26V 500KHz 4A Fast-PWM Synchronous Step-Down Converter

Description

The MT3935 is a fully integrated high efficiency synchronous step-down converter which requires minimum number of external components. It offers very compact solution with up to 4A continuous output current over a wide input range.

The MT3935 employs proprietary Constant On-Time (COT) control scheme providing superior transient response and maintaining constant switching frequency under the continuous conduction mode operation. The internal ramp compensation network allows stable operation with ultra-low equivalent series resistance (ESR) output ceramic capacitors without using external compensation network. An error amplifier in the control loop provides excellent line and load regulation.

The MT3935 integrates extensive protection functions include: UVLO, OCP, OVP and thermal shutdown.

The unique ultrasonic pulse-skipping mode (MT3935) maintains the switching frequency above 25kHz, which eliminates noise in audio applications. Other features include pulse skipping mode (MT3935), which maximizes efficiency in light-load applications.

The converter is available in a small 8pin SOP8-EP and DFN4x3_14L package.

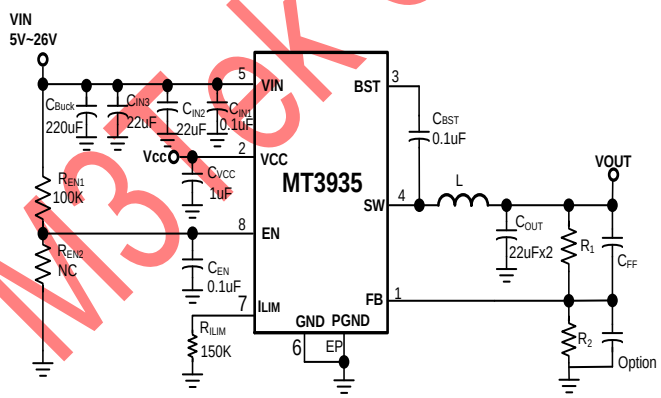
Features

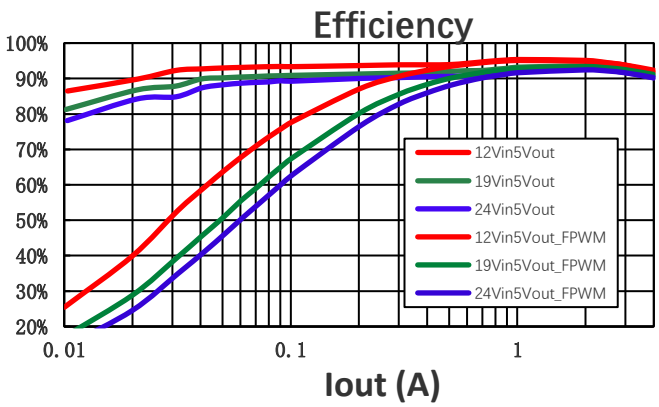
- 4.3V to 26V Input Voltage Range with
- 2% 0.8V Feedback Voltage Accuracy
- 4A continuous output current (5A Peak)
- Support 100% duty cycle Low Dropout Operation
- Stable operation with output low ESR ceramic capacitors
- Fast PWM Constant On Time (COT) control scheme with superior transient performance
- 500kHz Switching frequency with 2 Type Light Load Mode Control Schemes:
  MT3935N Ultrasonic Pulse Skip Mode (25kHz Min);
  MT3935A Forced PWM Mode
- Integrated High Side and Low Side Switches
  SOP8_EP: 40mΩ and 35mΩ
  DFN4x3_14L: 33mΩ and 35mΩ
- Accurate EN Threshold for the External Programmable VIN UVLO
- Low quiescent current
- Hiccup mode Over Current protection
- Thermal Shutdown with Auto recovery.
- Available in an 8-pin SOP8-EP and DFN4x3_14L Package

Applications

- Laptop Computer
- Tablet PC
- Networking Systems
- Personal Video Recorders
- Flat Panel Television and Monitors
- Distributed Power Systems

