Current Mode PWM Controller ME8226B Series

General Description

The ME8226B is a highly integrated current mode PWM controller optimized for high performance off-line power converters. VDD low startup current and low operating current contribute to a tiny power consumption and reliable power on startup.

ME8226B features a auto-tuning circuit combined with a steering charge pump，ensuring stable driving speed for various Qg conditions without any external resistor.

ME8226B offers a wide VDD supply range from 9.6V to 52V. The IC operates in a maximum frequency of 70KHz @Full Load, As the load gradually decreases ，the IC operates in Green Mode and Extended Burst Mode to minimize the standby power loss. EMI performance is also optimized by Frequency Jittering and Peak Current Jittering.

ME8226B offers comprehensive protection coverage including Cycle-by-Cycle current limiting （OCP），Over Load Protection（OLP），VDD Under Voltage Lockout （ UVLO ），Over Temperature Protection（OTP），VDD Over Voltage Protection（VDD OVP），Leading Edge Blanking（LEB）and CS open Protection（SCB）.

Features

- Ultra Low start-up and quiescent current
- Wide VDD range from 9.5V to 52V
- Built-in soft start to reduce VDS stress
- Frequency Jittering and Peak Current Jittering
- Extended Burst Mode Control
- Auto -tuning soft Drive technique for various external MOS
- Internal Synchronized Slope Compensation
- Protection coverage with auto recovery
  - Cycle-by-Cycle current limiting（OCP）
  - Over Load Protection（OLP）
  - VDD Under Voltage Lockout（UVLO）
  - VDD Over Voltage Protection（VDD OVP）
  - Over Temperature Protection（OTP）
  - Leading Edge Blanking（LEB）
  - CS open Protection（SCB）

