CV/CC controller ME8329-N

General Description

ME8329-N is a high performance, highly integrated QR (Quasi Resonant Mode) and Primary Side Regulation (PSR) controller for offline small power converter applications. ME8329-N integrates a high voltage power MOSFET.It has high efficiency and low EMI.ME8329-N can meet EPS level 6 energy standard easily. The IC also has built-in cable drop compensation function, which can provide excellent CV performance.

ME8329-N integrates functions and protections of Under Voltage Lockout (UVLO),VDD Over Voltage Protection(VDD OVP),Output Over Voltage Protection (Output OVP),Soft Start,Cycle-by-cycle Current Limiting (OCP), All Pins Floating Protection,Gate Clamping, VDD Clamping.

Features

- Easily to Pass Energy Star EPS6.0
- High efficiency and low EMI
- ± 5% Constant Current (CC) and Constant Voltage (CV) Regulation at Universal AC Input
- Less than 60mW standby power
- Built-in 650V/200V Power MOSFET
- Proprietary cable drop compensation
- Cycle-by-Cycle current limiting
- Built-in Leading Edge Blanking (LEB)
- All Pins Floating Protection
- Built-in Soft Start
- Output Over Voltage Protection
- VDD OVP & Clamp

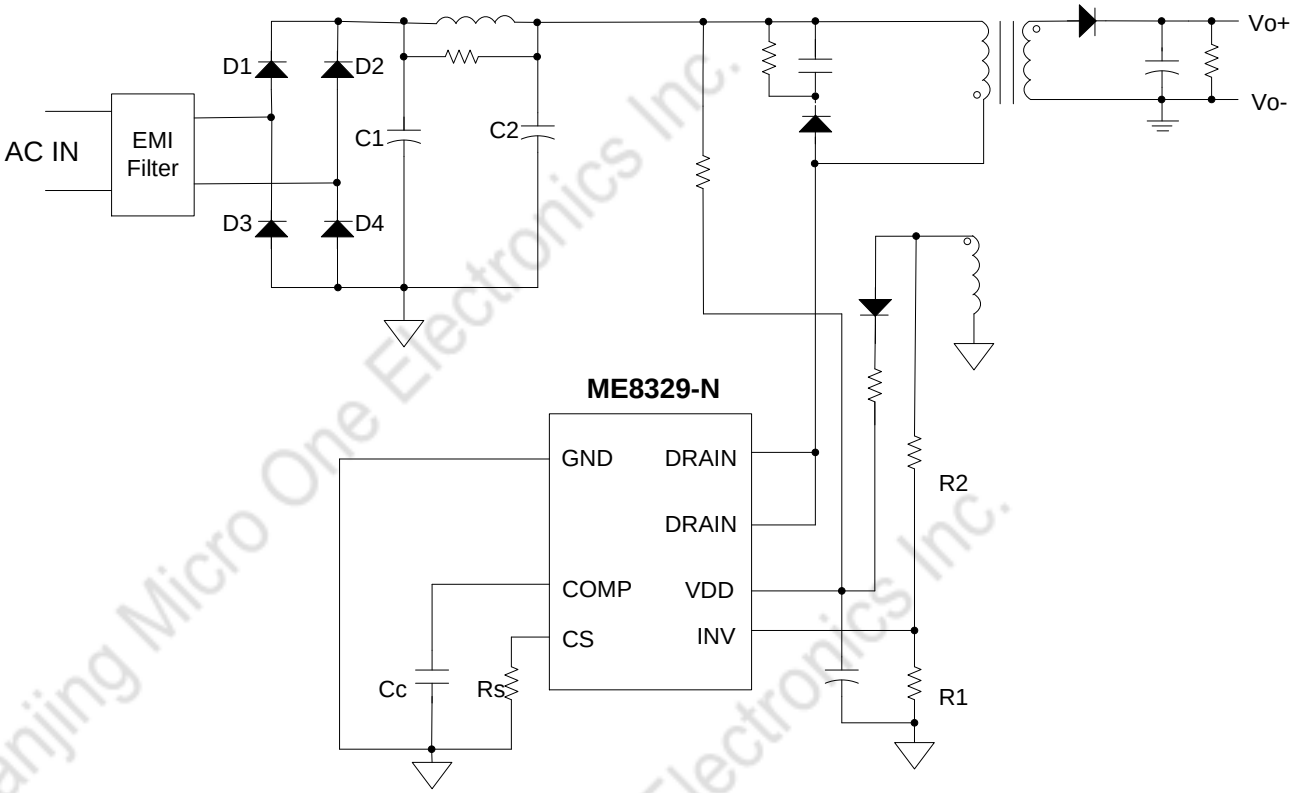
Typical Application

- Battery chargers for cellular phones, cordless phones, PDA, digital cameras, etc
- Replaces linear transformer and RCC SMPS
- Small power adapter
- AC/DC LED lighting

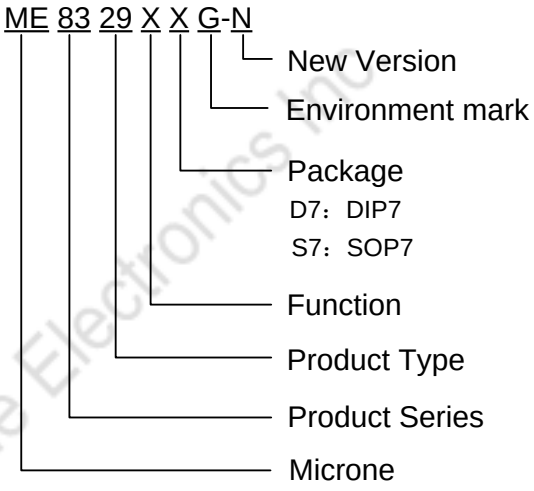
Package

- 7-pin DIP7、SOP7

Typical Application Circuit

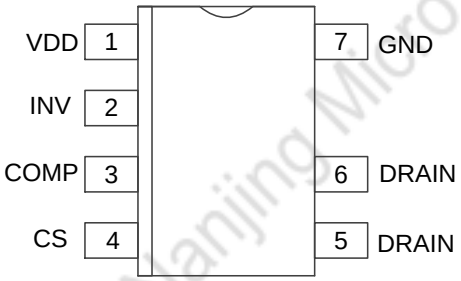


Selection Guide

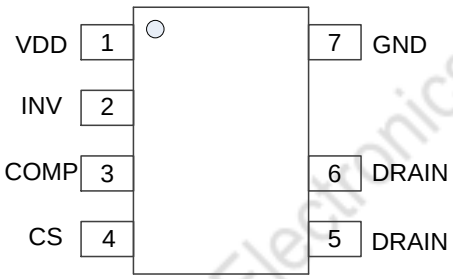


product series	product description
ME8329AD7G-N	Built-in 650V Power MOSFET; Max power:18W; Package:DIP7
ME8329AS7G-N	Built-in 650V Power MOSFET; Max power:16W; Package:SOP7
ME8329BD7G-N	Built-in 650V Power COOLMOS; Max power:30W; Package:DIP7
ME8329BS7G-N	Built-in 650V Power COOLMOS; Max power:24W; Package:SOP7
ME8329CS7G-N	Built-in 200V Power MOSFET; Max power:18W; Package:SOP7

