



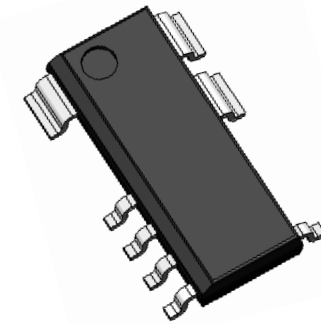
Working Together for a Greener Society

Future of Power Electronics and the Earth



**Off-line PWM Controllers
with Integrated Power MOSFET**

STR6S160HXD Series



Product Overview

■ Description

- High efficiency in all load ranges
 - Step drive control: Allows secondary rectifier diodes to have a breakdown voltage lower than ever (= lower V_F achievable)
 - Green mode: Reduces losses with lower oscillation frequency at light to medium loads
 - Burst oscillation mode: Intermittent oscillation operation at light load
 - Power consumption at no-load, $P_{IN} < 40$ mW
- Functions to stabilize input voltages for safer use
 - **High-voltage protection (HVP)**
 - Brown-in and brown-out function
- Protections
 - Pulse-by-pulse: Overcurrent protection (OCP)
 - Auto-restart: Overload protection (OLP), overvoltage protection (OVP), thermal shutdown (TSD)

■ Applications

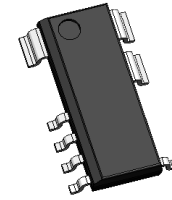
- Large home appliances (e.g., air conditioners)
- Small home appliances (e.g., vacuum cleaners, kitchen appliances)

■ Selection Guide

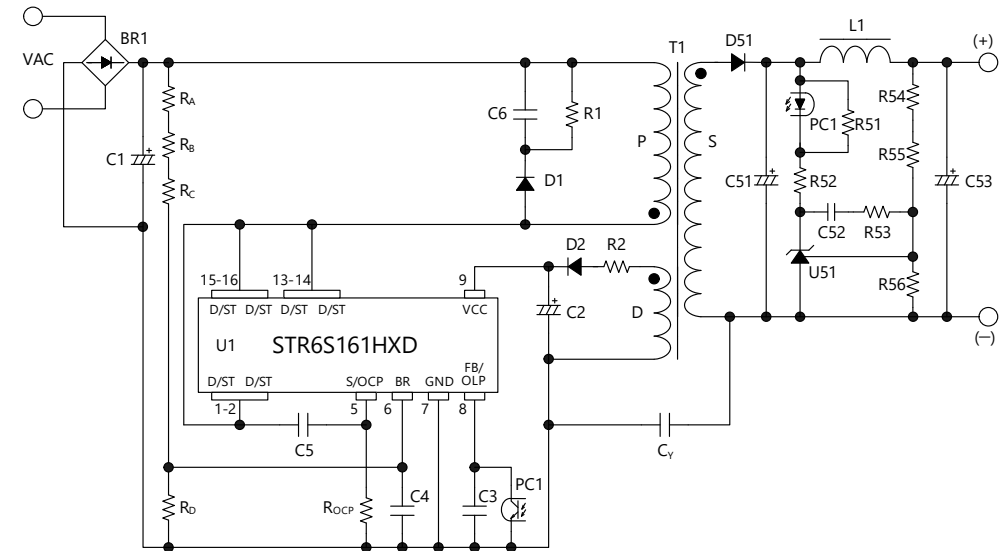
Part Number	f_{osc}	MOSFET		P_{OUT} (Adapter)		P_{OUT} (Open Frame)	
		V_{DSS}	$R_{DS(ON)}$	230 VAC	Universal	230 VAC	Universal
STR6S161HXD	100 kHz	700 V	3.95 Ω	19.6 W	14.3 W	33.5 W	22.5 W
STR6S169HXD In Dev.			6.0 Ω	16.5 W	10.5 W	28.5 W	18.5 W
STR6S168HXD In Dev.			10.0 Ω	13.5 W	7.5 W	23.0 W	13.0 W

■ Package

SOIC16



■ Typical Application

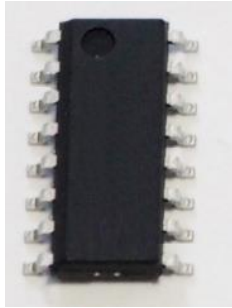


■ Thermally Enhanced SOIC16 Package

The widened D/ST pins brought a 7% increase in heat dissipation, higher than that of a conventional SOIC16 package.

