030A-VN05NRR		Tape & Reel 3Kpcs
		EMS6030B-VN05NRR		
SOT-23-5	2.5	EMS6030C-VN05NRR		
		EMS6030D-VN05NRR		

Functional Block Diagram

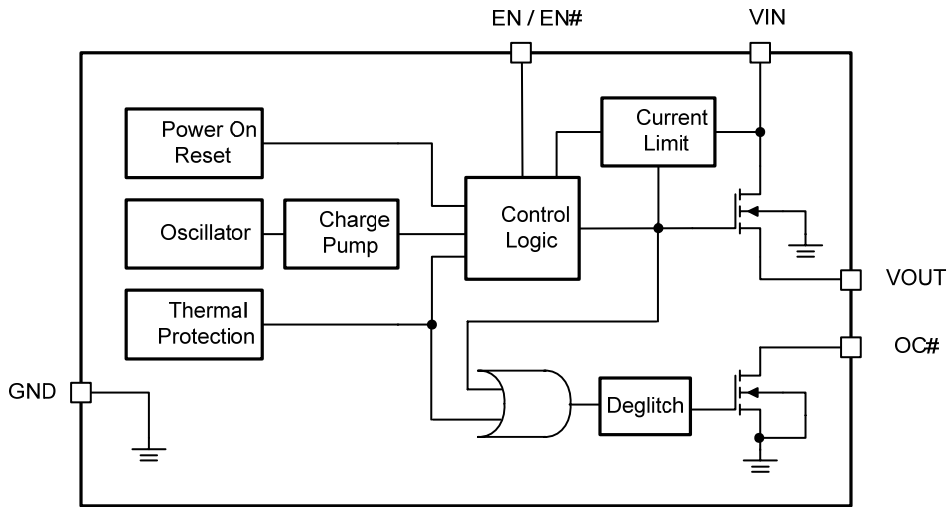


Fig. 2

Pin Functions

Pin Name	SOT-23-5	Function
VOUT	1	<b>Output Voltage.</b> VOUT is power output pin.
GND	2	<b>Ground.</b>
OC#	3	<b>OC Flag Output.</b> This is an open-drain output and is set low impedance once current limit or over temperature protection enabled.
EN/EN#	4	<b>Chip Enable Input</b> (Active high for EN, Active low for EN#)
VIN	5	<b>Input Voltage.</b> 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.

## Absolute Maximum Ratings<sup>(Note1)</sup>

Devices are subjected to fail if they stay above absolute maximum ratings.

- Input Voltage ----- -0.3V to +6V
- Other Pins ----- -0.3V to (VIN+0.3V)
- Power Dissipation, PD@TA=25°C, SOT-23-5 ----- 0.4W
- Package Thermal Resistance,  $\theta_{JA}$ , SOT-23-5 <sup>(Note 2)</sup> ----- 250°C/W
- Junction Temperature ----- 150°C
- Lead Temperature (Soldering, 10 sec.) ----- 260°C
- Storage Temperature ----- -65°C to 150°C
- ESD susceptibility <sup>(Note3)</sup>
  - HBM (Human Body Mode) ----- 2KV
  - MM (Machine Mode) ----- 200V

## Recommended Operating Conditions<sup>(Note4)</sup>

- Supply Input Voltage, V<sub>IN</sub> ----- +2.5V to +5.5V
- Junction Temperature ----- -40°C to 125°C
- Ambient Temperature ----- -40°C to 85°C

## Electrical Characteristics

- VIN=5V, TA=+25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
<b>Supply Input Section</b>						
POR Threshold	V <sub>PORTH</sub>		-	2.2	2.5	V
Quiescent Current	I <sub>Q</sub>	I <sub>OUT</sub> =0A	-	65	95	uA
Shutdown Current	I <sub>SD</sub>	EN#=5V	-	0.1	1	uA
<b>Output Voltage</b>						
On Resistance	R <sub>ON</sub>	I <sub>OUT</sub> =0.5A, EMS6030A/B	-	60	80	mΩ
		I <sub>OUT</sub> =0.5A, EMS6030C/D	-	60	70	
Reverse Leakage Current	I <sub>REV</sub>	V <sub>OUT</sub> =5V, V <sub>IN</sub> =0V	-	0.1	2	uA
Soft-Start Time		Rising from 10% to 90% CL=1uF; R <sub>LOAD</sub> =10Ω	-	1.5	2	ms
<b>Enable</b>						
Enable High Level	V <sub>EN</sub>		1.2	-	-	V
Disable Low Level	V <sub>SD</sub>		-	-	0.5	V
EN Input Current	I <sub>EN</sub>		-	0.1	1	uA
<b>OC# Flag Output</b>						
OC# Output Resistance	R <sub>FLGB</sub>	I <sub>SINK</sub> =1mA	-	20	80	Ω
OC# Off Current	I <sub>FLGB_OFF</sub>	V <sub>FLGB</sub> =5V	-	0.1	1	uA
OC# Delay Time	T <sub>D</sub>		8	15	22	ms
OUT Shutdown Discharge Resistance	R <sub>DIS</sub>		-	100	-	Ω

