



Working Together for a Greener Society

Future of Power Electronics and the Earth



**Off-line PWM Control ICs
with Integrated Power MOSFET**

STR3A42xHD/MD Series



■ Description

The STR3A42xHD/MD series are power ICs for switching power supplies, incorporating a MOSFET and a current mode PWM control IC. To enhance efficiency in all load ranges, the IC automatically shifts its operation to the green mode or burst oscillation mode, depending on the load.

The product achieves high cost-performance power supply systems with few external components.

■ Applications

- AC/DC Adapter
- Large Home Appliance
- Other SMPSs (Switching Mode Power Supplies)

■ Package DIP8



■ Selection Guide

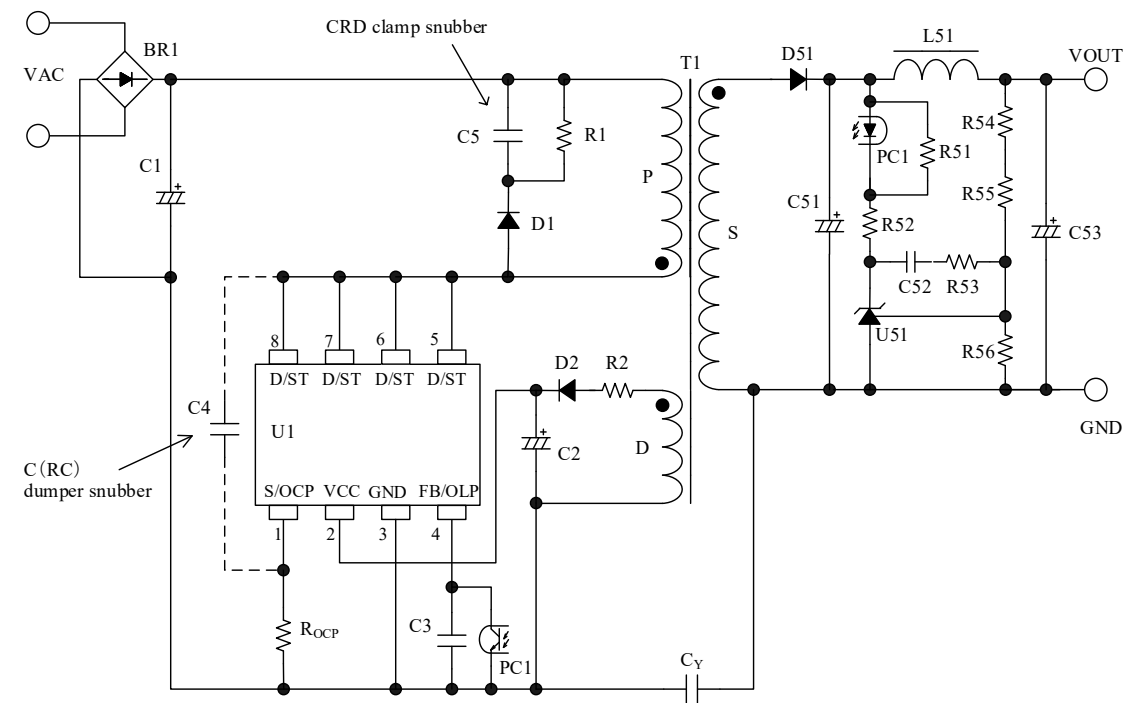
Part Number	f _{OSC(AVG)}	MOSFET		P _{OUT} (Adapter)		P _{OUT} (Open Frame)	
		V _{DSS}	R _{DS(ON)}	230VAC	85 to 265VAC	230VAC	85 to 265VAC
STR3A424HD	100 kHz	700 V	1.4 Ω	41 W	32 W	60 W	40 W
STR3A426HD*			0.92 Ω	49 W	38 W	72 W	49 W
STR3A424MD*	65 kHz		1.4 Ω	41 W	32 W	60 W	40 W
STR3A426MD			0.92 Ω	49 W	38 W	72 W	49 W