The extended distance between the high- and low-voltage pins ensures a safer design.

General SOIC16 Package



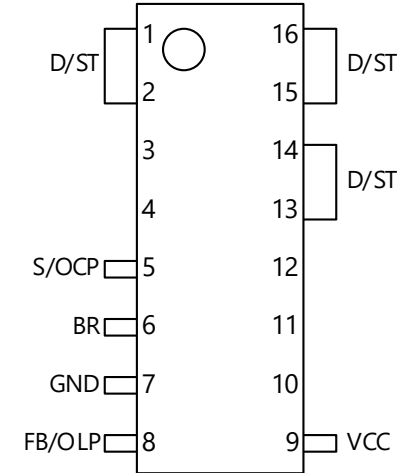
STR6S161HXD



High-to-low voltage pin distance: 3.315 mm (min.)

Wider D/ST pin widths

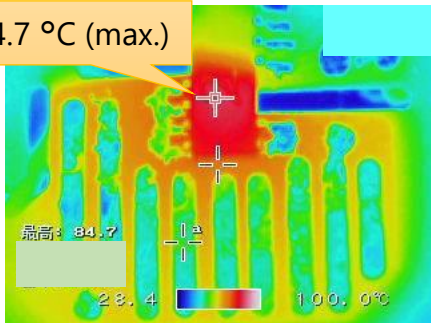
■ Pin Configuration Definitions



■ Heat Dissipation Comparison

General SOIC16 Package

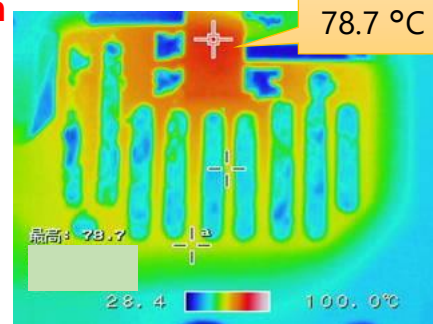
84.7 °C (max.)