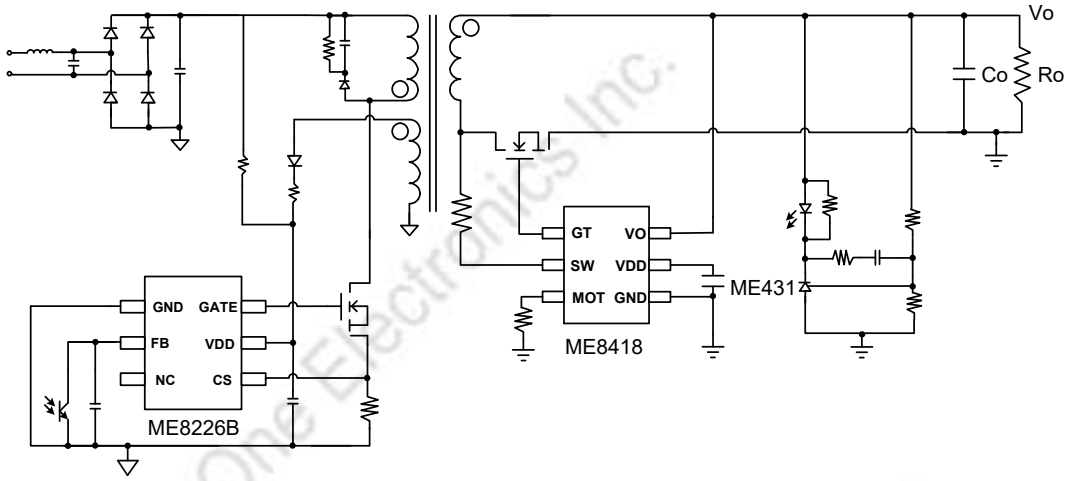
Typical Application

- General Power supply
- Adaptor

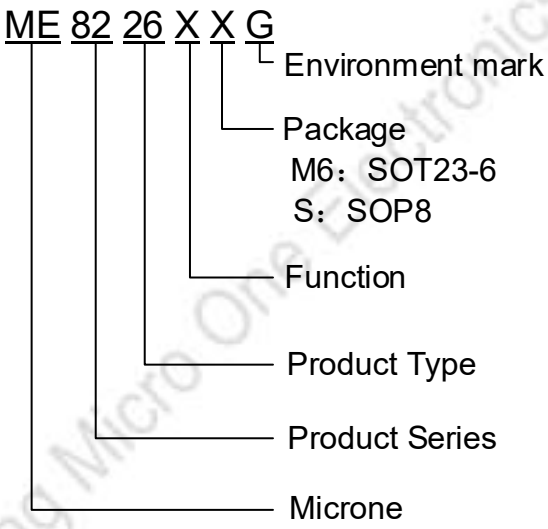
Package

- 6-pin SOT23-6
- 8-pin SOP8

Typical Application



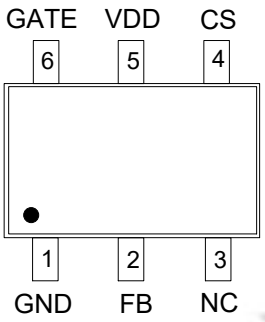
Selection Guide



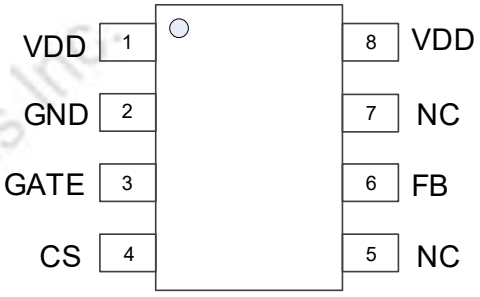
product series	product description
ME8226BM6G	Package：SOT23-6
ME8226BSG	Package：SOP8

Note: If you need other packaging form of products, please contact our sales staff.

