

Universal-Input/13 or 16 W Flyback Switching Regulators



ABSOLUTE MAXIMUM RATINGS at $T_A = +25^\circ\text{C}$

Control Supply Voltage, V_{CC}	35 V
Drain-Source Voltage, V_{DSS}	650 V
Drain Switching Current, I_D	
STR-A6151	2.5 A*
STR-A6159	1.8 A*
Peak Drain Switching Current, I_{DM}	
STR-A6151	2.5 A
STR-A6159	1.8 A
Single-Pulse Avalanche Energy, E_{AS}	
STR-A6151	72 mJ
STR-A6159	24 mJ
Start-Up-Pin Voltage Range,	
$V_{startup}$	-0.3 V to +600 V
OCP Voltage Range,	
V_{OCP}	-0.5 V to +6 V
FB/OLP Voltage Range,	
$V_{FB/OLP}$	-0.5 V to +10 V
Package Power Dissipation, P_D	
control ($V_{CC} \times I_{CC(ON)}$)	0.15 W
MOSFET ($V_{DSS} \times I_D$)	1.35 W
total	1.5 W
MOSFET Channel Temp., T_J	+150°C
Internal Frame Temp., T_F	+125°C
Operating Temperature Range,	
T_A	-20°C to +125°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 4).

The STR-A6151 and STR-A6159 are PRC topology (fixed off-time) regulators specifically designed to satisfy the requirements for increased integration and reliability in flyback converters. They incorporate a primary control and drive circuit with avalanche-rated power MOSFETs. The STR-A6151 features higher switching current and avalanche-energy ratings and lower on-resistance.

Covering the power range from below 13 watts to 16 watts for a 230 VAC input, or 10 to 12 watts for a universal (85 to 264 VAC) input, these devices 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 reduces power consumption at light load, while multiple protections, including the avalanche-energy guaranteed MOSFET, provide high reliability of system design.

Cycle-by-cycle current limiting, undervoltage lockout with hysteresis, overvoltage protection, and thermal shutdown protect the power supply during the normal overload and fault conditions. Overvoltage protection and thermal shutdown are 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. Both devices are provided in an 8-pin mini-DIP plastic package.

FEATURES AND BENEFITS

- Rugged 650 V Avalanche-Rated MOSFET
Simplified Surge Absorption
No V_{DSS} Derating Required
- Choice of $r_{DS(on)}$ (3.95 Ω or 6 Ω maximum)
- Two Operational Modes by Automatic Switching:
PRC Mode for Normal Operation
Burst Mode for Stand-By Operation or Light Loads
- Built-In Leading Edge Blanking
- Low Start-Up Current
Start-Up Circuit Disabled in Operation
- Low Operating Current (1.5 mA typ)
- Automatic Burst Stand-By (intermittent operation)
Input Power < 0.1 W at No Load