Heat dissipation up by 7%

STR6S161HXD

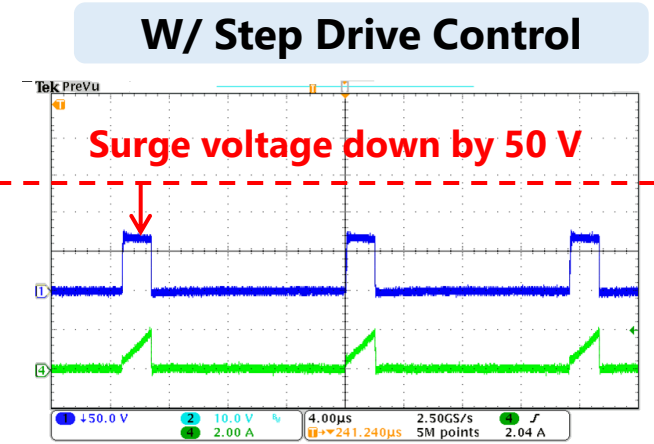
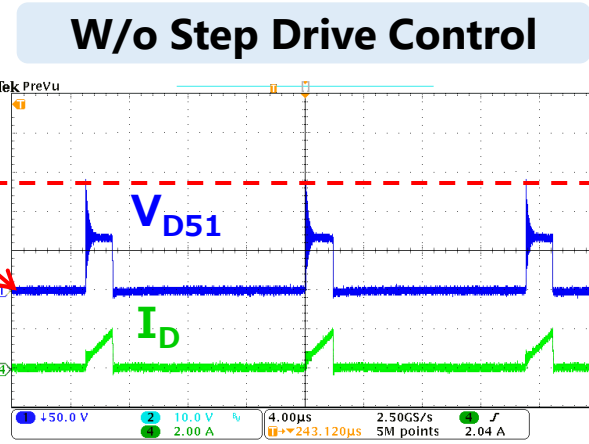
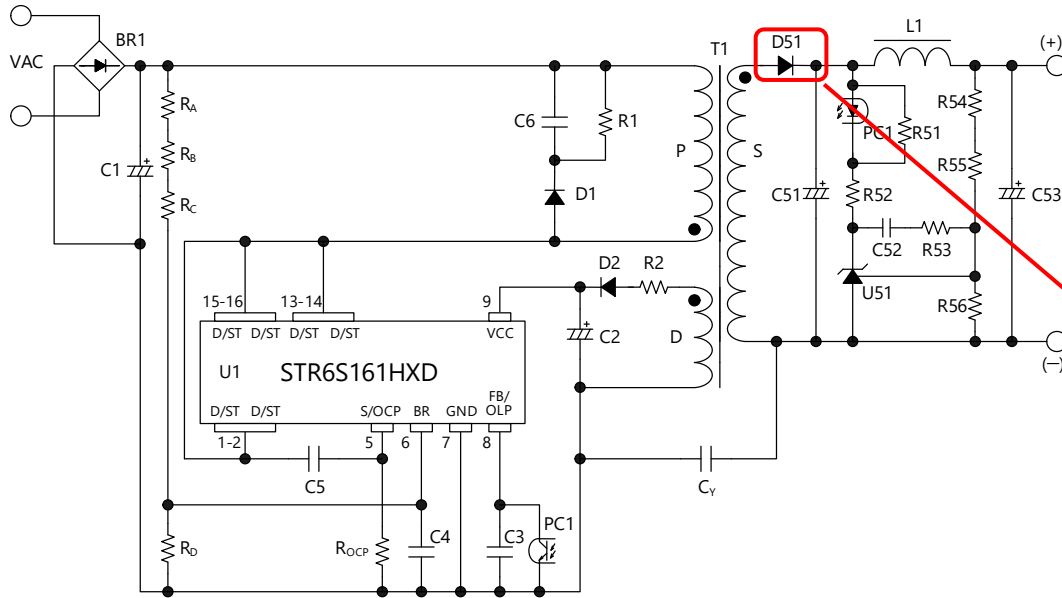
78.7 °C (max.)



Symbol	Pin No.	Function
D/ST	1-2	Power MOSFET drain; startup current input
—	3, 4	(Pin removed)
S/OCP	5	Power MOSFET source; OCP signal input
BR	6	Brown-in/brown-out; HVP
GND	7	Ground
FB/OLP	8	Feedback signal input; OLP signal input
VCC	9	Logic power supply input; OVP signal input
—	10-12	(Pin removed)
D/ST	13-16	Power MOSFET drain; startup current input

Step Drive Control

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.



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.