* Under development

■ Features

- Pb-free (RoHS Compliant)
- High Thermal Dissipation Package
- Improving circuit efficiency (Since the step drive control can keep V_{RM} of secondary-side rectifier diodes low, the circuit efficiency can be improved by low V_F)
- Current Mode Type PWM Control
- Soft Start Function
- Automatic Standby Function
- Input Power at No Load, $P_{IN} < 15 \text{ mW}$
- Operation Mode
 - Normal Operation: PWM mode
 - Light Load Operation: Green-mode
 - Standby: Burst Oscillation Mode
- Random Switching Function
- Slope Compensation Function (for Subharmonic Oscillation Suppression)
- Leading Edge Blanking Function
- Bias Assist Function
- Protections
 - Overcurrent Protection (OCP): Pulse-by-Pulse
Two Different OCPs, with Input Compensation Function
 - Overload Protection (OLP) with Timer: Auto-restart
 - Overvoltage Protection (OVP): Auto-restart
 - Thermal Shutdown (TSD): Auto-restart with hysteresis

■ Typical Application



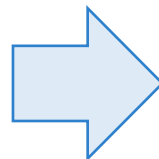
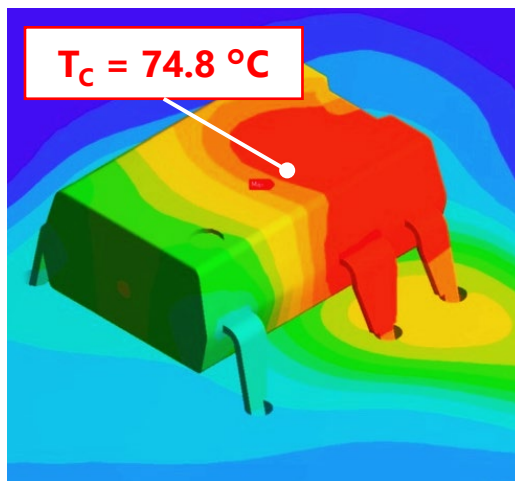
The STR3A42xHD/MD series is supplied in a thermally enhanced DIP8 package.

While a conventional DIP8 (pin 6 removed) had only two drain pins on one side (pins 7 to 8), the thermally enhanced DIP8 package has four drain pins on one side (pins 5 to 8), significantly expanding the heat dissipation path to the PCB.

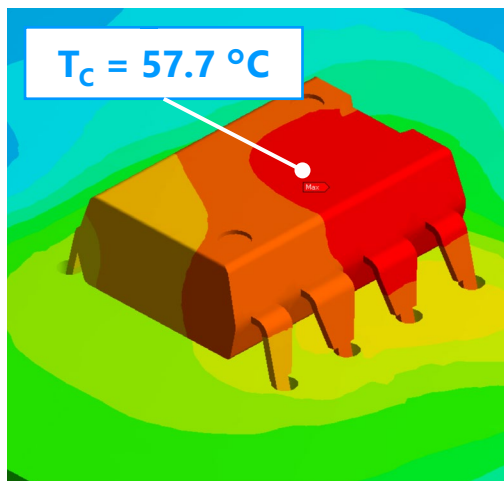
As a result, when comparing 700 V / 1.4 Ω products, the maximum output power* of the thermally enhanced DIP8 package is approximately 32 W, compared to approximately 23 W for the conventional DIP8 (pin 6 removed), enabling support for higher power applications.

*an adapter (85 to 265 VAC)

DIP8 (Pin 6 removed)