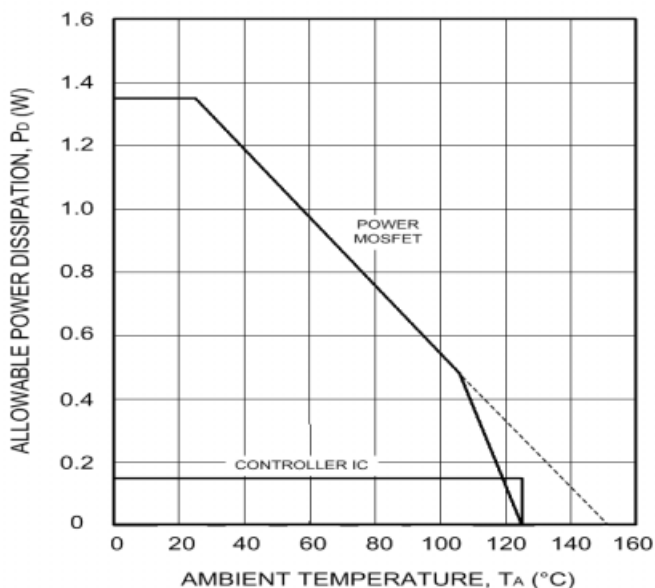
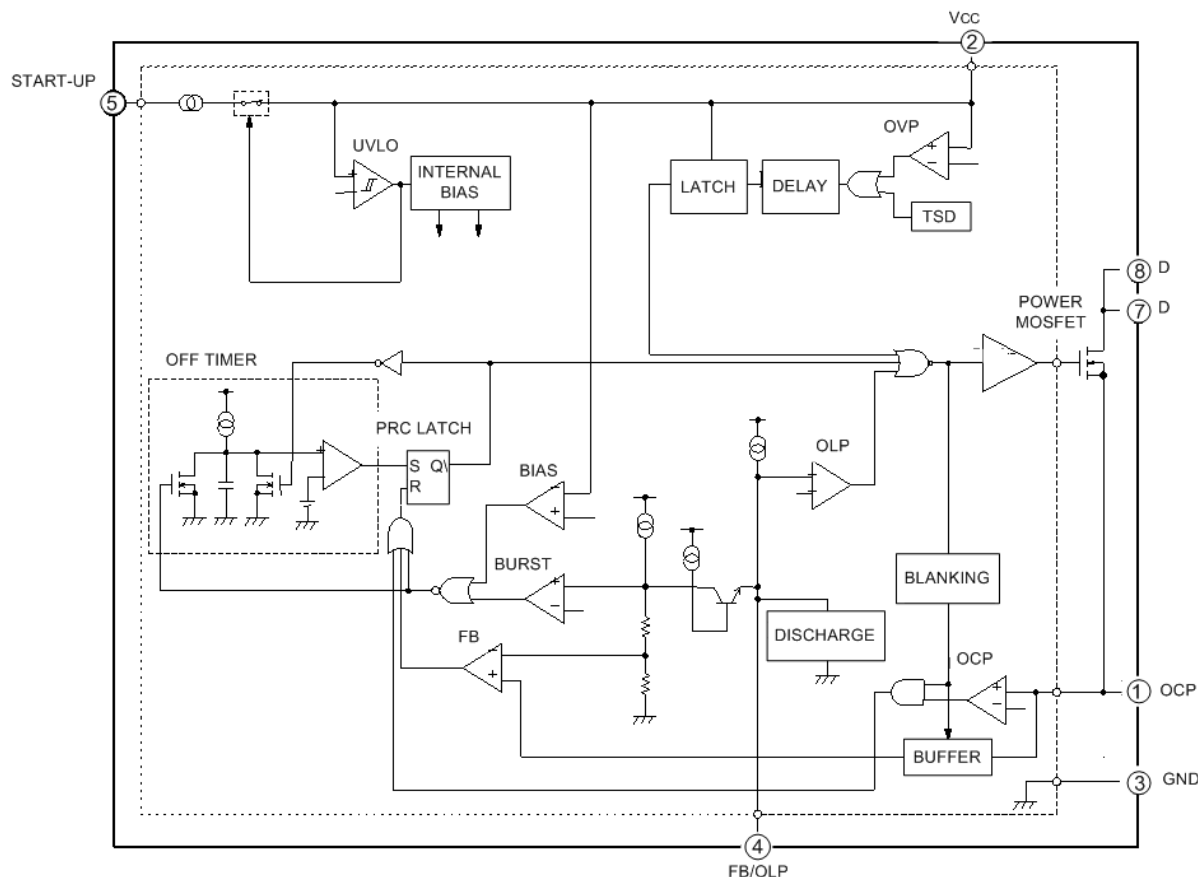
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Always order by complete part number, e.g., **STR-A6151** .