Pin Configuration



DIP7

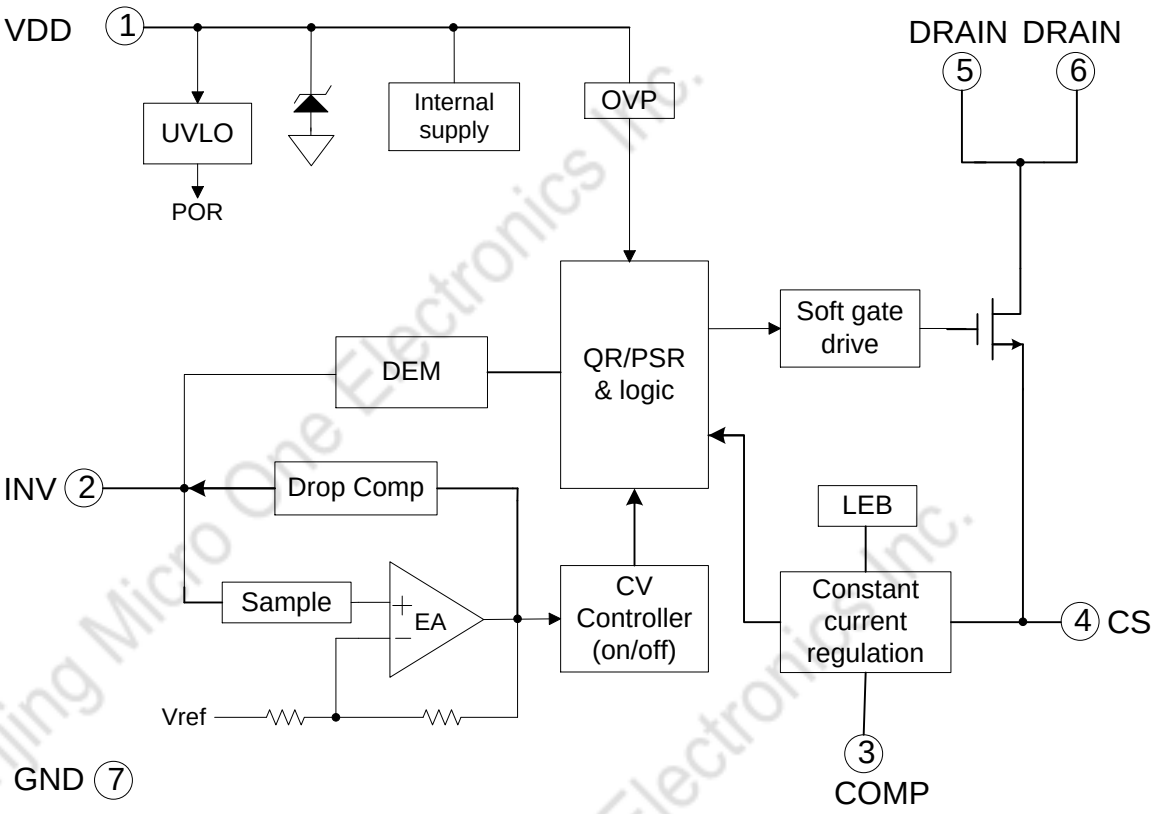


SOP7

Pin Assignment

Pin Number（SOP7、DIP7）	Symbol	Function
1	VDD	Power Supply
2	INV	System feedback pin. This control input regulates both the output voltage in CV mode and output current in CC mode based on the flyback voltage of the auxiliary winding
3	COMP	Connect a capacitor between this pin and GND for CC regulation
4	CS	Current sense
5，6	DRAIN	High voltage power MOSFET drain connection
7	GND	Ground

Block Diagram



Absolute Maximum Ratings

Parameter		Ratings	Unit
VDD DC supply Voltage		35	V
VDD DC clamp current		10	mA
COMP, CS Voltage range		-0.3 ~ 7	V
INV Voltage range		-0.7 ~ 7	V
Storage Temperature range		-55 ~ +150	℃
Junction Temperature range		-40 ~ +150	℃
Operating Ambient Temperature range		-40 ~ +85	℃
Lead temperature(Soldering, 10sec.)		260	℃
ESD capability, HBM(Human body model)		2	KV
ESD capability, MM(Machine model)		250	V
Thermal resistance(Junction to air) θ_{JA}	DIP7	74	℃/W
	SOP7	86	℃/W
Continuous Total Power Dissipation P_D	DIP7	1.7	W
	SOP7	1.45	W

Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

Recommended working condition

Parameter	Min	Typ.	Max	Unit
Power supply voltage, VDD	10	-	30	V
Operating Ambient Temperature	-40	-	85	℃
Maximum switching Frequency	-	120	-	KHz

Electrical Characteristics

(Test conditions: VDD=16V, T_A=25°C unless otherwise stated)

