



2A Single Load Switch with Reverse Voltage Protection for Low Voltage Rail

General Description

The EM5210 is a small, low RON load switch with controlled turn on. The device contains an N-channel MOSFET that can operate over an input voltage range of 1.2 V to 5.5 V. The switch is controlled by an on/off input (ON), which is capable of interfacing directly with low-voltage control signals. The EM5210 is active high enable.

The EM5210 contains a 150-Ω on-chip load resistor for quick output discharge when the switch is turned off. The rise time of the device is internally controlled in order to avoid inrush current. An internal reverse voltage comparator disables the power-switch when the output voltage (VOUT) is driven higher than the input (VIN) to quickly (20μs typ) stop the flow of current towards the input side of the switch. Reverse current is always active, even when the power-switch is disabled. Additionally, under-voltage lockout (UVLO) protection turns the switch off if the input voltage is too low. The EM5210 is available in a small, space-saving 6-pin SOT23-6 package and is characterized for operation over the free-air temperature range of -40°C to 85°C.

Ordering Information

Part Number	Package	Remark
EM5210J6	SOT23-6	

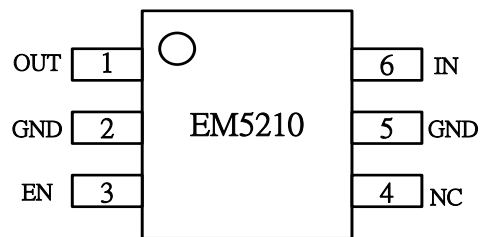
Features

- 2A Single Input Load Switch
- Wide V_{IN} Range from 1.2V to 5.5V
- Smaller Size SOT23-6 Package
- Under-Voltage Lock Out
- Reverse Voltage Protection
- Quick Output Discharged

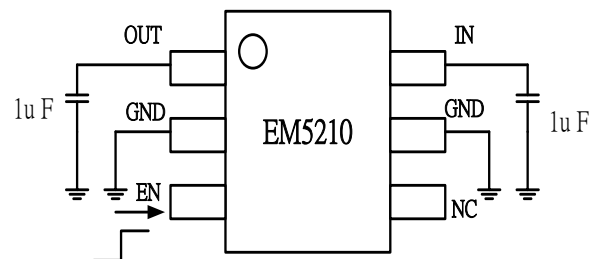
Applications

- Notebook & Netbook & MB
- Desktops
- Tablet PC

Pin Configuration



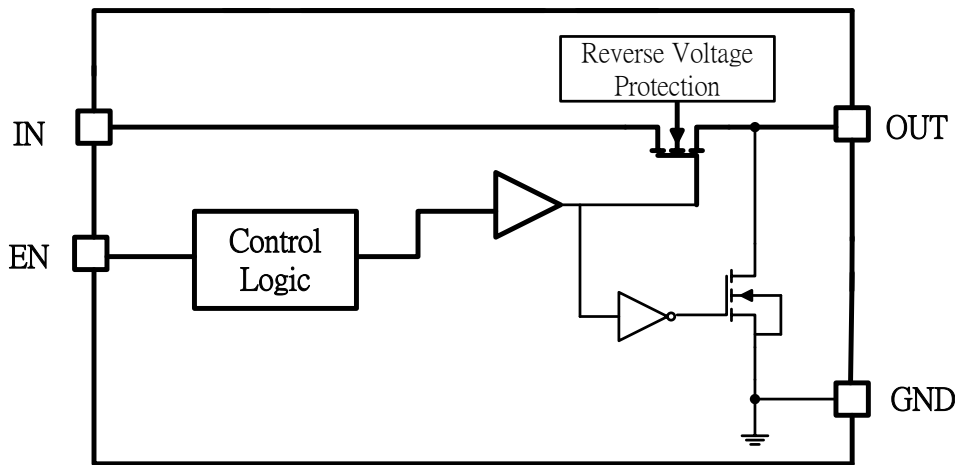
Typical Application Circuit



Pin Assignment

Pin Name	Pin No.	Pin Function
GND	2,5	Ground.
IN	6	Input Voltage. This is the drain input to the power device that supplies current to the output pin. Minimum 0.1uF low ESR ceramic capacitor is recommended at this pin.
EN	3	Chip Enable Input (Active high for EN)
OUT	1	Output Voltage. VOUT is power output pin. Minimum 0.1uF low ESR ceramic capacitor is recommended at this pin.