STR-A6151 and STR-A6159
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**Switching
Regulators**

FUNCTIONAL BLOCK DIAGRAM



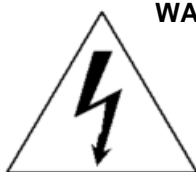
FEATURES AND BENEFITS (cont'd)

- 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
Latching Thermal Shutdown
- Molded Small-Size 8-Pin Package
For Low-Height SMPS
Polarized to Prevent Backwards Assembly

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ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$, $V_{CC} = 20\text{ V}$ (unless otherwise specified).

Characteristic	Pin No.	Symbol	Test Conditions	Ratings			
				Min	Typ	Max	Units
Drain-to-Source Breakdown Volt.	8 - 1	$V_{(BR)DSS}$	$I_D = 300\text{ }\mu\text{A}$, $V_1 - V_3 = 0\text{ V}$ (short)	650	-	-	V
Drain Leakage Current	8 - 1	I_{DSS}	$V_{DS} = 650\text{ V}$, $V_1 - V_3 = 0\text{ V}$ (short)	-	-	300	μA
On-State Resistance	8 - 1	$r_{DS(on)}$	STR-A6151, $I_D = 0.4\text{ A}$	-	-	3.95	Ω
			STR-A6159, $I_D = 0.4\text{ A}$	-	-	6.00	Ω
MOSFET Switching Time	8 - 3	t_f	-	-	-	250	ns
Operation Start Voltage	2 - 3	$V_{CC(ON)}$	$V_{CC} = 0 \rightarrow 19.2\text{ V}$	16	17.5	19.2	V
Operation Stop Voltage	2 - 3	$V_{CC(OFF)}$	$V_{CC} = 19.2 \rightarrow 9\text{ V}$	9.0	10	11	V
Circuit Current in Operation	2 - 3	$I_{CC(ON)}$	-	-	-	4.0	mA
Circuit Current in Non-Operation	2 - 3	$I_{CC(OFF)}$	$V_{CC} = 14\text{ V}$	-	-	50	μA
Auto-Bias Threshold Voltage	2 - 3	$V_{CC(bias)}$	$V_{CC} = 20 \rightarrow 9.6\text{ V}$	9.6	10.6	11.6	V
$V_{CC(bias)} - V_{CC(OFF)}$	-	-	-	0.2	0.6	-	V
Maximum OFF Time	8 - 3	t_{OFF}	-	7.3	8.0	8.7	μs
OCP Threshold Voltage	1 - 3	V_{OCP}	-	0.69	0.77	0.86	V
Leading Edge Blanking Time	8 - 3	t_b	-	200	320	480	ns
Burst Threshold Voltage	4 - 3	V_{burst}	-	0.70	0.79	0.88	V
OLP Threshold Voltage	4 - 3	V_{OLP}	-	6.5	7.2	7.9	V
Current at OLP Operation	4 - 3	I_{OLP}	-	-18	-26	-35	μA
Maximum FB Current	4 - 3	$I_{FB(MAX)}$	-	227	300	388	μA
Start-Up Current	5 - 3	$I_{startup}$	$V_{CC} = 15\text{ V}$	340	790	1230	μA
Start-Up Circuit Leakage Current	5 - 3	$I_{start(leak)}$	-	-	-	30	μA
OVP Operation Voltage	2 - 3	$V_{CC(OVP)}$	$V_{CC} = 0 \rightarrow 34.1\text{ V}$	28.7	31.2	34.1	V
OVP/TSD Latch Sustaining Current	2 - 3	$I_{CC(H)}$	$V_{CC} = 34.1 \rightarrow 8.5\text{ V}$	-	-	200	μA
OVP/TSD Latch Release Voltage	2 - 3	V_{CC}	$V_{CC} = 34.1 \rightarrow 6.6\text{ V}$	6.6	7.3	8.0	V
Thermal Shutdown	-	T_J	-	135	-	-	$^\circ\text{C}$
Thermal Resistance	-	$R_{\theta JF}$	-	-	-	52	$^\circ\text{C/W}$



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.