**Electrical Characteristics (cont.)**

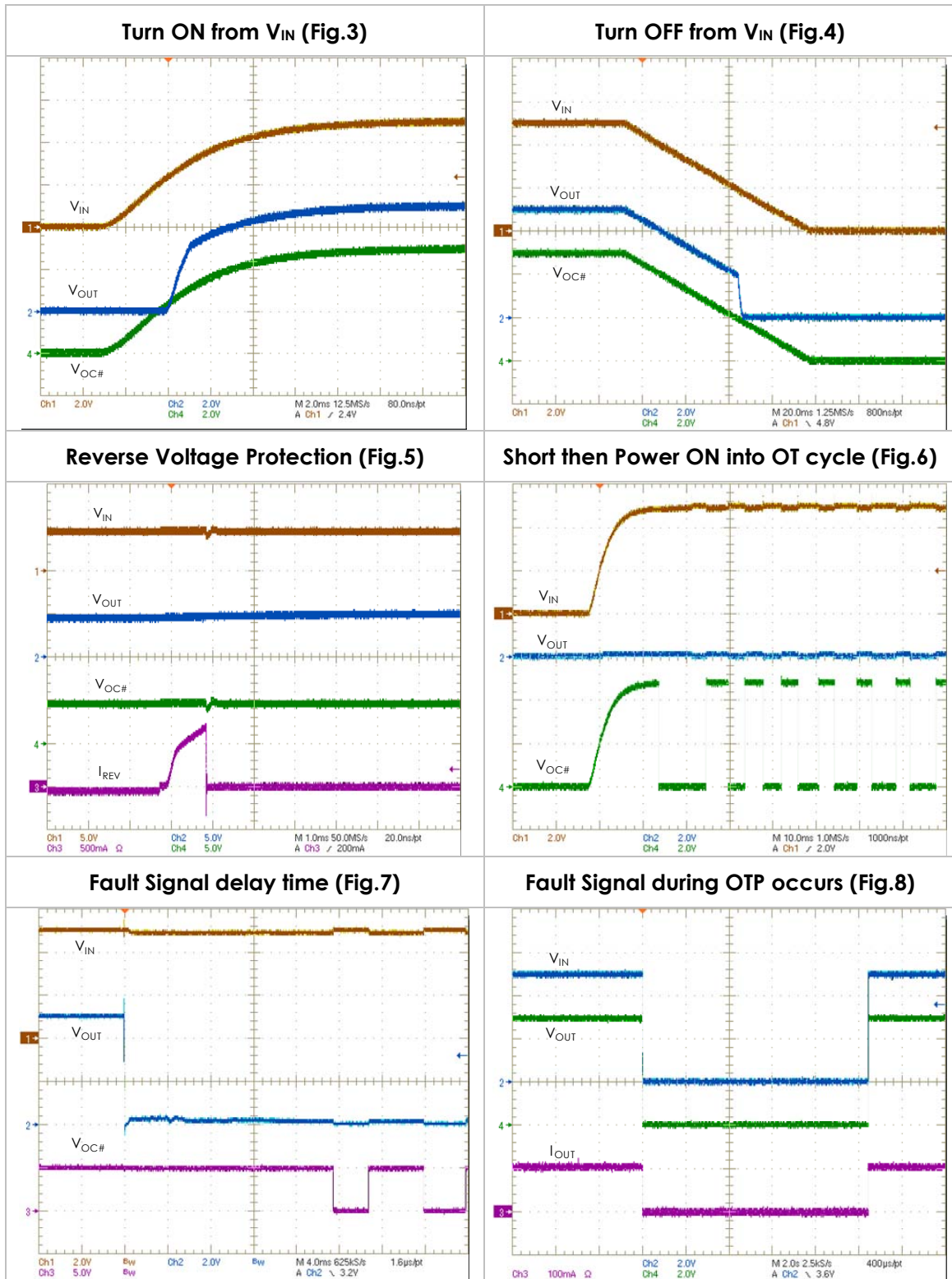
- VIN=5V, TA=+25°C, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
<b>Protection</b>						
OCP Threshold Level	I <sub>OCP</sub>	EMS6030A/B	2.4	3.2	3.9	A
		EMS6030C/D	2.6	3.2	3.9	A
Output Short Circuit Current	I <sub>SC</sub>	EMS6030A/B	1.2	1.7	3	A
		EMS6030C/D	1.7	2.1	3	A
Thermal Shutdown Temperature	T <sub>SD</sub>	EMS6030A/B	-	160	-	°C
		EMS6030C/D	-	150	-	
Thermal Shutdown Hysteresis	T <sub>SDHYS</sub>		-	30	-	°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.**  $\theta_{JA}$  is measured in the natural convection at TA=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.

