Switching Regulators

STR-A6169

Data Sheet 28102.24

Universal-Input/5 W Flyback Switching Regulator

ABSOLUTE MAXIMUM RATINGS at T_A = +25°C

Control Supply Voltage, V_{CC}	35 V
Drain-Source Voltage, V_{DSS}	800 V
Drain Switching Current, I_D	1.2 A*
Peak Drain Switching Current, I_{DM}	1.2 A
Single-Pulse Avalanche Energy, E_{AS}	7 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} × $I_{CC(ON)}$)	0.15 W
MOSFET (V_{DSS} × 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).
†For the availability of parts meeting -40°C requirements, contact Sanken's Sales Representative.

The STR-A6169 is a PRC topology (fixed off-time) regulator specifically designed to satisfy the requirements for increased integration and reliability in flyback converters. It incorporates a primary control and drive circuit with avalanche-rated 800 V power MOSFET.

Covering the power range from below 8 watts for a 230 VAC input, or 5 watts for a universal (85 to 264 VAC) input, 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 reduces power consumption at light load, while multiple protections, including the avalanche-energy guaranteed MOSFET, provide high reliability of system design. Devices with an increased output power rating are the STR-A6151 and STR-A6159.

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. The STR-A6169 is provided in an 8-pin mini-DIP plastic package.