Pin Configuration



SOT23-6

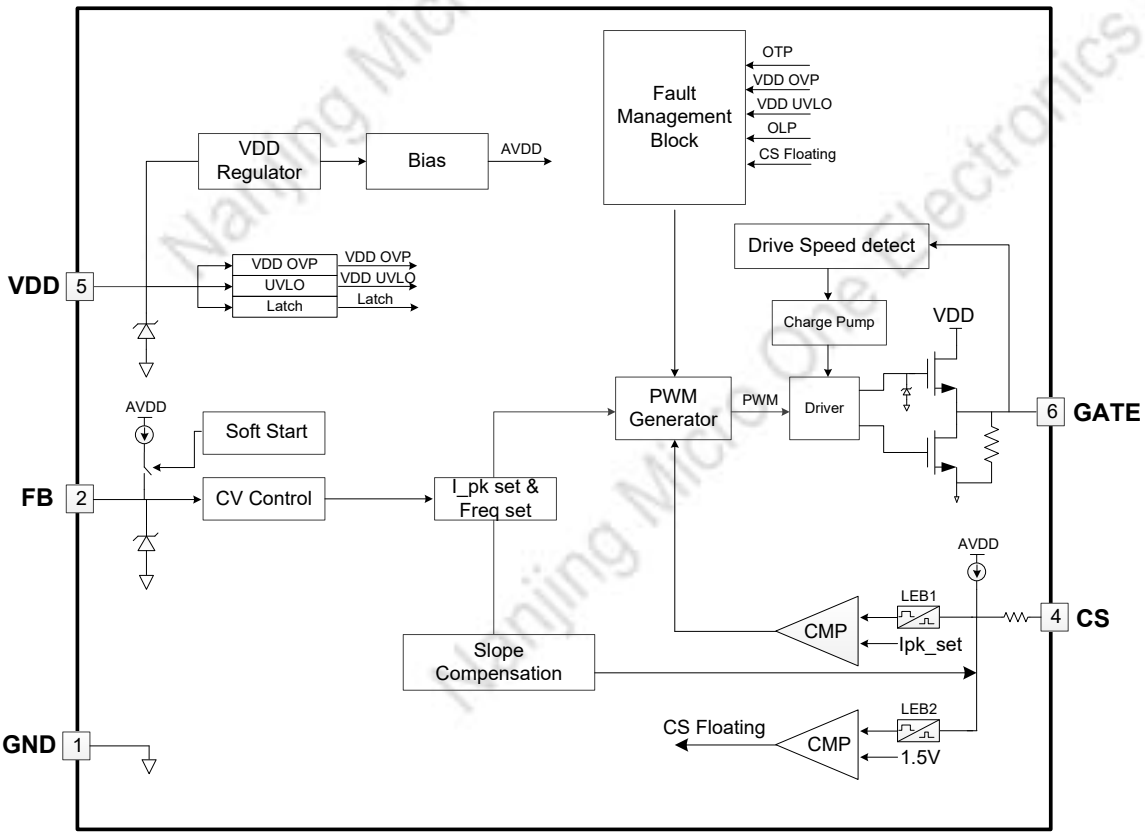


SOP8

PIN Assignments

PIN Num.		Symbol	Description
SOT23-6	SOP8		
1	2	GND	Ground
2	6	FB	Feedback input
3	5,7	NC	No Connection
4	4	CS	Current Sense input
5	1,8	VDD	Power Supply
6	3	GATE	Gate Drive output for power MOSFET

Block Diagram



Absolute Maximum Ratings

Parameter		Range	Unit
VDD DC Supply Voltage		-0.3~80	V
VDD operating current		0~10	mA
FB、CS Input Voltage		-0.3~7	V
Operating ambient temperature :T_A		-40～85	ºC
Min/Max Storage Junction Temperature		-55～150	ºC
Maximum junction temperature T_J		-40～150	ºC
Thermal resistance (Junction to air) θ_{JA}	SOT23-6	200	ºC/W
	SOP8	136	ºC/W
Continuous Total Power Dissipation P_D	SOT23-6	0.63	W
	SOP8	0.92	W
Welding Temperature		+260（10s）	ºC
ESD(HBM)		±2000	V
ESD(CDM)		±2000	V

Notes:

1) Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product.

2) The maximum allowable power dissipation is a function of the maximum junction temperature $T_{J\,(MAX)}$, the junction-to- ambient thermal resistance θ_{JA}, and the ambient temperature T_A. The maximum allowable continuous power dissipation at any ambient temperature is calculated by $P_{D(MAX)}=(T_{J(MAX)}-T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation produces an excessive die temperature, and the regulator goes into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage.

3）The θ_{JA} values given in this table are for comparison with other packages only and cannot be used for design purposes. They do not represent the performance achieved in real-world applications.

Recommended Operating Condition

Parameter	Range	Unit
VDD Input Voltage	9.5~52	V
Operating Ambient Temperature	-40~85	°C

Electrical Characteristics

(TA = 25°C,VDD=16V, if not otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
Supply Voltage (VDD)						
I_{Start}	Start-Up Current Sourced from VDD Pin	VDD=16V	4	5	7	μA
VDD	Operation Voltage		9.5	-	52	V
VDD_ON	VCC Under Voltage Lockout Enter		15	17.5	20	V
VDD_OFF	Under-Voltage Lockout Voltage of VDD Pin		8	9.5	11	V
VDD_OVP	VDD Over Voltage Protection Threshold voltage	FB=2.5V，ramp up VDD until gete clock is off	50	52	54	V
Iq	VDD Standby current	FB=0，CS=0，VDD=24V	-	240	700	uA
I_Fault	VDD Pull down current @ Fault Condition	VDD=24V@Fault condition	-	1.2	1.4	mA
I_oper	Operation Current	VDD=24V，FB=2.8V，CS=0	2.5	-	-	mA
Feedback Input Section（FB Pin）						
V_{FB_OPEN}	FB open Loop Voltage	FB Floating，CS=0	4	4.2	4.4	V
R_{FB}	FB Input Impedance		18	20	22	KΩ
I_{FB_SHORT}	FB pin short circuit current	FB=0，CS=0	190	210	230	uA
V_{FB_OLP}	Open loop Protection FB threshold	VDD20V，Ramp up FB until gate clock is off	3	3.1	3.2	V
V_{FB_ECO}	ECO Mode threshold		2.1	2.2	2.3	V
V_{FB_DPWM}	DPWM threshold		1.6	1.7	1.8	V
V_{FBL}	The threshold enter burst mode		0.7	0.8	0.9	V
V_{FBH}	The threshold exit burst mode		0.9	1	1.15	V
T_{D_OLP}	Open loop Protection De-bounce Time		55	60	65	ms
Tss	Internal Soft start time		4	6	8	ms
Current Sense Input （CS Pin）						
T_{ON_MIN}	Minimum On Time		400	450	500	ns
T_{LEB}	Leading edge Blanking Time		250	300	350	ns
Vcs_min	CS minimum Voltage		170	200	230	mV
Vcs_max	CS maximum Voltage		770	800	830	mV
V_{SC}	CS open Protection threshold		1.4	1.5	1.6	V
D_Max	Maximum duty cycle		70%	75%	80%	
Oscillator						
Fmax	Maximum Frequency for operation	FB=3V	65	70	75	KHz
Fmin	Burst Mode Switch Frequency	FB=1V	21	23	25	KHz
ΔF_jitter	Frequency jittering		-	±7%	-	
ΔIpk	Ipk jittering		-	±3%	-	