Typical Application Diagram



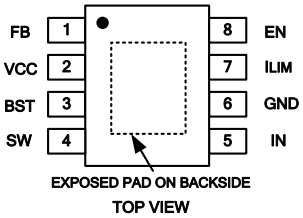


Ordering Information

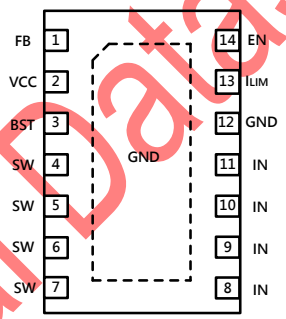
Part No.	Marking	Temp. Range	Remark	Package	MOQ
MT3935NSPR	MT3935 YWWxx	-40°C ~85°C	Adjustable Vout COT UA mode	SOP8_EP	2500/Tape & Reel
MT3935ASPR	MT3935A YWWxx	-40°C ~85°C	Adjustable Vout COT FPWM mode	SOP8_EP	2500/Tape & Reel
MT3935NDDR	MT3935 YWWxx	-40°C ~85°C	Adjustable Vout COT UA mode	DFN4x3_14L	5000/Tape & Reel
MT3935ADDR	MT3935A YWWxx	-40°C ~85°C	Adjustable Vout COT FPWM Mode	DFN4x3_14L	5000/Tape & Reel

Note: Y: Year, WW: Week, xx: Manufacture Control Code

Pin Configuration



SOP8-EP

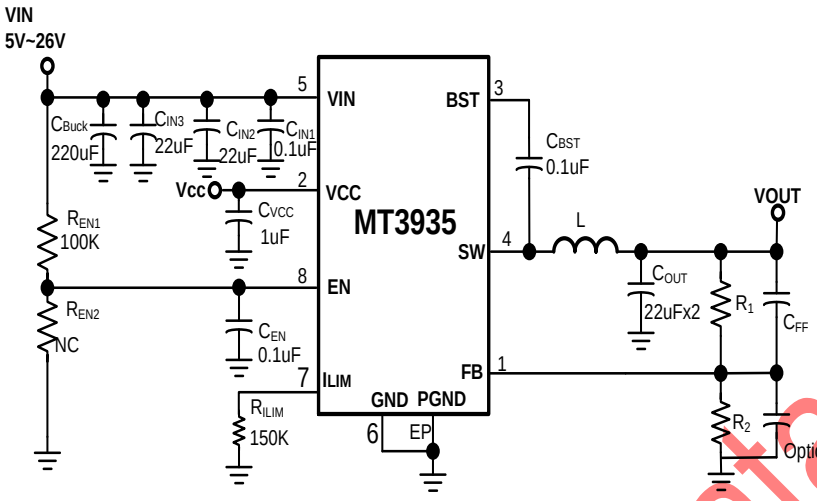


DFN4x3_14L

Pin Descriptions

Pin No SOP8-EP	Pin No DFN4x3_14L	Pin Name	DESCRIPTION
1	1	FB	Feedback Input. Connect FB to the center of the external resistor divider from the output to the AGND to set the output voltage.
2	2	VCC	Internal 5V LDO output. The driver and control circuits are powered from this voltage. Decouple with a minimum 1μF ceramic capacitor to PGND as close to the pin as possible.
3	3	BST	High-Side Driver Bootstrap Supply. Connect a 0.1uF capacitor between SW and BST for proper operation.
4	4, 5, 6, 7	SW	Output pin of internal power switches. Connect this pin to the inductor and bootstrap capacitor.
5	8, 9, 10,11	IN	Supply Voltage. The IN pin supplies power for internal MOSFET and regulator. Bypass IN to PGND with a 22μF or greater low ESR ceramic capacitor.
6	12	GND	System Analog Ground.
7	13	ILIM	Programmable current limit pin. Connect a resistor to ground to program the HS peak current limit
8	14	EN	The device is shut down when this pin is low and active when this pin is high. The hysteretic threshold voltage is 1.2V going up and 1.1V going down. An external resistor divider from VIN can be used to program a VIN threshold below which the device will shut down. Connect EN to VIN through a 100k resistor for automatic startup.
EP	EP	PGND	Exposed Pad is connected to the low side MOSFET Power Ground. Connect EP to a large-area contiguous copper ground plane for effective power dissipation.