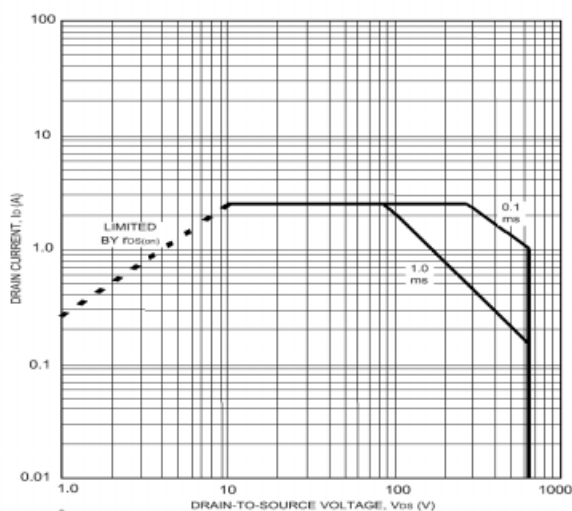
The use of an isolation transformer is recommended during circuit development and breadboarding.

STR-A6151 and STR-A6159 Universal-Input/13 or 16 W Flyback Switching Regulators

Switching
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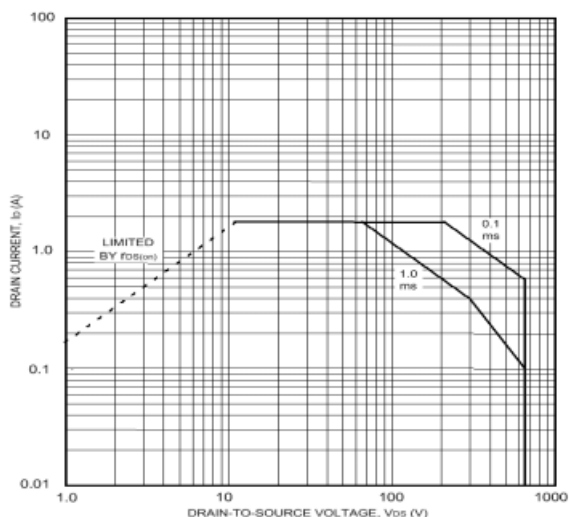
MOSFET TYPICAL CHARACTERISTICS

STR-A6151

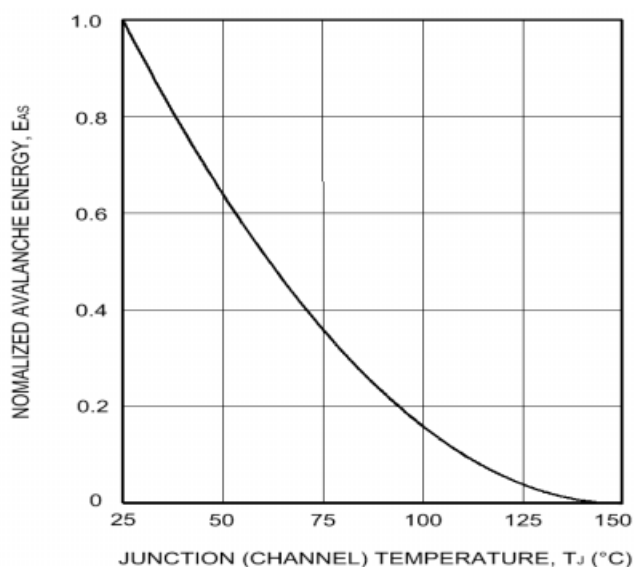
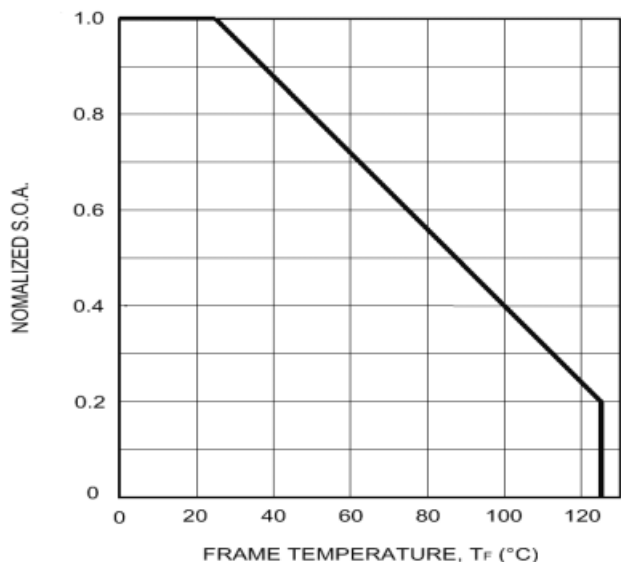