Gate Driver						
VOL	Output low level		-	-	1	V
VOH	Output high level		7	-	-	V
V_clamp	Output clamp voltage		10	11	12	V
T_adj	Auto-tuning enable time duration		100	-	300	ns
Thermal Protection						
OTP IN			-	170	-	℃
OTP OUT			-	125	-	℃

Operation Description

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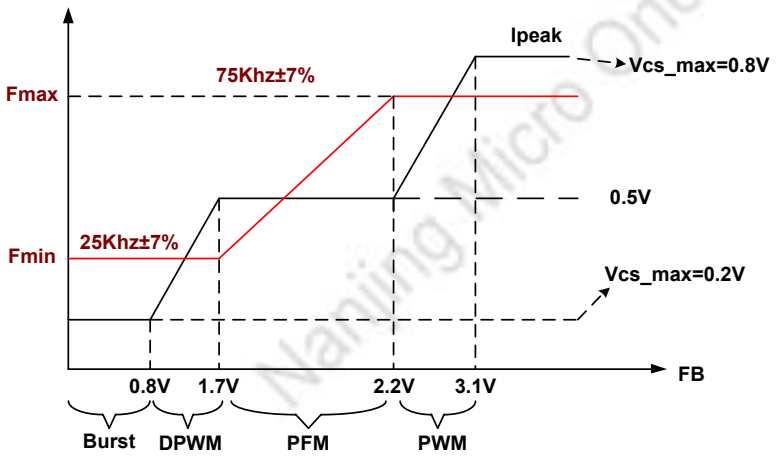
ME8226B also offers a wide VDD supply range from 9.5V to 52V and operates in a maximum frequency of 70KHz @Full Load, As the load gradually decreases ， the IC operates in Green Mode and Extended Burst Mode to minimize the standby power loss. EMI performance is also optimized by Frequency Jittering and Peak Current Jittering. The good supply system reliability is also achieved with Multiple auto-recovery Protection features.

Start up Control

Startup current of ME8226B is set to be extremely low so that VDD could be charged up above UVLO threshold easily by a large external resistor tied to Vbuck .

When VDD reaches VDD_ON(typical 17.5V)，the controller detect fault condition，If the fault status=1，VDD then begins to fall because the controller bias current is at I_Fault（Typically 1.2mA）and the auxiliary supply voltage is not present. When VDD falls to VDD_OFF(typically 6V), the current source turns back on and charges VDD. This Cycle repeats indefinitely until Fault status==0.

Frequency and Ipk set



During the full load power operation, ME8226B operates at a 70KHz frequency，As the load gradually

decreases ，the IC operates in Green Mode and Extended Burst Mode to minimize the standby power loss. Ipk control is also achieved by DPWM & PWM control loop.

Current Sensing and Leading Edge Blanking

Cycle-by-Cycle current limiting is offered in ME8226B current Mode PWM control. The switch current is detected by a sense resistor into the CS pin. An internal leading edge blanking circuit chops off the sensed voltage spike at initial internal power MOSFET on state due to a snubber diode reverse recovery and surge gate current of power MOSFET during the blanking period.