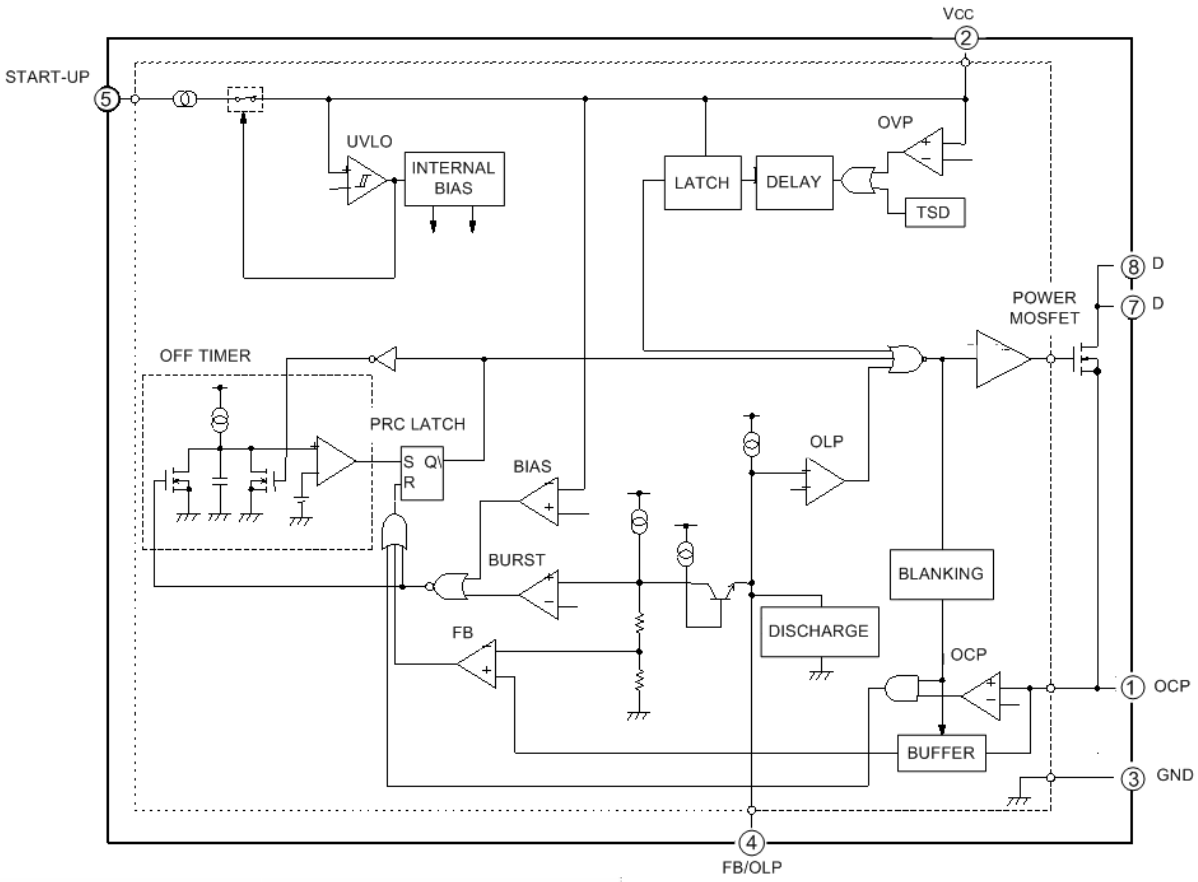
FEATURES AND BENEFITS

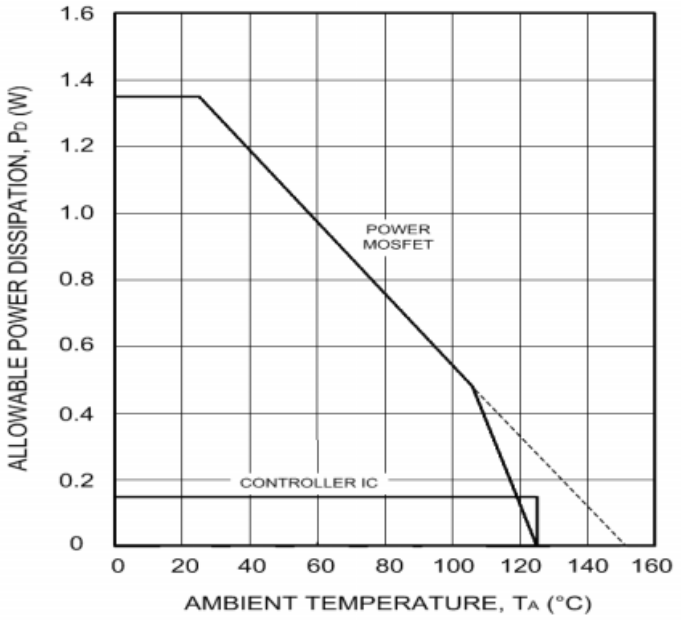
- Rugged 800 V Avalanche-Rated MOSFET
  Simplified Surge Absorption
  No V_{DSS} Derating Required
- 19.2 Ω $r_{DS(on)}$
- Two Operational Modes by Automatic Switching:
  PRC Mode for Normal Operation
  Burst Mode for Stand-By Operation or Light Loads
- Built-In Leading Edge Blanking
- Low Start-Up Current
  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

—continued

Always order by complete part number, e.g., **STR-A6169** .

FUNCTIONAL BLOCK DIAGRAM



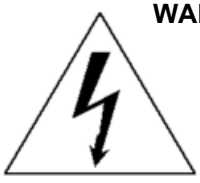


FEATURES AND BENEFITS (cont'd)

- 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

ELECTRICAL CHARACTERISTICS at T_A = 25°C, V_{CC} = 20 V (unless otherwise specified).