Avalanche energy is measured at $V_{DD} = 99$ V,
 $L = 20$ mH, $I_L = 2.5$ A.

STR-A6159

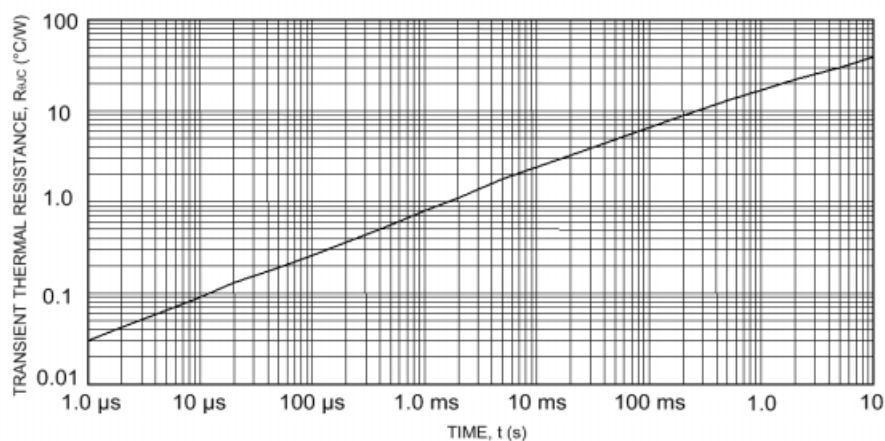


Avalanche energy is measured at $V_{DD} = 99$ V,
 $L = 20$ mH, $I_L = 1.8$ A.

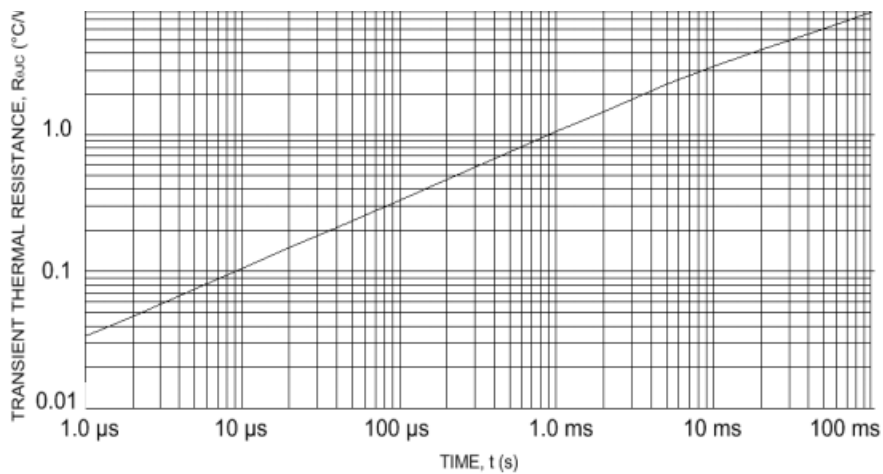


MOSFET TYPICAL CHARACTERISTICS (cont'd)