Extended Burst Mode Operation

At zero load or light load condition, majority of the power dissipation in a switching mode power supply is from switching loss on the MOSFET transistor, the core loss of the transformer and the loss on the snubber circuit. The magnitude of power loss is in proportion to the switching frequency. Lower switching frequency leads to the reduction on the power loss and thus conserves the energy.

The switching frequency is internally adjusted at no load or light load condition. The switch frequency reduces at light/no load condition to improve the conversion efficiency. At light load or no load condition, the FB input drops below burst mode threshold level and device enters Burst Mode control. The Gate drive output switches only when VCC voltage drops below a preset level and FB input is active to output an on state. Otherwise the gate drive remains at off state to minimize the switching loss and reduces the standby power consumption to the greatest extend. The nature of high frequency switching also reduces the audio noise at any loading conditions.

Soft Start

Soft-start is achieved by ramping up an internal reference, VSSTART, and comparing it to the current sense signal. VSSTART ramps up from 0 V once the controller initially powers up. The peak current set point is then limited by the VSSTART ramp resulting in a gradual increase of the switch current during start-up. The soft-start duration, is typically 4 ms.

Auto-tuning soft drive

ME8226B features a auto-tuning circuit combined with a steering charge pump，ensuring stable driving speed for various Qg conditions without any external resistor.

Protection Controls

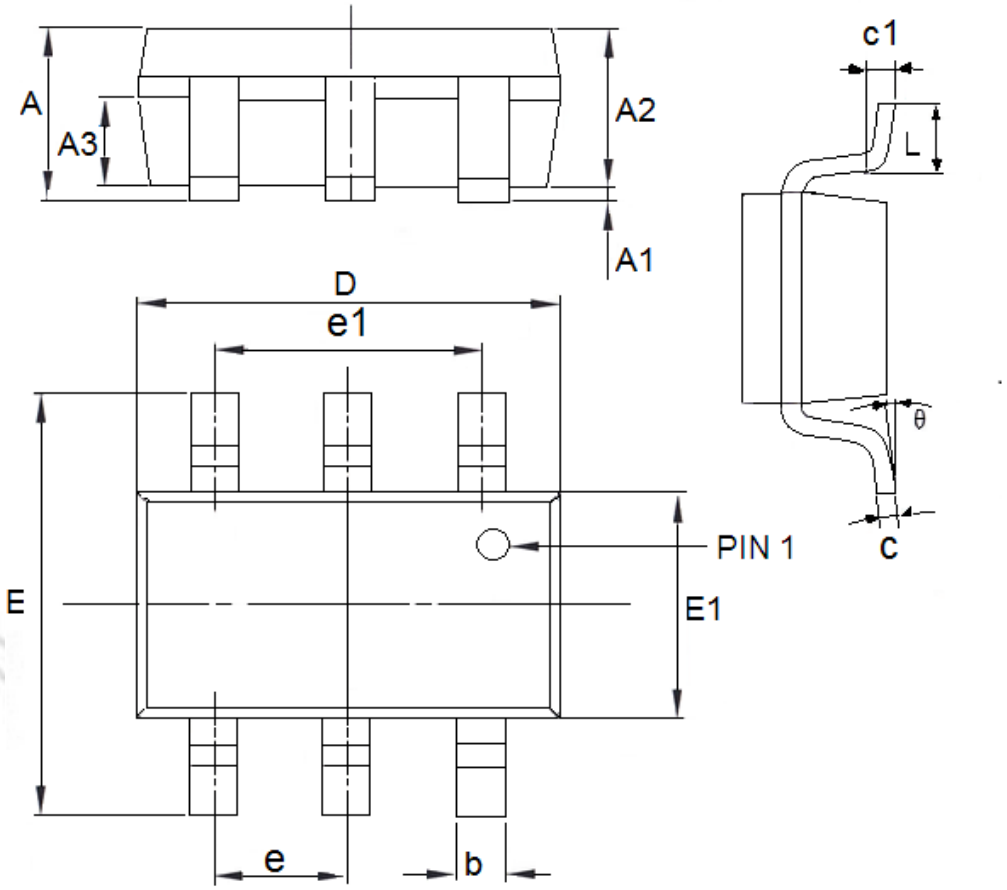
Good power supply system reliability is achieved with its rich protection features including Cycle-by-Cycle current limiting (OCP), Over Load Protection (OLP), CS short protection, CS floating protection, over voltage protection (OVP), and Under Voltage Lockout on VCC (UVLO).