Item	Testing condition		Min	Typ.	Max	Unit
Supply Voltage (VDD) Section						
Start up Current I_{START}	VDD=UVLO(ON)-1V Measure current into VDD		-	2	20	μA
Operating Current I_{DD}	V_{INV}=1V, CL=0.5nF VDD=20V		-	0.9	1.5	mA
VDD Under Voltage Lockout Exit (Recovery) ($UVLO_{OFF}$)	VDD Falling		7.8	8.8	9.8	V
VDD Under Voltage Lockout Enter ($UVLO_{ON}$)	VDD Rising		19.5	20.5	21.5	V
VDD Over voltage protection trigger(OVP)			32	34	36	V
VDD Zener clamp voltage (VDD_Clamp)	I_{VDD}=7mA		-	39	-	V
Feedback Input Section(INV Pin)						
Internal Error amplifier(EA) reference input $V_{INV\_EA\_Ref}$			1.98	2.0	2.02	V
Minimum OFF time Tmin_off			-	2	-	μS
Maximum OFF time Tmax_off			-	3.2	-	mS
Max cable compensation current Icable_max			-	65	-	μA
Current Sense (CS pin)						
Leading Edge Blanking of CS, LEB			-	500	-	nS
Over Current detection and control delay T_{D_OC}			-	100	-	nS
Constant current control(COMP pin)						
Internal COMP voltage $V_{\_COMP\_REF}$			0.98	1.0	1.02	V
Protection section						
Overheat protection temperature T_P			-	150	-	°C
MOSFET Section						
Drain-Source Voltage	Vgs=0，ME8329A-N/ ME8329B-N		650	-	-	V
	Vgs=0，ME8329C-N		200	-	-	V
Static Drain-Source On-Resistance	V_{GS}=10V, Id=1.0A	ME8329A-N	-	-	3.8	Ω
	V_{GS}=10V, Id=1.3A	ME8329B-N	-	1.05	1.2	Ω
	V_{GS}=10V, Id=2.5A	ME8329C-N	-	-	0.8	Ω

Application Information

ME8329-N is a high performance, multi mode controlled, highly integrated QR (Quasi Resonant) Primary Side Regulation (PSR) controller. The built-in high precision CV/CC control with high level protection features make it very suitable for offline small power converter applications.

- **Start-up current and start-up control**

Start-up current of ME8329-N is designed to be very low (typically 2μA) so that VDD could be charged up above $UVLO_{ON}$ threshold level and device starts up quickly. A large value start-up resistor can therefore be used to minimize the power loss yet reliable start-up in application.

- **Operating current**

The operating current in ME8329-N is as small as 1mA (typical). The small operating current results in higher efficiency and reduces the VDD hold-up capacitance requirement.

- **QR/PSR Control**

ME8329-N uses a proprietary QR/PSR control for high efficiency and low EMI. The IC works in Quasi-Resonant (QR) mode in Constant Current (CC) and Constant Voltage (CV) mode. In this way, the efficiency is boosted and the EMI is reduced greatly. The IC can easily meet EPS level 6 energy standard.

- **Constant Current (CC) Regulation**

ME8329-Ncan accurately control the output current by the internal current feedback control loop. The output mean current in constant current (CC) mode can be approximately expressed as:

$$I_{CC}(mA) = \frac{N}{2} \times \frac{500(mV)}{Rcs(\Omega)}$$

In the equation above, N----The turn ratio of primary side winding to secondary side winding.

Rcs--- the sensing resistor connected between the MOSFET source to GND.

- **Precision CV/CC Performance**

In ME8329-N the parameters are trimmed to tight range, which makes the system CC/CV to have less than ±5% variation.

- **Soft Start**

ME8329-N features an internal soft start that slowly increases the threshold of cycle-by-cycle current limiting comparator during start-up sequence. It reduces the stress on the secondary diode during start-up. Every start-up process is followed by a soft start activation.

- **Proprietary Cable Voltage Compensation in CV Mode**

When it comes to cellular phone charger applications, the battery is located at the end of cable, which causes

typically several percentage of voltage drop on the actual battery voltage. ME8329-N has a proprietary built-in cable voltage drop compensation block which can provide a constant output voltage at the end of the cable over the entire load range in CV mode.