Application Schematic

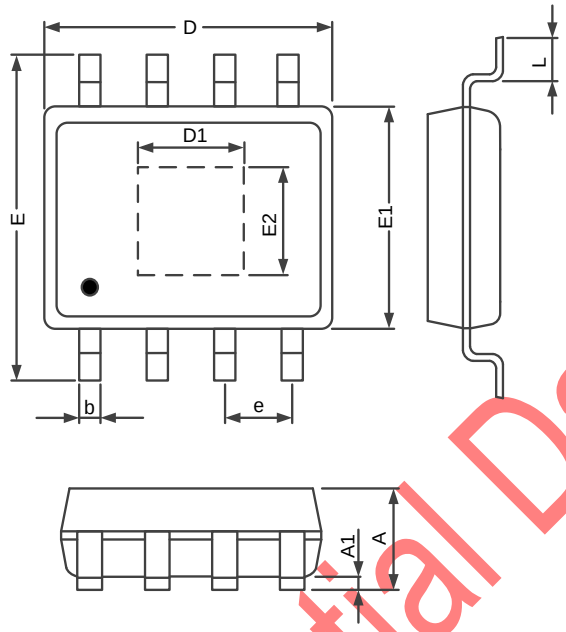


EVB BOM List

Qty	Ref	Value		Description	Package
1	C_{Buck}	220µF		Electrolytic Capacitor, 50V	8x12mm
2	C_{IN2}, C_{IN3}	22µF		Ceramic Capacitor, 50V, X5R	0805
2	C_{IN1}, C_{EN}	0.1µF		Ceramic Capacitor, 50V, X5R	0603
2	C_{OUT}	22µF		Ceramic Capacitor, 16V, X5R	0805
1	C_{BST}	0.1µF		Ceramic Capacitor, 10V, X5R	0603
1	C_{VCC}	1uF		Ceramic Capacitor, 10V, X5R	0603
1	L	Vout=5V	4.7µH	Inductor, Isat > 10A	SMD
		Vout=3.3V	3.3µH		
1	R_1	Vout=5V	51KΩ	Resistor, ±1%	0603
		Vout=3.3V	51KΩ		
1	R_2	Vout=5V	9.76KΩ	Resistor, ±1%	0603
		Vout=3.3V	16KΩ		
1	C_{FF}	Vout=5V	22pf	Ceramic Capacitor, 10V, X5R	0603
		Vout=3.3V	22pf		
1	C_{Bottom}	NC		Ceramic Capacitor, 10V, X5R	0603
1	R_{EN}	100KΩ		Resistor, ±1%	0603
1	RILIM	150KΩ		Resistor, ±1%	0603
1	Power IC	MT3935		Step-Down DC/DC Converter	SOP8-EP/ DFN4x3_14L

Package Information

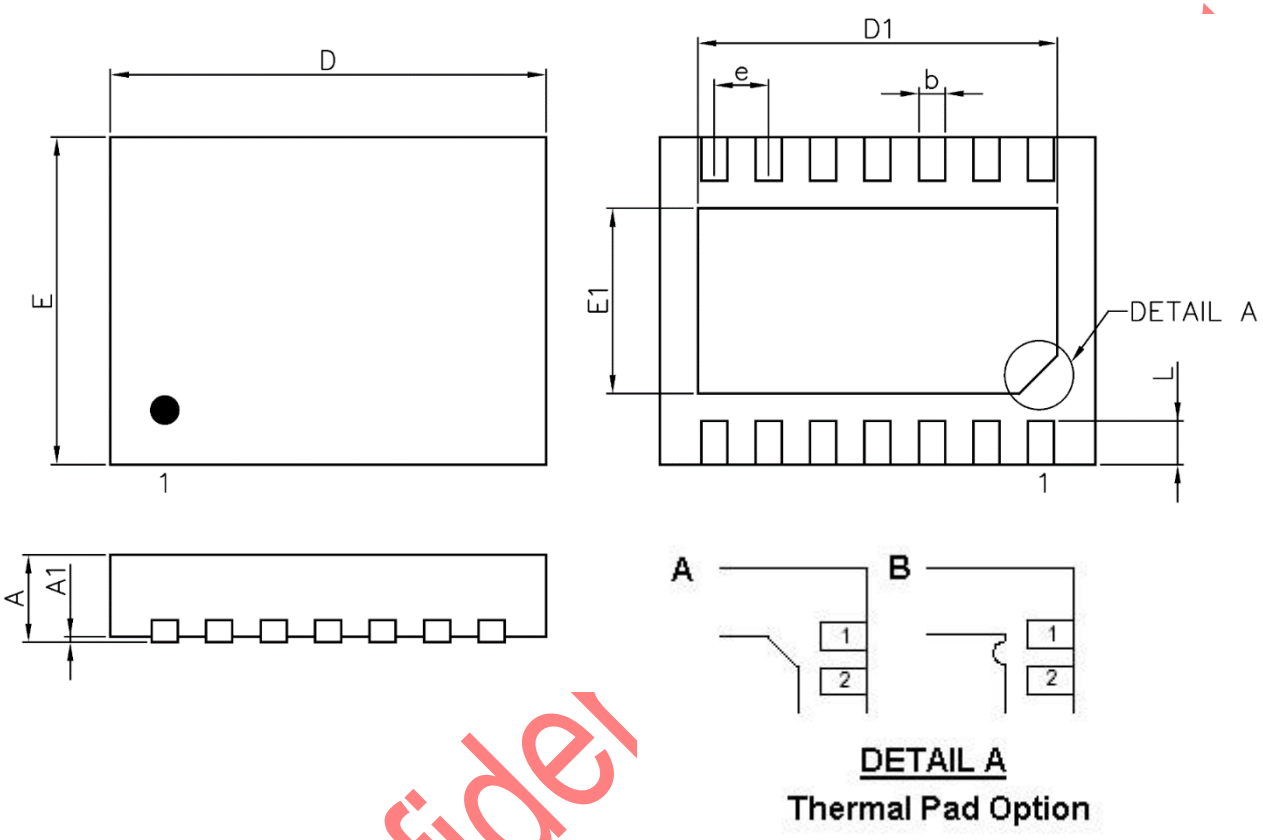
SOP8EP Outline Dimensions
Unit: inches/mm



SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MIN.
A	1.35	1.75	0.053	0.069
A1	0.00	0.15	0.000	0.006
D	4.7	5.1	0.185	0.200
E1	3.7	4.1	0.145	0.161
D1	2.90	3.50	0.114	0.138
E2	2.00	2.50	0.080	0.098
E	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
b	0.31	0.51	0.012	0.020
e	1.16	1.37	0.046	0.054

Package Information

DFN 14L 4x3mm Outline Dimensions
Unit: inches/mm



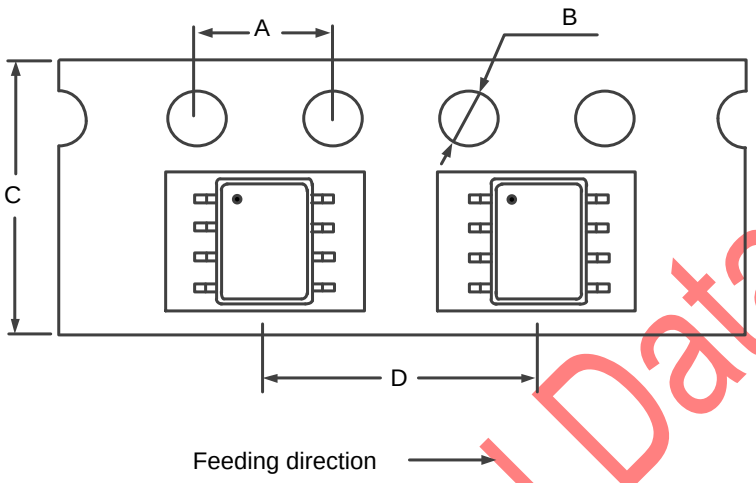
DETAIL A
Thermal Pad Option

SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	0.80	0.028	0.031
A1	0.00	0.05	0.000	0.002
b	0.18	0.30	0.007	0.012
D	3.90	4.10	0.154	0.161
D1	3.20	3.40	0.126	0.134
E	2.90	3.10	0.114	0.122
E1	1.60	1.80	0.063	0.071
e	0.50		0.020	
L	0.30	0.50	0.012	0.020