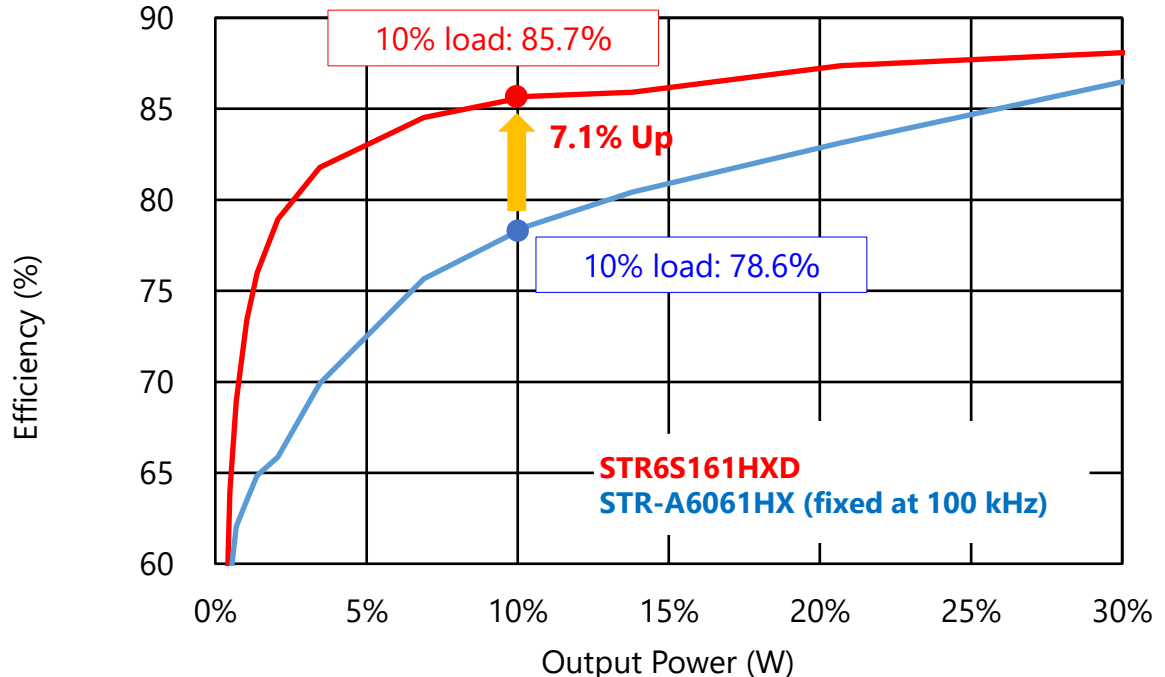
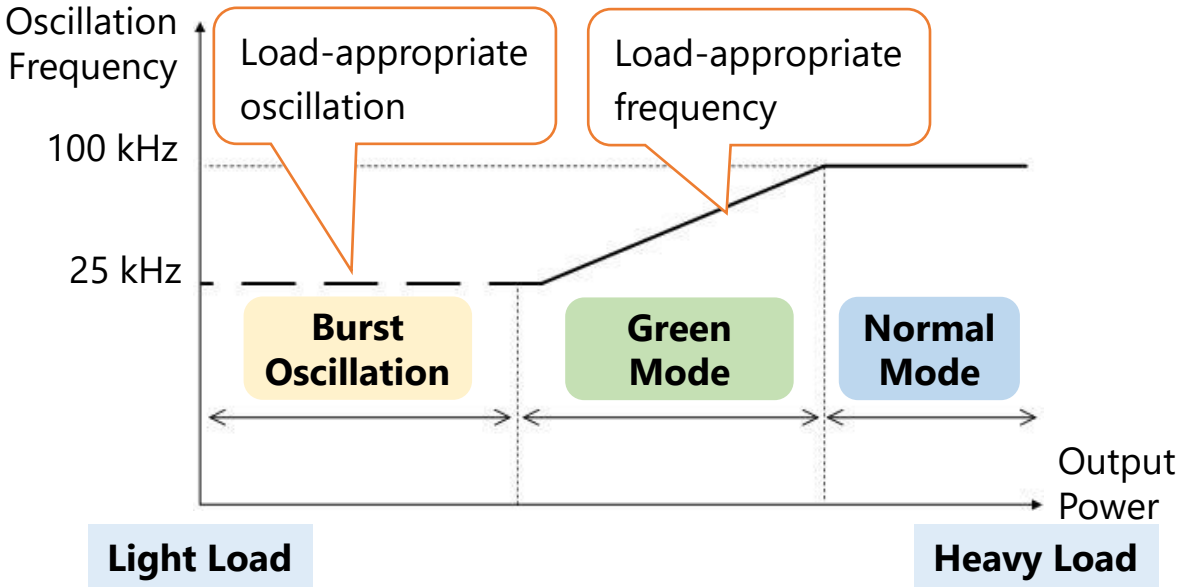
Secondary Rectifier Diode in Conventional IC	Secondary Rectifier Diode in IC with Step Drive Control
FML-G12S $V_{RM} = 200\text{ V}$ $V_F = 0.98\text{ V}$	SJPB-H9 $V_{RM} = 90\text{ V}$ $V_F = 0.82\text{ V}$

So, the decrease in V_F is $(0.98\text{ V} - 0.82\text{ V}) = 0.16\text{ V}$.
 If the current through the diode is 1 A, the amount of loss we can reduce will be $(0.16\text{ V} \times 1\text{ A}) = \mathbf{160\text{ mW}}$.