Typical Performance Characteristics

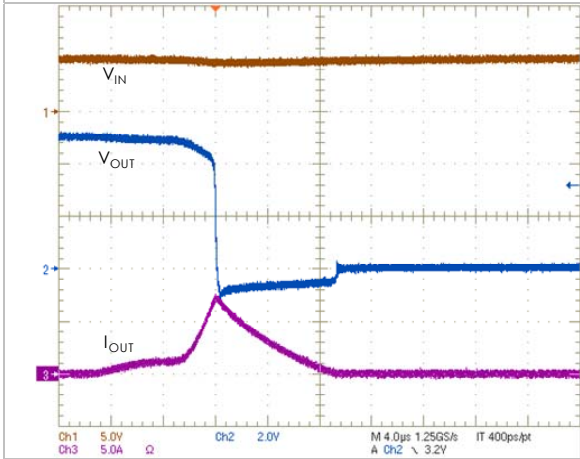
■  $V_{IN}=5V, T_A=25^{\circ}C$ , unless otherwise specified.



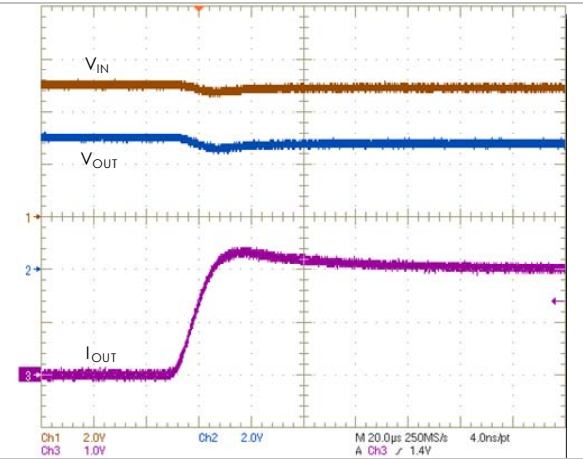
Typical Performance Characteristics (cont.)

■  $V_{IN}=5V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.

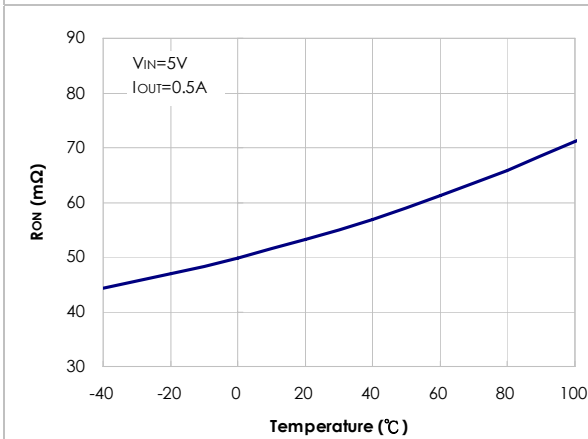
2us Response for output short protection (Fig.9)



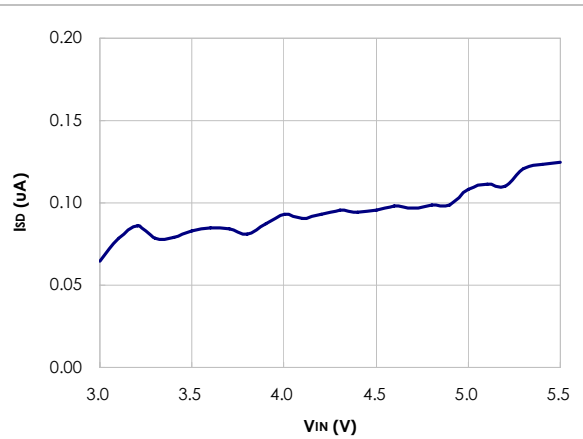
Normal operating 2A output current (Fig.10)