Function Block Diagram



Absolute Maximum Ratings (Note1)

- V_{IN} -----1.2V to 5.5 V
- Other Pins-----5.5V
- Power Dissipation, P_D @ $T_A = 25^\circ\text{C}$, SOT23-6 -----0.45 W
- Package Thermal Resistance, θ_{JA} , SOT23-6(Note 2)-----230°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)

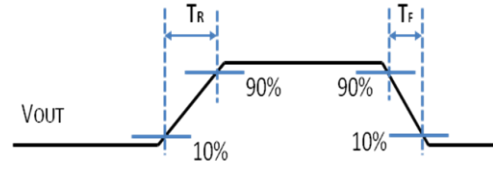
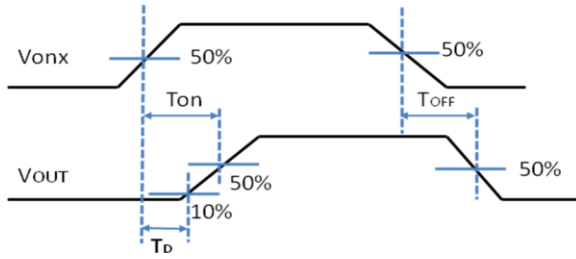
- Supply Input Voltage, V_{IN} ----- 1.2V to 5.5V
- Max Output Current, I_o ----- 2A
- Junction Temperature ----- -40°C to 125°C
- Ambient Temperature ----- 0°C to 85°C

Electrical Characteristics

VIN= 1.2V to 5.5V, TA=25°C, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Section						
POR Threshold	V _{PORTH}		-	-	1.1	V
Quiescent Current	I _Q	I _{OUT} =0A, VIN=VON=5V	-	10		uA
Shutdown Current	I _{SD}	Disable mode, VIN=5V VIN=5V, Von=0V, Vo=OPEN or GND	-		1	uA
Output Voltage						
On Resistance	R _{ON}	VIN=5.5V, I _{OUT} =0.2A	-	100	150	mΩ
		VIN=1.2V, I _{OUT} =0.2A		80	120	mΩ
Shutdown Output Pull low Resistance		VIN=5V, ON=0V, Io=10mA		150		Ω
Enable						
Enable High Level	V _{EN}		1.1	-	-	V
Disable Low Level	V _{SD}	VIN=1.2V~5V	-	-	0.3	V
EN Input Current	I _{EN}		-	0.1	1	uA
Non Production Test Item						
Output Reverse Protection	RVP	Vo>Vin+ VRVP then turn off MOS		100		mV
		Deglitch time		20		us
Thermal Shutdown Temperature	T _{SD}	V _{EN} =V _{IN} , I _{OUT} =0A	-	160	-	°C
Thermal Shutdown Hysteresis	T _{SDHYS}	V _{EN} =V _{IN} , I _{OUT} =0A	-	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.** θ_{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.



Switching characteristics

VIN=1.2V. TA=25 Degree,					
Turn-off time	T _{OFF}	R _L =10Ω, C _L =0.1uF		10	uS
Vout Rising time	T _R	R _L =10Ω, C _L =0.1uF		3.5	mS
Vout falling time	T _F	R _L =10Ω, C _L =0.1uF		10	uS
ON Delay time	T _D	R _L =10Ω, C _L =0.1uF		2	mS

VIN=3.3V. TA=25 Degree,					
Turn-off time	T _{OFF}	R _L =10Ω, C _L =0.1uF		10	uS
Vout Rising time	T _R	R _L =10Ω, C _L =0.1uF		4	mS
Vout falling time	T _F	R _L =10Ω, C _L =0.1uF		10	uS
ON Delay time	T _D	R _L =10Ω, C _L =0.1uF		1.5	mS

