Universal-Input/100 W Off-Line Quasi-Resonant Flyback Switching Regulator



ABSOLUTE MAXIMUM KATINGS at $T_A = +25$ °C

Control Cumply Voltage V
Control Supply Voltage, V _{CC} 35 V
Drain-Source Voltage, V _{DSS} 650 V
Drain Switching Current, I _D 15 A*
Peak Drain Switching Current,
I _{DM}
Single-Pulse Avalanche Energy,
E _{AS} 292 mJ
OCP/BD Voltage Range,
V _{OCP} 1.5 V to +5 V
FB Input Current, I _{FB} 10 mA
FB Voltage Range, V _{FP} -0.5 V to +9 V
Package Power Dissipation, P _D
control $(V_{CC} \times I_{CC(ON)})$ 0.8 W
MOSFET $(V_{DSS} \times I_D)$ See Graph
MOSFET Channel Temp., T _J . +150°C
·
Internal Frame Temp., T _F +115°C
Operating Temperature Range,
T _A 20°C to +115°C
Storage Temperature Range,
T _S 40°C to +125°C

* Drain switching current is limited by temperature (page 2) and safe operating area (page 5).

†For the availability of parts meeting -40°C requirements, contact Allegro's Sales Representative.

The STR-W6754 is a quasi-resonant regulator specifically designed to satisfy the requirements for increased integration and reliability in switch-mode power supplies. It incorporates a primary control and drive circuit with an avalanche-rated power MOSFET. The regulator exhibits only low-level high-frequency EMI noise because of soft switching of the MOSFET close to ground (bottom point). A bottom-skip function minimizes an increase of operational frequency during light loads to improve system efficiency over the entire load range.

Covering the power range from below 160 watts for a 230 VAC input, or 100 watts for a universal input (85 to 264 VAC), this device can be used in a range of applications, from DVD and VCR players to ac adapters for cellular phones and digital cameras. An auto-standby function, which is internally triggered by sensing on time, reduces power consumption at light load. An externally triggered standby mode reduces the input power further. Multiple protections, including the avalanche-energy-guaranteed MOSFET, provide high reliability of system design. Devices with an increased output power rating are the STR-W6756.

Cycle-by-cycle current limiting, undervoltage lockout with hysteresis, and overvoltage protection protect the power supply during the normal overload and fault conditions. Overvoltage protection is latched after a short delay. The latch may be reset by cycling the input supply. Low start-up current and a low-power standby mode selected from the secondary circuit completes a comprehensive suite of features. The STR-W6754 is provided in a fully molded TO-220-style flangemounted, high power, isolated plastic package.

FEATURES AND BENEFITS

- Rugged 650 V Avalanche-Rated MOSFET Simplified Surge Absorption No V_{DSS} Derating Required
- \blacksquare 0.96 Ω Maximum $r_{DS(on)}$
- Two Operational Modes by Automatic Switching: Quasi-Resonant Mode for Normal Operation Burst Mode for Standby Operation or Light Loads
- Automatic or Manually Triggered Burst Standby Input Power < 0.1 W at No Load
- Low Operating Current (6 mA typ)

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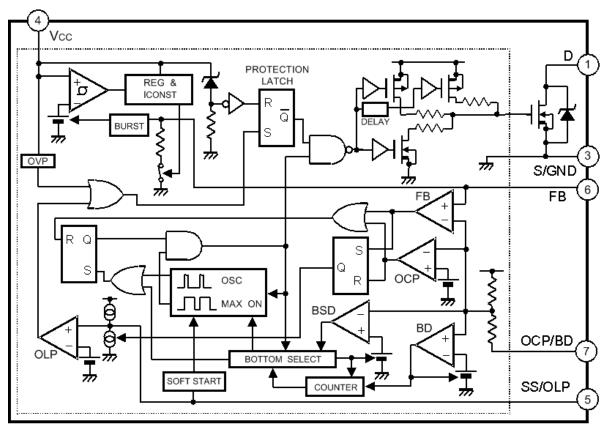
Always order by complete part number, e.g., |STR-W6754|.

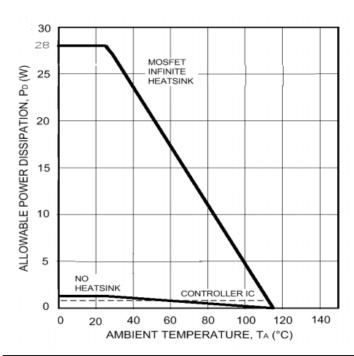




Universal-Input/100 W Off-Line Quasi-Resonant Flyback Switching Regulator

FUNCTIONAL BLOCK DIAGRAM





FEATURES AND BENEFITS (cont'd)

- Auto-Bias Function
 Stable Burst Operation Without Generating Interference
- Internal Off-Timer Circuit
- Built-In Constant-Voltage Drive
- Multiple Protections:
 Pulse-by-Pulse Overcurrent Protection
 Overload Protection with Auto Recovery
 Latching Overvoltage Protection
 Undervoltage Lockout with Hysteresis
- RoHS Compliant





Switching Regulators

STR-W6754 Universal-Input/100 W Off-Line Quasi-Resonant Flyback Switching Regulator

ELECTRICAL CHARACTERISTICS at $T_A = +25$ °C, $V_{CC} = 20$ V, voltage measurements are referenced to S/GND terminal (unless otherwise specified).