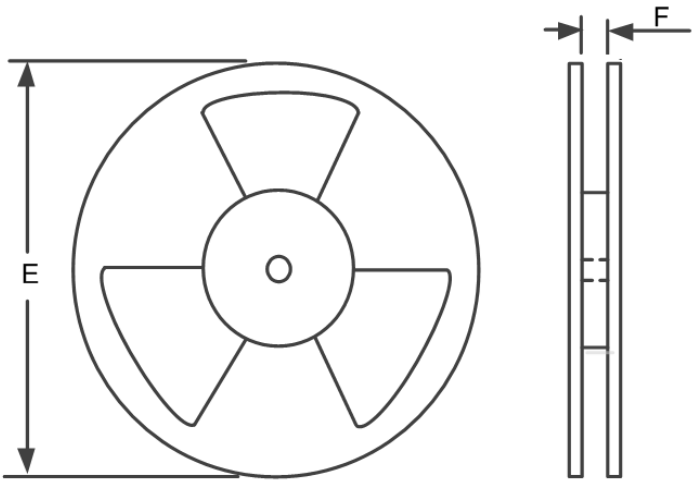
Tape & Reel Carrier Dimensions

SOP8-EP

1. Orientation / Carrier Tape Information:



2. Reel Information:

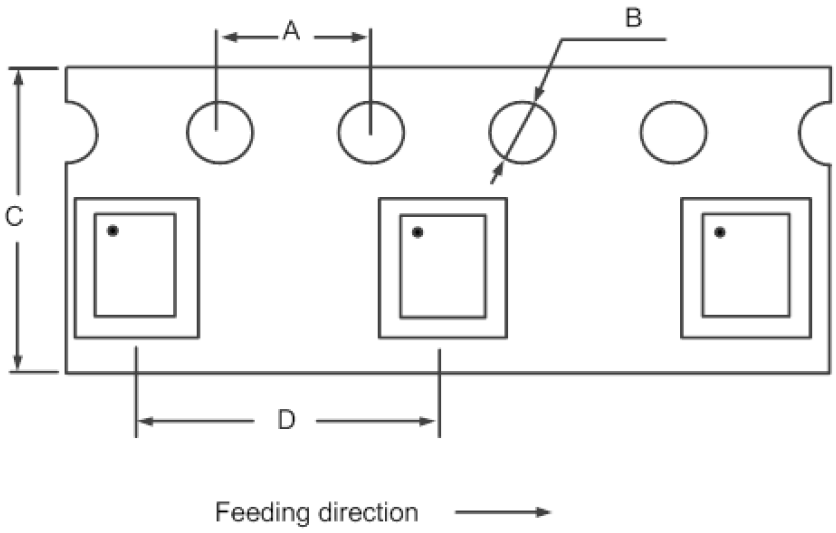


3. Dimension Details:

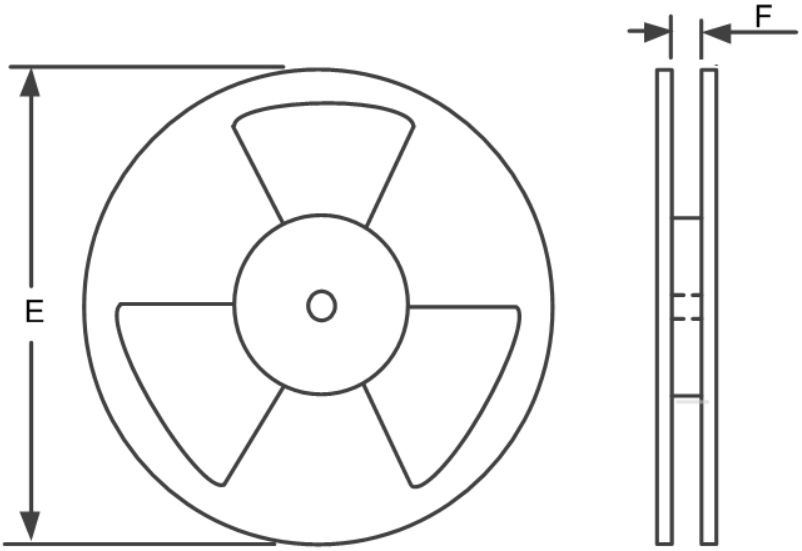
PKG Type	A	B	C	D	E	F	Q'ty/Reel
SOP8EP	4.0 mm	1.5 mm	12.0 mm	8.0 mm	13 inches	13.0 mm	2,500

DFN14L 4x3

1. Orientation / Carrier Tape Information:



2. Reel Information:



3. Dimension Details:

PKG Type	A	B	C	D	E	F	Q'ty/Reel
DFN 4x3	4.0 mm	1.5 mm	12.0 mm	8.0 mm	13 inches	13.0 mm	5,000

Reflow Profile

Classification Of IR Reflow Profile

Reflow Profile	Green Assembly
Average Ramp-Up Rate (Ts_{min} to Tp)	1~2℃/second, 3℃/second max.
Preheat & Soak -Temperature Min(Ts_{min}) -Temperature Max(Ts_{max}) -Time(ts_{min} to ts ts_{max})	 150℃ 200℃ 60~120 seconds
Time maintained above: -Temperature(T_L) -Time(t_L)	 217℃ 60~150 seconds
Peak Temperature(Tp)	See Classification Temp intable1
Time within 5℃of actual Peak Temperature(tp)	30 seconds max.
Ramp-Down Rate	6℃/second max.
Time 25℃ to Peak Temperature	8 minutes max.

* Tolerance for peak profile Temperature(T_p) is defined as a supplier minimum and a user maximum.
** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.

Table 1. Pb-freeProcess –Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6mm	260℃	260 ℃	260℃
1.6mm–2.5mm	260℃	250℃	245℃
≥2.5mm	250 ℃	245℃	245℃

Note: For all temperature information, please refer to topside of the package, measured on the package body surface.