- **Leading Edge Blanking (LEB)**

Each time the power MOSFET is switched on, a turn-on spike occurs across the sensing resistor. To avoid premature termination of the switching pulse, an internal leading edge blanking circuit is built in. During this blanking period (500ns, typical), the cycle-by-cycle current limiting comparator is disabled and cannot switch off the gate driver. Thus, external RC filter with a small time constant is enough for current sensing.

- **Minimum and Maximum OFF Time**

In ME8329-N, a minimum OFF time (typically 2us) is implemented to suppress ringing when GATE is off. The minimum OFF time is necessary in applications where the transformer has a large leakage inductance, particularly at low output voltages or start-up. The maximum OFF time in ME8329-N is typically 3ms, which provides a large range for frequency reduction. In this way, a low standby power of 100mW can be achieved.

- **VDD OVP(Over Voltage Protection)**

VDD OVP (Over Voltage Protection) is implemented in ME8329-N and it is a protection of auto-recovery mode.

- **Pin Floating Protection**

In ME8329-N, if pin floating situation occurs, the IC is designed to have no damage to system.

- **Soft Gate Drive**

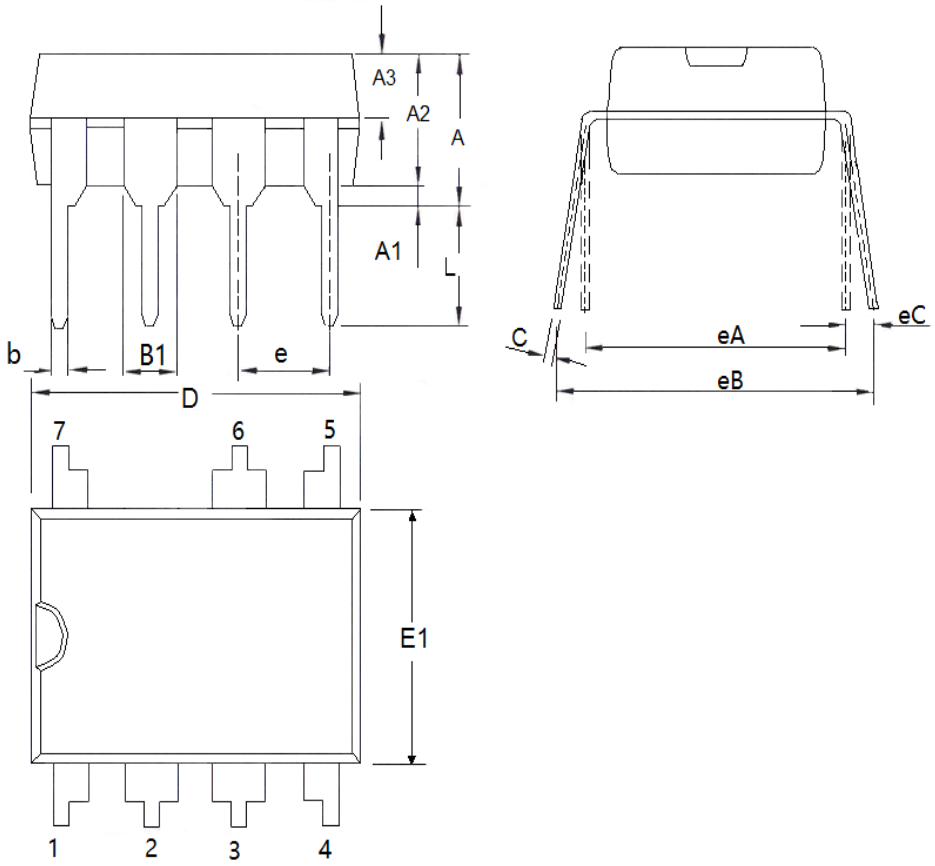
ME8329-N has a soft totem-pole gate driver with optimized EMI performance. An internal 16V clamp is added for MOSFET gate protection at higher than expected VDD input.