				Lim	nits	
Characteristic	Symbol	Test Conditions	Min.	Тур.	Max.	Units
Start-Up Operation			-			
Operation Start Voltage	V _{CC(ON)}	Turn-on, V _{CC} = 0 → 19.9 V	16.3	18.2	19.9	V
Soft-Start Operation Stop Voltage	V _{SS/OLP}		1.1	1.2	1.4	V
Soft-Start Oper. Charging Current	I _{SS/OLP}		-390	-550	-710	μΑ
Operation Stop Voltage	V _{CC(OFF)}	Turn-off, V _{CC} = 19.9 → 8.8 V	8.8	9.7	10.6	V
Circuit Current in Non-Operation	I _{CC(OFF)}	V _{CC} = 15 V	_	_	100	μΑ
Normal Operation						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	I _D = 300 μA	650	_	_	V
Drain Leakage Current	I _{DSS}	V _{DS} = 650 V	_	_	300	μΑ
On-State Resistance	r _{DS(on)}	I _D = 1.9 A, T _J = +25°C	_	_	0.96	Ω
Switching Time	t _f		_	_	400	ns
Circuit Current	I _{CC(ON)}		_	_	6.0	mA
Oscillation Frequency	f _{osc}		19	22	25	kHz
Bottom-Skip Oper. Threshold Volt.	V _{OCPBD(BS1)}		-605	-665	-720	mV
	V _{OCPBD(BS2)}		-385	-435	-485	mV
Quasi-Resonant Oper. Threshold	V _{OCPBD(TH1)}		280	400	520	mV
	V _{OCPBD(TH2)}		670	800	930	mV
Feedback-Pin Threshold Voltage	V _{FB(OFF)}		1.32	1.45	1.58	V
Feedback-Pin Current	I _{FB(ON)}		600	1000	1400	μΑ
Standby Operation						-
Standby Operation Start Voltage	V _{CC(S)}	V _{CC} = 0 → 12.2 V	10.3	11.1	12.1	V
Standby Oper. Start Volt. Interval	V _{CC}		1.10	1.35	1.65	V
Standby Non-Operation Current	I _{CC(S)}	V _{CC} = 10.2 V	_	20	56	μΑ
Feedback-Pin Current	I _{FB(ON)}	V _{CC} = 10.2 V	_	4.0	14	μΑ
Feedback-Pin Threshold Voltage	$V_{FB(S)}$	V _{CC} = 12.2 V	0.55	1.10	1.50	V
Minimum ON Time	t _{on(min)}		0.5	0.8	1.2	μs

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Universal-Input/100 W Off-Line Quasi-Resonant Flyback Switching Regulator



ELECTRICAL CHARACTERISTICS at $T_A = +25$ °C, $V_{CC} = 20$ V, voltage measurements are referenced to S/GND terminal (unless otherwise specified).

			Limits						
Characteristic	Symbol	Test Conditions	Min.	Тур.	Max.	Units			
Protection Operation									
OVP Operation Voltage	V _{CC(OVP)}	Turn-off, $V_{CC} = 0 \rightarrow 29.9 \text{ V}$	25.5	27.7	29.9	V			
Maximum ON Time	t _{on(max)}		27.5	32.5	39.0	μs			
OLP Operation Voltage	V _{SSOLP}		4.0	4.9	5.8	V			
OLP Operation Current	I _{SSOLP}		-6.0	-11	-16	μA			
Overcurrent Detect. Threshold Volt.	V _{OCPBD(LIM)}		-0.895	-0.940	-0.995	V			
OCP/BD-Pin Current	I _{OCPBD}		-40	-100	-250	μA			
Latch Holding Current	I _{CC(H)}	$V_{CC} = 29.9 \rightarrow V_{CC(OFF)} - 0.3 \text{ V}$	_	45	140	mA			
Latch Release Voltage	V _{CC(L)}	V _{CC} = 29.9 → 6 V	6.0	7.2	8.5	V			
Other									
Thermal Resistance	$R_{ heta JF}$	Output junction-to-frame	_	_	1.6	°C/W			

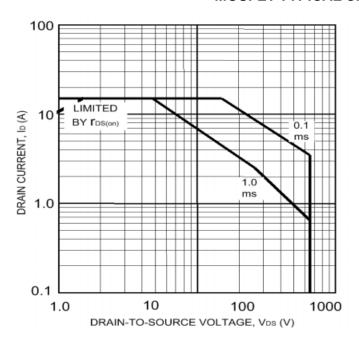
NOTES: 1. Typical Data is for design information only.