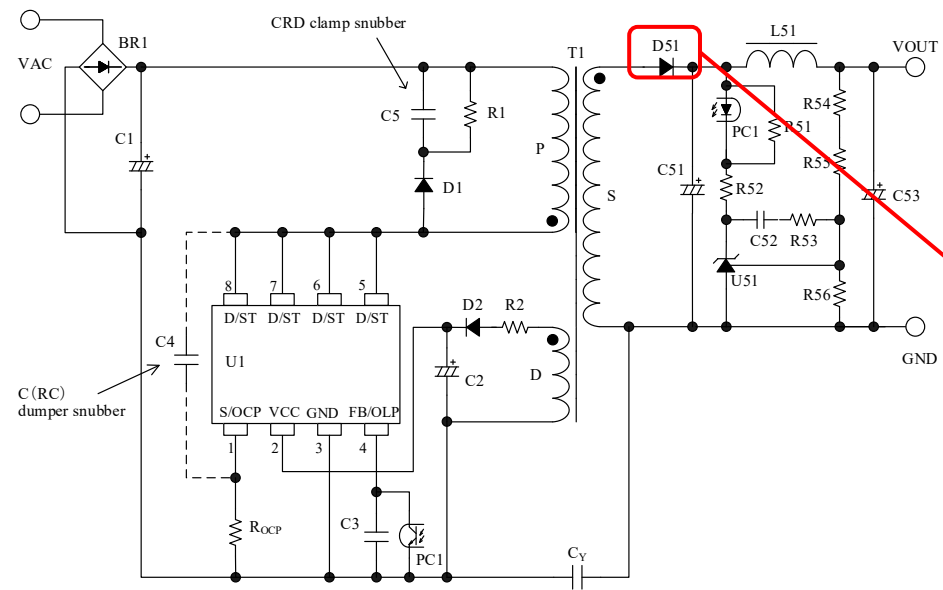


**Thermally Enhanced
DIP8 Package**

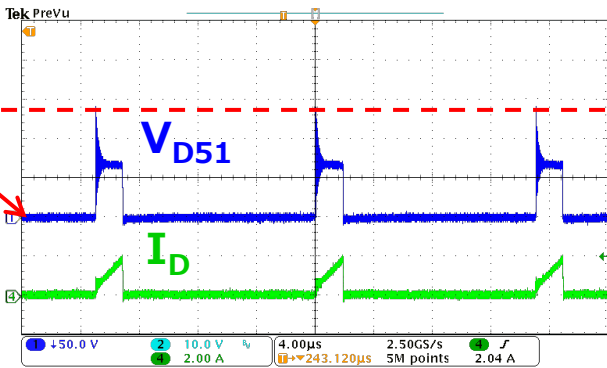


**The maximum case
temperature decreased
by $\geq 15\text{ }^{\circ}\text{C}$ under the
same conditions.**

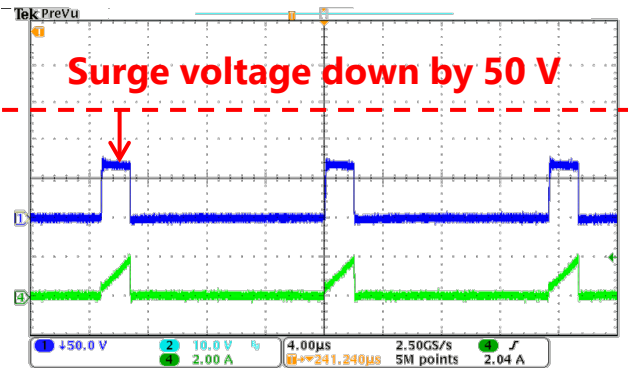
The step drive control is the function that optimally controls the gate drive of the power MOSFET inside the IC. This reduces surge voltage in the secondary rectifier diode at power MOSFET turn-on.



W/o Step Drive Control



W/ Step Drive Control



Comparison: Waveforms of Secondary Rectifier Diodes

The reduced surge voltage allows the secondary rectifier diode to have a lower breakdown voltage, thus decreasing V_F . The decreased V_F also reduces losses.