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.

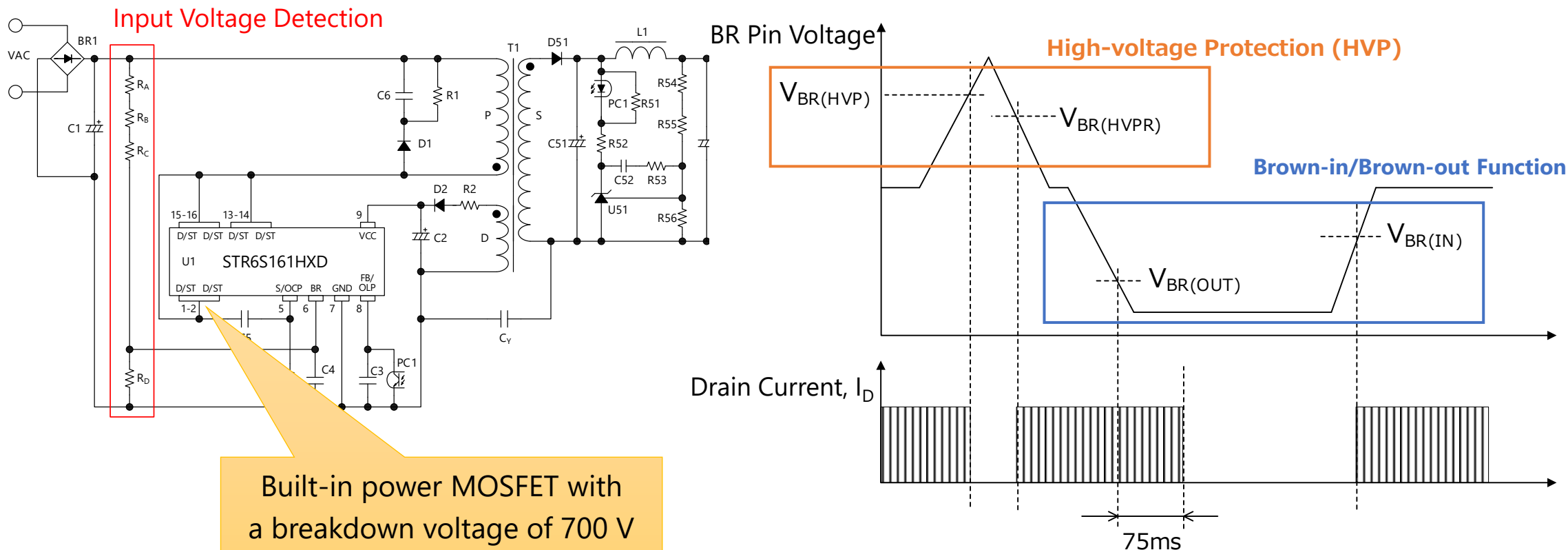


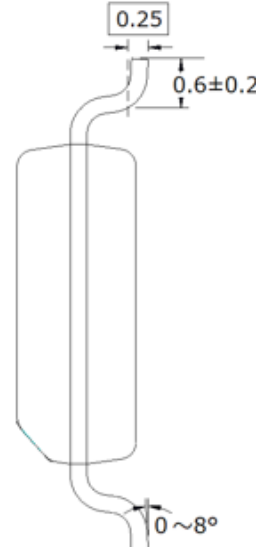
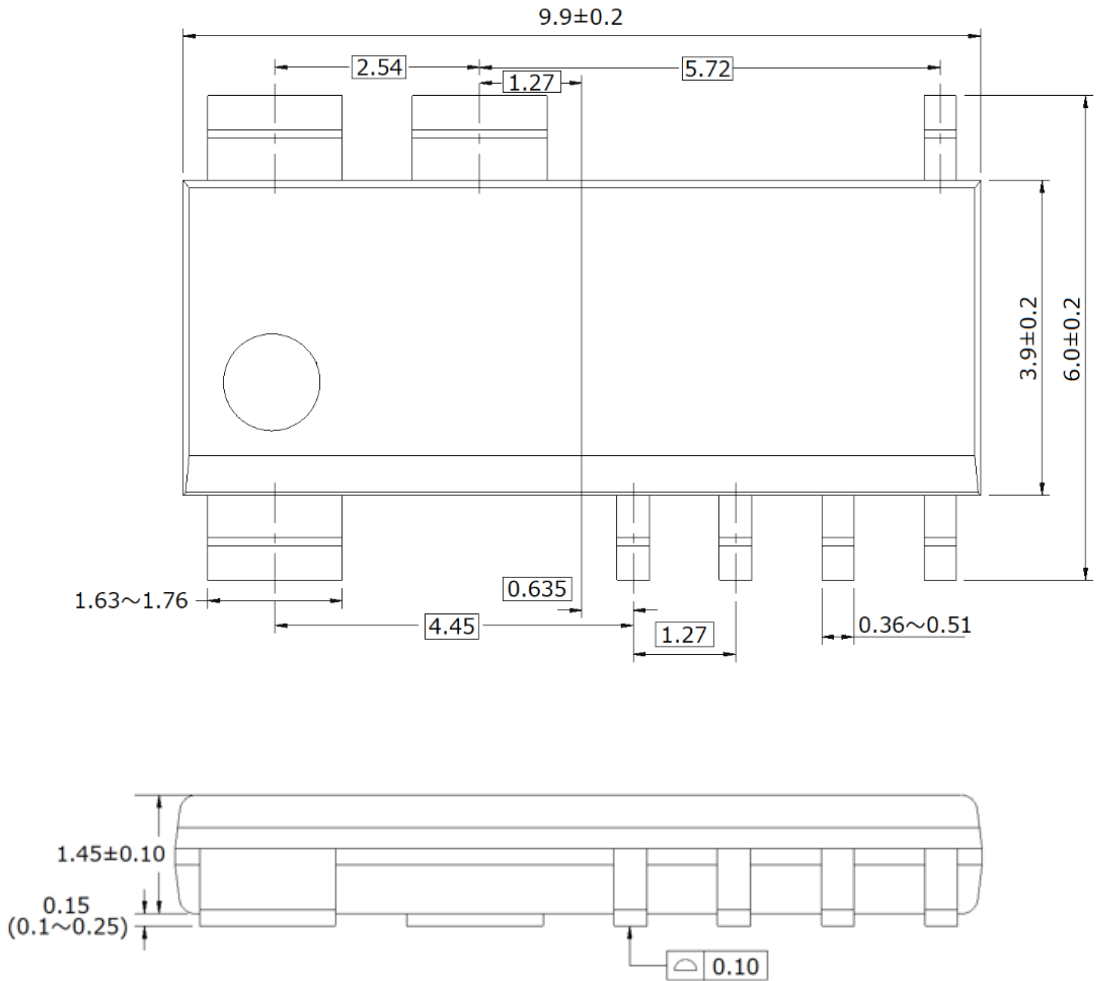
This mechanism of reducing oscillation frequency led to a 7.1% increase in efficiency at light load (10% load).

The STR6S161HXD has the AC input voltage protections that allow your application to operate safely even in an area with unstable input voltages.

In addition, the built-in power MOSFET has a breakdown voltage of 700 V and ensures the avalanche energy capability.

Waveforms of AC Input Voltage Protections





- NOTES:**
- Dimension in millimeters
 - Mold flashes excluded
 - Pb-free (RoHS compliant)
 - MSL 1 (Moisture Sensitivity Level 1)
 - Flow/reflow soldering available

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