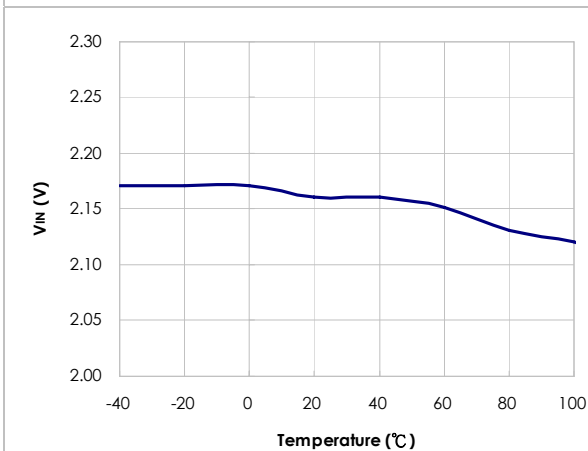
$R_{ON}$  Performance vs. Temperature (Fig.11)



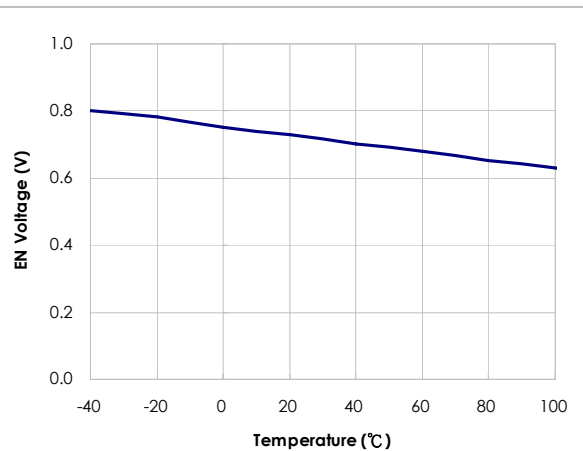
Shutdown Current vs. Input Voltage (Fig.12)



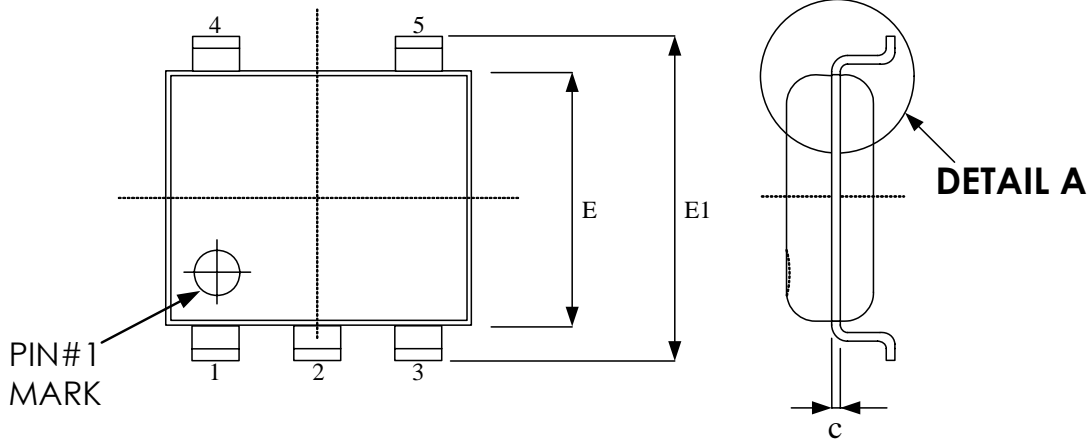
UVLO ON Voltage vs. Temperature (Fig.13)



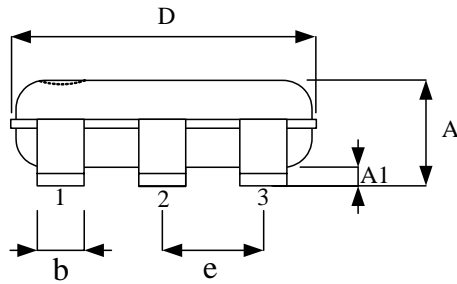
Enable Voltage vs. Temperature (Fig.14)



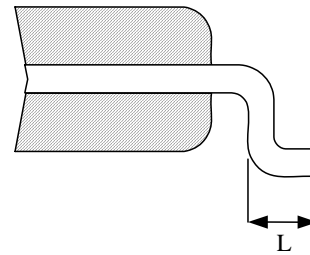
Package Outline Drawing  
SOT-23-5



TOP VIEW



SIDE VIEW



DETAIL A

Symbol	Dimension in mm	
	Min.	Max.
A	0.90	1.45
A1	0.00	0.15
b	0.30	0.50
c	0.08	0.25
D	2.70	3.10
E	1.40	1.80
E1	2.60	3.00
e	0.95 BSC	
L	0.30	0.60



**Revision History**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
0.1	2016.02.26	Initial version.
0.2	2016.04.15	1. Updated the Fig.1 description. 2. Updated the AMR description. 3. Updated the electrical characteristics table.
1.0	2016.09.01	1. Remove preliminary word and modify version to 1.0 2. Modify order information

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