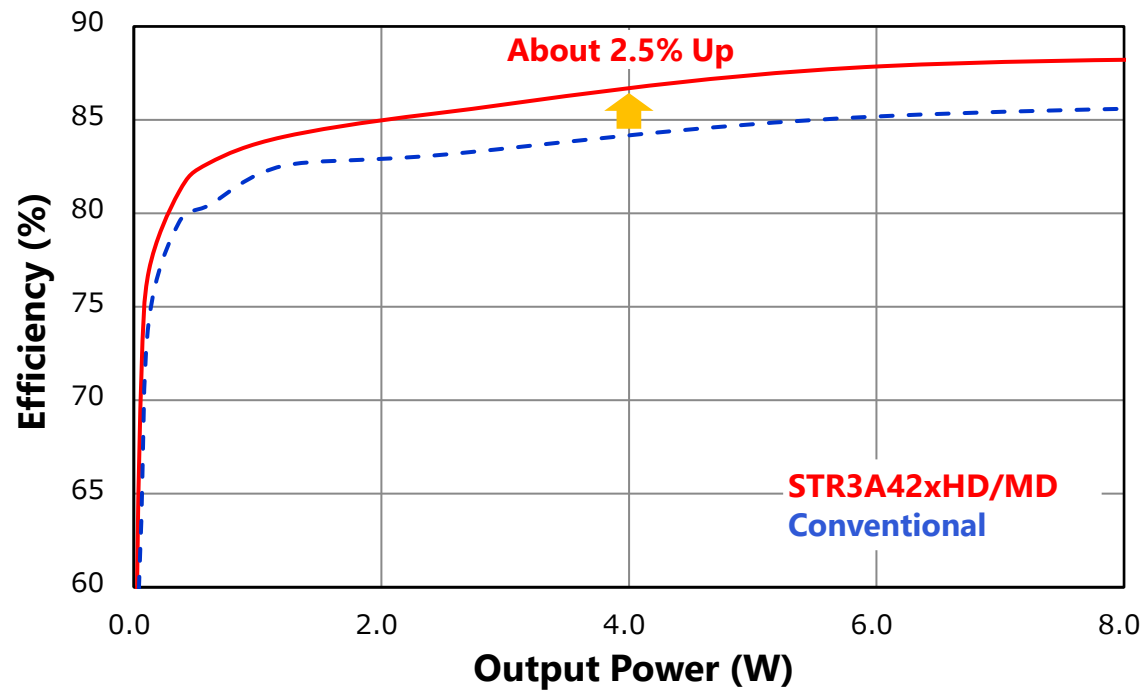
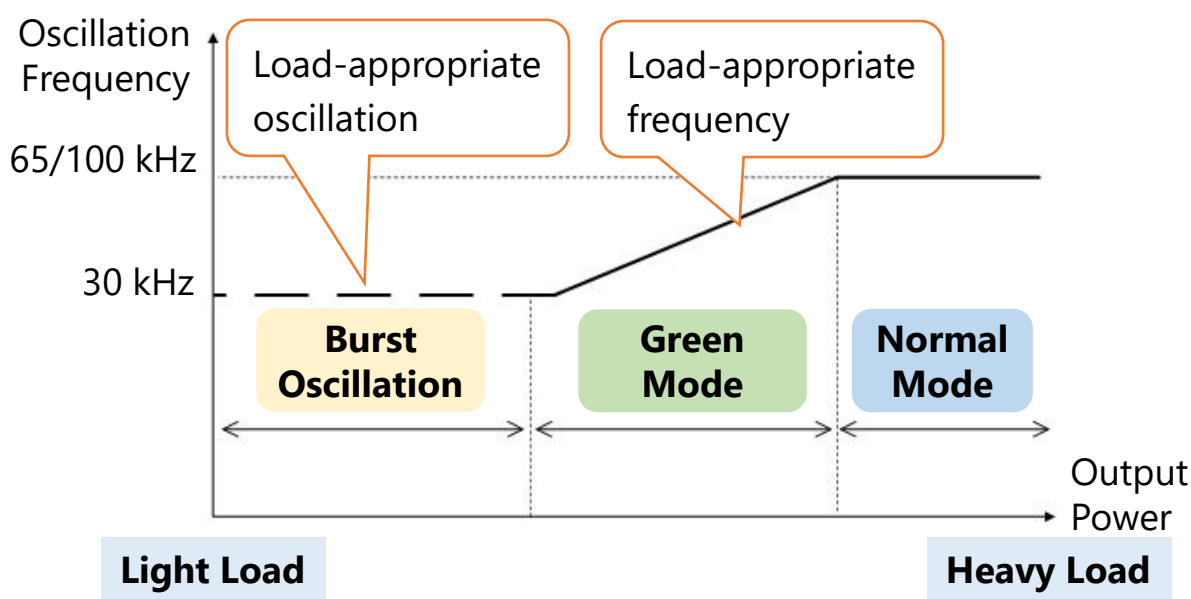
Secondary Rectifier Diode in Conventional IC	Secondary Rectifier Diode in IC with Step Drive Control
FMX-22S $V_{RM} = 200\text{ V}$ $V_F = 0.98\text{ V}$	FMES-21010 $V_{RM} = 100\text{ V}$ $V_F = 0.85\text{ V}$

So, the decrease in V_F is $(0.98\text{ V} - 0.85\text{ V}) = 0.13\text{ V}$.
If the current through the diode is 1 A, the amount of loss we can reduce will be $(0.13\text{ V} \times 1\text{ A}) =$ **130 mW**.