Package Quantity

Package Type	Minimum Packing QTY	UNITS	Small Box	Large BOX
DIP7	50	Tube	2K	20K
SOP7	3000	Tape & Reel	6K	48K

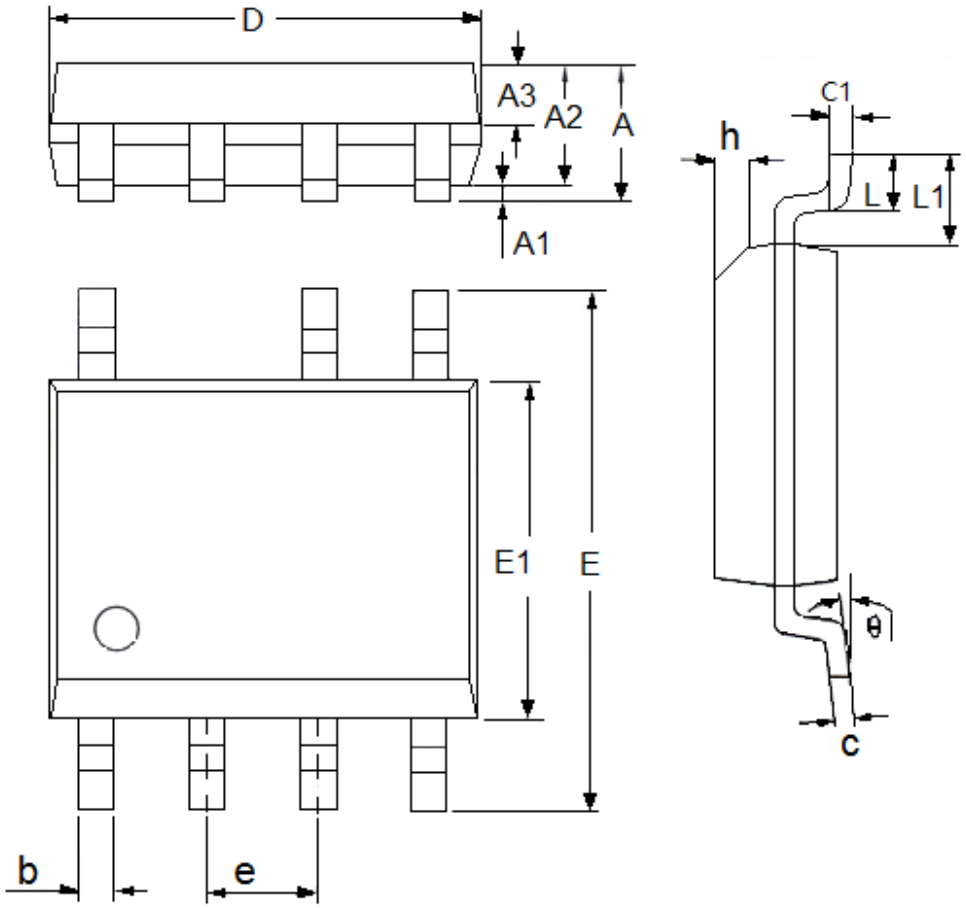
Packaging Information

- **DIP7**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	3.6	4.31	0.1417	0.1697
A1	0.5(TYP)		0.0197(TYP)	
A2	3.2	3.6	0.1260	0.1417
A3	1.47	1.65	0.0579	0.0650
b	0.38	0.57	0.0150	0.0224
B1	1.52(TYP)		0.0598(TYP)	
C	0.2	0.36	0.0079	0.0142
D	9	9.4	0.3543	0.3700
E1	6.1	6.6	0.2402	0.2598
eA	7.62(TYP)		0.3(TYP)	
eB	7.62	9.3	0.3000	0.3661
e	2.54(TYP)		0.1(TYP)	
eC	0	0.84	0.0000	0.0331
L	3	3.6	0.1181	0.1417

- **SOP7**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.35	1.75	0.0531	0.0689
A1	0.05	0.25	0.0020	0.0098
A2	1.25	1.65	0.0492	0.0650
A3	0.5	0.7	0.0197	0.0276
b	0.33	0.51	0.0130	0.0201
c	0.17	0.25	0.0067	0.0098
D	4.7	5.1	0.1850	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	0.0500
L1	1.04(TYP)		0.0409(TYP)	
θ	0	8°	0.0000	8°
c1	0.25(TYP)		0.0098(TYP)	

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