STR-A6151



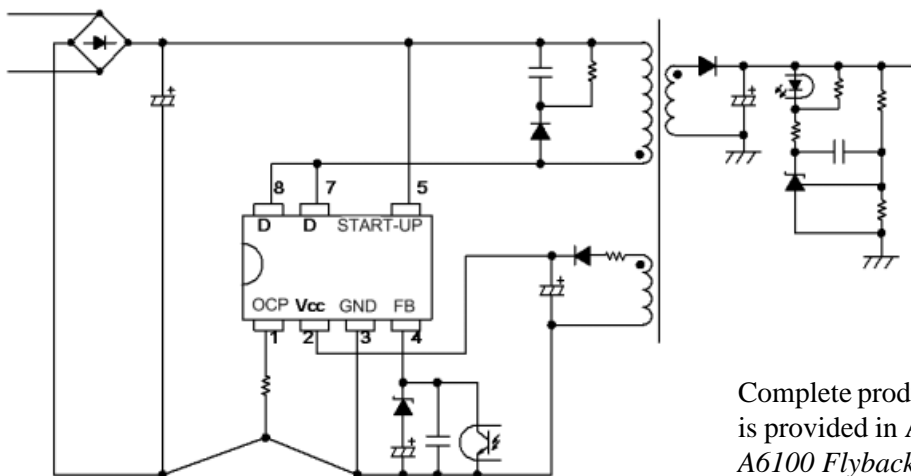
STR-A6159



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APPLICATIONS INFORMATION



Typical Application

Complete product description and applications information is provided in Application Note 28103.20, *Series STR-A6100 Flyback Switching Regulators*.

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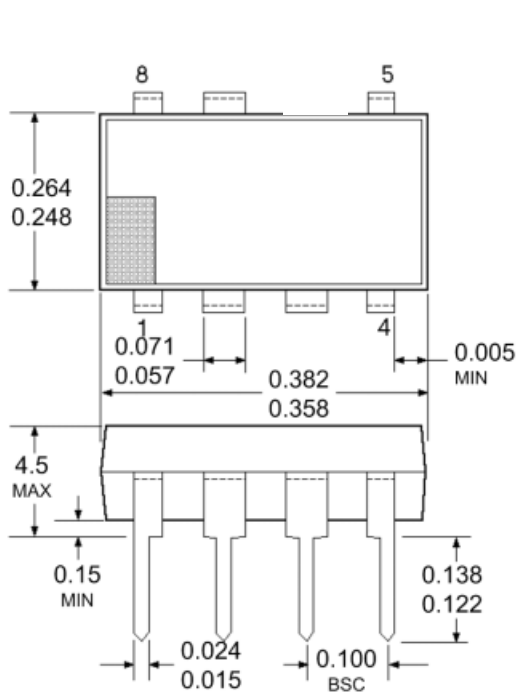
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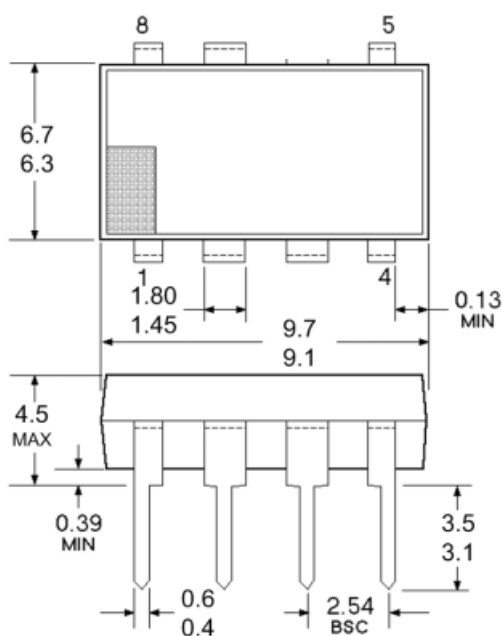
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PACKAGE DIMENSIONS



Dimensions in Inches
(for reference only)



Dimensions in Millimeters
(controlling dimensions)

Product Weight: Approx. 0.51 g.
Frame temperature, T_F , is measured at the root of pin 3.