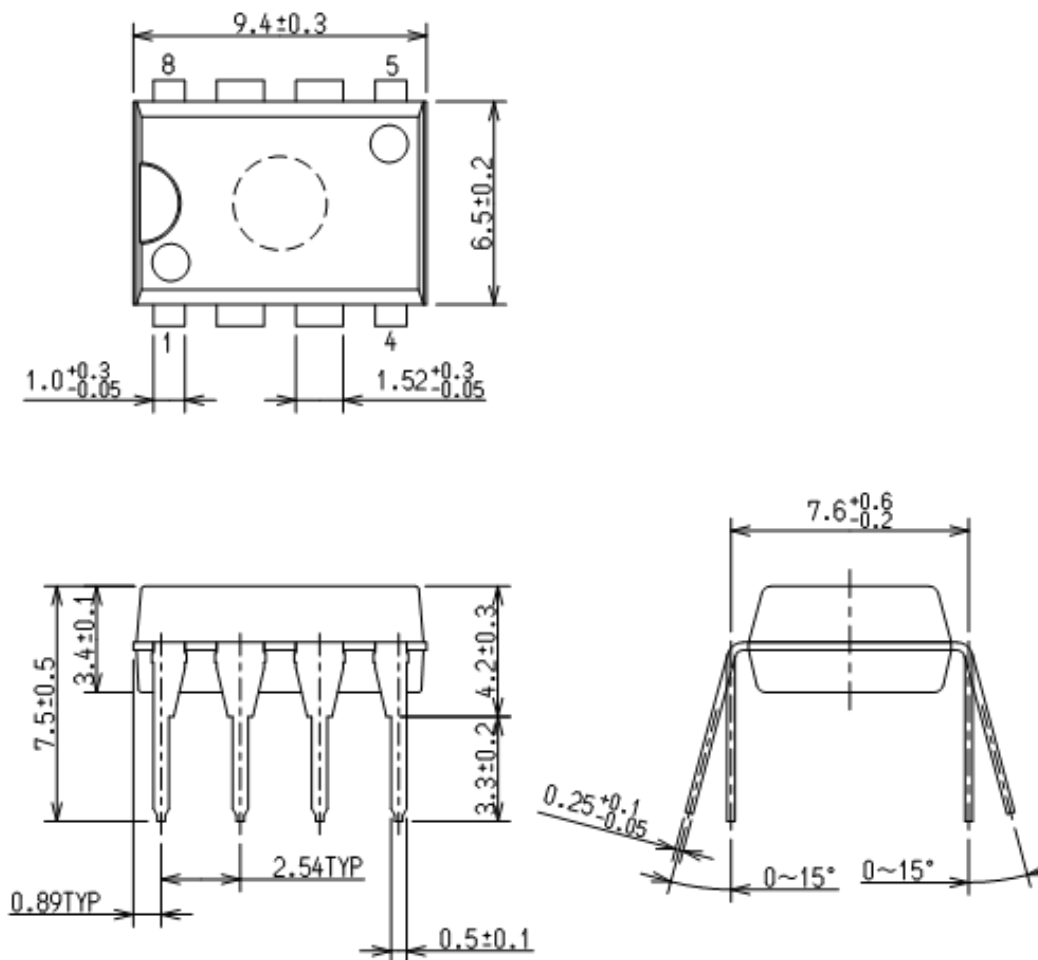
The green mode is the function that controls an oscillation frequency according to loads. This function makes the oscillation frequency decrease as the load decreases.

When the load decreases to the standby operation point, the IC shifts to the burst oscillation operation. In the burst oscillation operation, the number of burst oscillations decreases as the load decreases.

Consequently, the IC has lower switching loss and higher efficiency at medium to light loads.



This mechanism of reducing oscillation frequency led to a 2.5% increase in efficiency at light load (4 W).



NOTES:

- Dimensions in millimeters
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, it is required to minimize the working time within the following limits:
 Flow: 260°C / 10 s, 1 time
 Soldering Iron: 350°C / 3.5 s, 1 time
 Soldering should be at a distance of at least 1.5 mm from the body of the product.

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