VIN=5.5V. TA=25 Degree,					
Turn-off time	T _{OFF}	R _L =10Ω, C _L =0.1uF		10	uS
Vout Rising time	T _R	R _L =10Ω, C _L =0.1uF		4	mS
Vout falling time	T _F	R _L =10Ω, C _L =0.1uF		10	uS
ON Delay time	T _D	R _L =10Ω, C _L =0.1uF		1.5	mS

Functional Description

Under-Voltage Lockout

The under voltage lockout circuit shut-down the power switch until the input voltage reaches the UVLO turn on threshold.

ON/OFF Control

EM5210 is enabled if the voltage of the EN pin is greater than logic high level and the VIN voltage has an adequate applied. If the voltage of the EN pin is less than logic low level, the device will be disabled.

Output Pull-Down

A 150 ohm (typical) internal pull down resistor will discharge the bulk capacitor when the device enters in UVLO or disable mode. The discharged time is dependent on the RC time constant of resistance and output capacitor.

Reverse Current Protection

When the output voltage exceeds the input voltage by 100mV, the reverse voltage circuitry will disconnects the internal Power MOS after 20us deglitch time in order to protect the input power supply. This protection circuit remains active until the voltage at output drops below the input voltage that about 100mV, the Power MOS will be turned back on.

Reverse Blocking Control

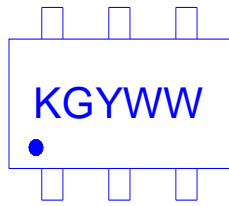
The reverse blocking control feature prevents the current to flow from output to input when device is disabled.

Over Temperature Protection

Over temperature protection prevent the IC from damage when the junction temperature over the 160 degree, the internal thermal sense turns the power switch off thus preventing the power switch from damage. Hysteresis in the thermal sense circuit allows the device to cool down by approximately 20degree before the output is re-started.

Ordering & Marking Information

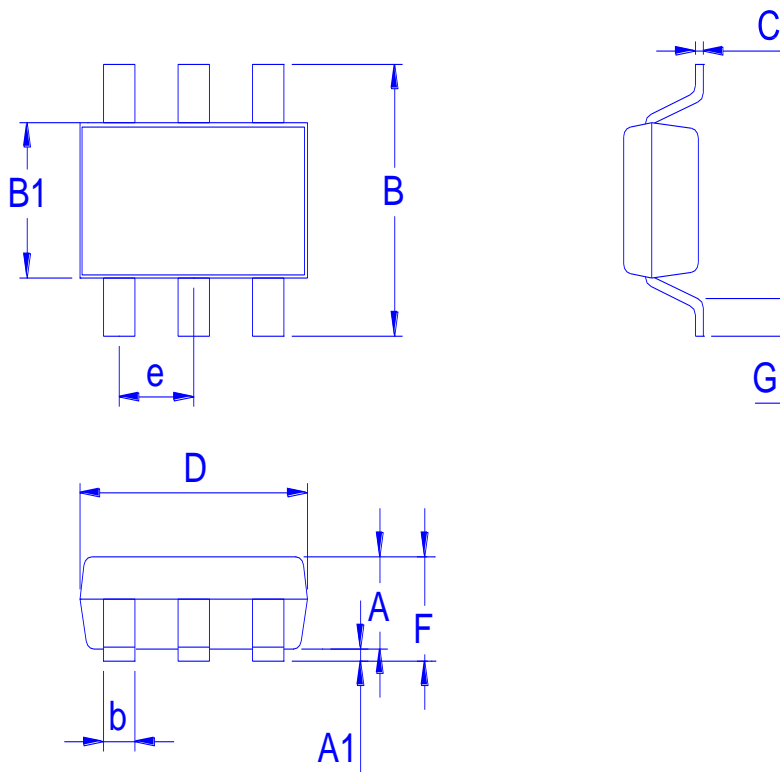
Device Name: EM5210J6 for SOT-23-6



KG: Device Code, KG for EM5210J6
 YWW: Date Code

#1

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