Package Quantity

Package Type	Minimum Packing QTY	UNITS	Small Box	Large BOX
SOT23-6	3000	Tape & Reel	30K	120K
SOP8	3000	Tape & Reel	6K	48K

Package Information

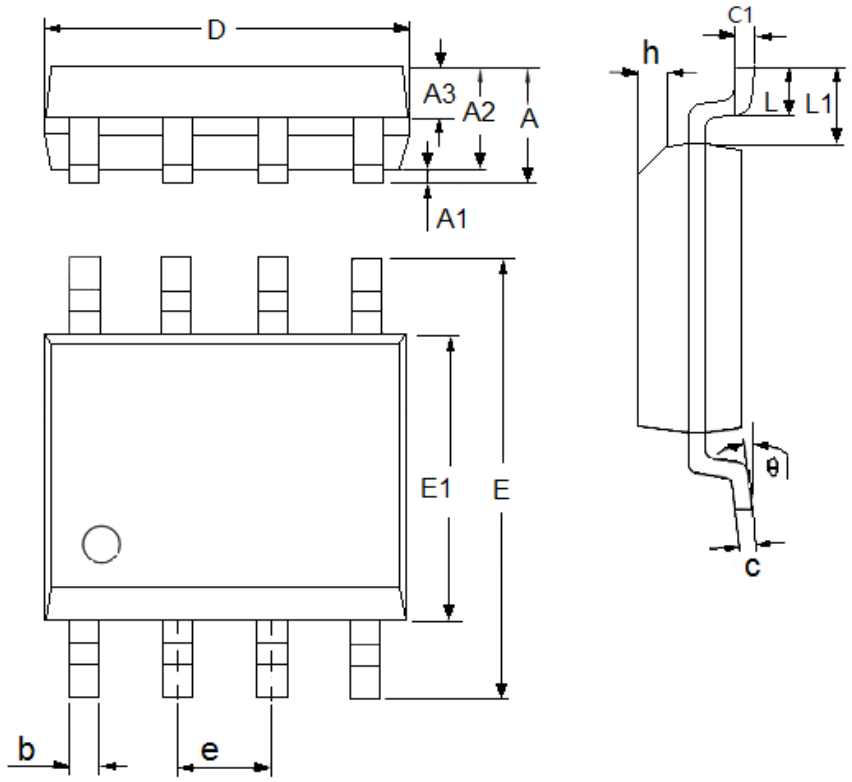
- **Package Type: SOT23-6**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.55	0.75	0.0217	0.0295
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.7	3.12	0.1063	0.1228
e1	1.9(TYP)		0.0748(TYP)	
E	2.6	3.1	0.1024	0.1220
E1	1.4	1.8	0.0551	0.0709
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6	0.0098	0.0236
θ	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

Package Information

- **Package Type: SOP8**



DIM	Millimeters		Inches	
	Min	Max	最小值	Min
A	1.3	1.8	0.0512	0.0709
A1	0.05	0.25	0.002	0.0098
A2	1.25	1.65	0.0492	0.065
A3	0.5	0.7	0.0197	0.0276
b	0.3	0.51	0.0118	0.0201
c	0.17	0.25	0.0067	0.0098
D	4.7	5.1	0.185	0.2008
E	5.8	6.2	0.2283	0.2441
E1	3.8	4	0.1496	0.1575
e	1.27(TYP)		0.05(TYP)	
h	0.25	0.5	0.0098	0.0197
L	0.4	1.27	0.0157	0.05
L1	1.04(TYP)		0.0409(TYP)	
θ	0	8°	0	8°
c1	0.25(TYP)		0.0098(TYP)	

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