2. Negative current is defined as coming out of (sourcing) the specified device termninal.

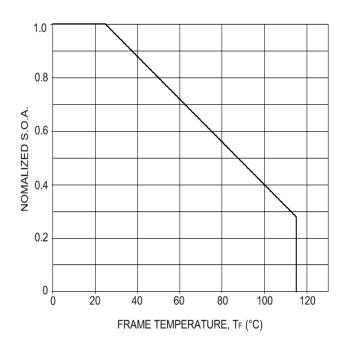


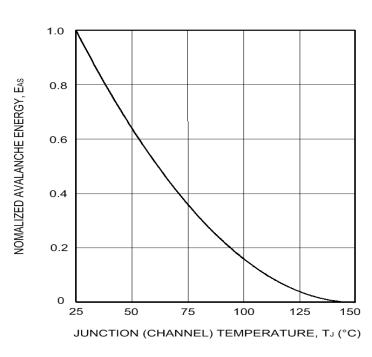
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MOSFET TYPICAL CHARACTERISTICS



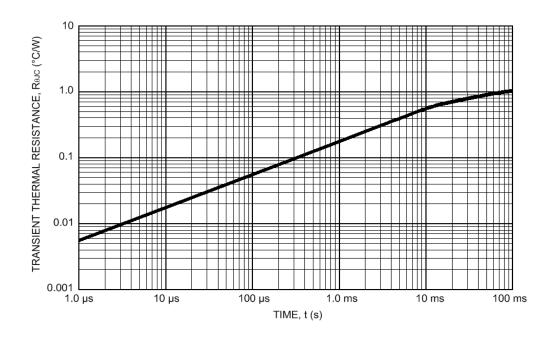
Avalanche energy is measured at V_{DD} = 99 V, L = 20 mH, I_L = 5.1 A.





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MOSFET TYPICAL CHARACTERISTICS (cont'd)



WARNING — These devices are designed to be operated at lethal voltages and energy levels. Circuit designs that embody these components must conform with applicable safety requirements. Precautions must be taken to prevent accidental contact with power-line potentials. Do not connect grounded test equipment.

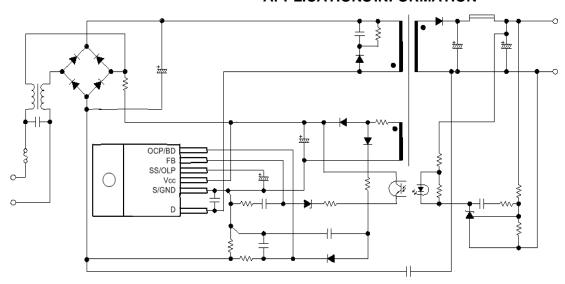
The use of an isolation transformer is recommended during circuit development and breadboarding.





Universal-Input/100 W Off-Line Quasi-Resonant Flyback Switching Regulator

APPLICATIONS INFORMATION



Typical Application

Complete product description and applications information is provided in Application Note 28103.30, *Series STR-W6750 Off-Line Quasi-Resonant Flyback Switching Regulators*.

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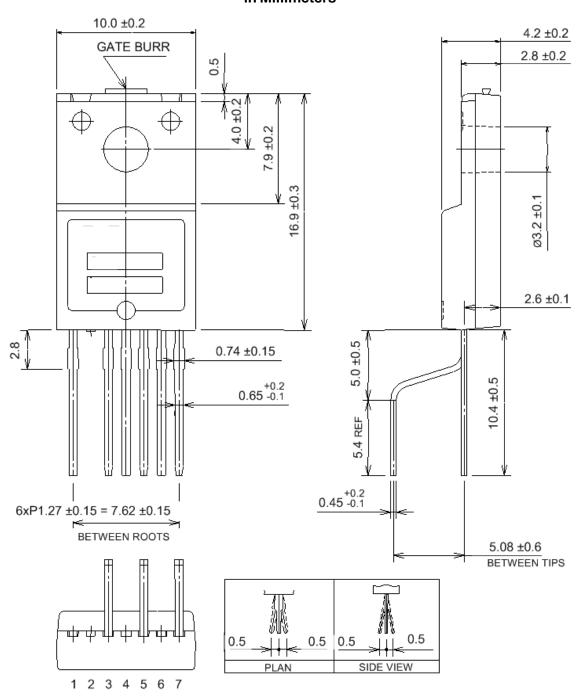
The use of Sanken products without the written consent of Sanken in applications where extremely high reliability is required (aerospace equipment, nuclear power-control stations, life-support systems, etc.) is strictly prohibited.

The information included herein is believed to be accurate and reliable. Application and operation examples described in this publication are given for reference only and Sanken and Allegro assume no responsibility for any infringement of industrial property rights, intellectual property rights, or any other rights of Sanken or Allegro or any third party that may result from its use.

Universal-Input/100 W Off-Line Quasi-Resonant Flyback Switching Regulator

Switching Regulators

PACKAGE DIMENSIONS in Millimeters



Product weight: approx. 2.3 g.

Recommended mounting hardware torque: 0.588 ~ 0.785 Nm, 6 ~ 8 kgf x cm.

Recommended silicon grease: Dow Corning SC102, Toshiba YG6260, Shin-Etsu G746, or equivalent.