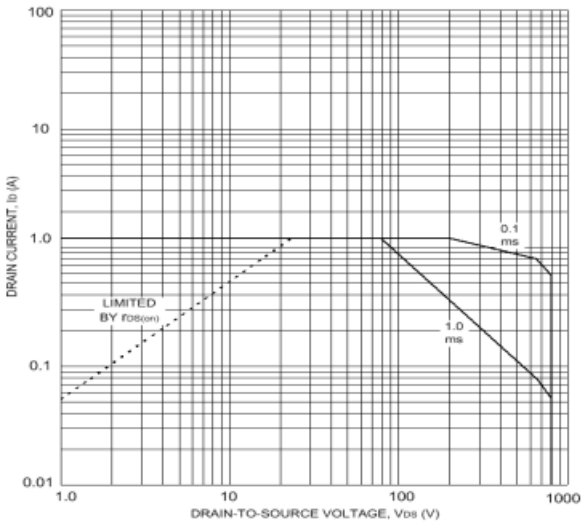
Characteristic	Pin No.	Symbol	Test Conditions	Ratings			
				Min	Typ	Max	Units
Drain-to-Source Breakdown Volt.	8 - 1	V_{DSS}	I_D = 300 µA, $V_1 – V_3$ = 0 V (short)	800	-	-	V
Drain Leakage Current	8 - 1	I_{DSS}	V_{DS} = 800 V, $V_1 – V_3$ = 0 V (short)	-	-	300	µA
On-State Resistance	8 - 1	$r_{DS(on)}$	I_D = 0.4 A	-	-	19.2	Ω
MOSFET Switching Time	8 - 3	t_f	-	-	-	250	ns
Operation Start Voltage	2 - 3	$V_{CC(ON)}$	V_{CC} = 0 → 19.2 V	16	17.5	19.2	V
Operation Stop Voltage	2 - 3	$V_{CC(OFF)}$	V_{CC} = 19.2 → 9 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 V	-	-	50	µA
Auto-Bias Threshold Voltage	2 - 3	$V_{CC(bias)}$	V_{CC} = 20 → 9.6 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 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 → 34.1 V	28.7	31.2	34.1	V
OVP/TSD Latch Sustaining Current	2 - 3	$I_{CC(H)}$	V_{CC} =34.1 → 8.5 V	-	-	200	µA
OVP/TSD Latch Release Voltage	2 - 3	V_{CC}	V_{CC} =34.1 → 6.6 V	6.6	7.3	8.0	V
Thermal Shutdown	-	T_J	-	135	-	-	°C
Thermal Resistance	-	$R_{\theta JF}$	-	-	-	52	°C/W



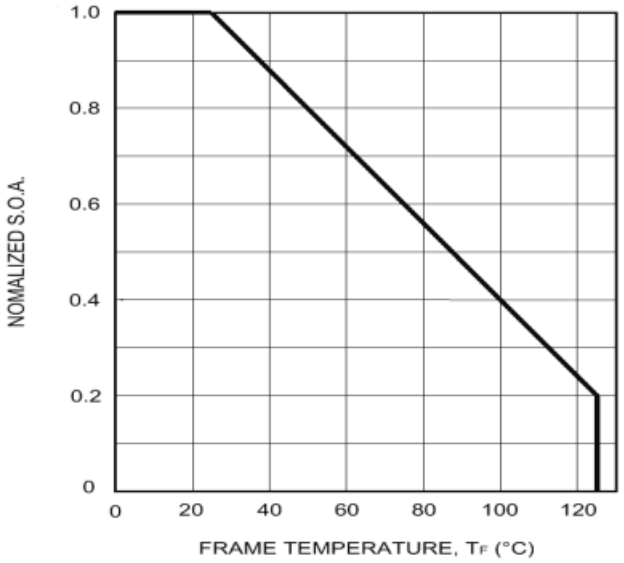
WARNING — These devices are designed to be operated at lethal voltages and energy levels. Circuit designs that embody these components must conform with applicable safety requirements. Precautions must be taken to prevent accidental contact with power-line potentials. Do not connect grounded test equipment.

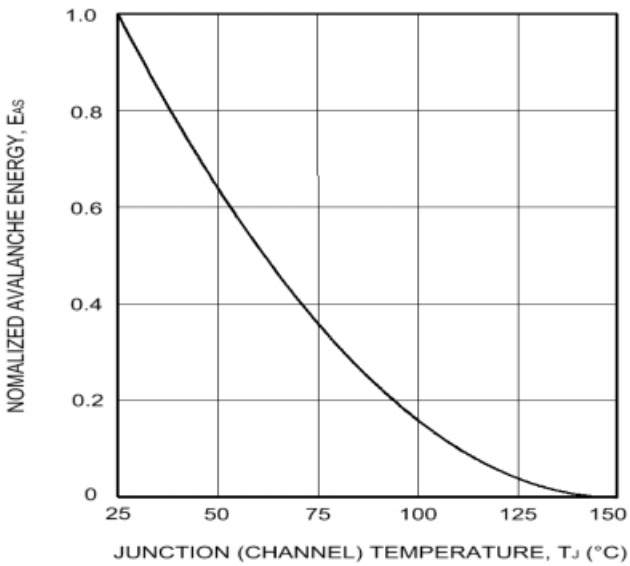
The use of an isolation transformer is recommended during circuit development and breadboarding.

MOSFET TYPICAL CHARACTERISTICS

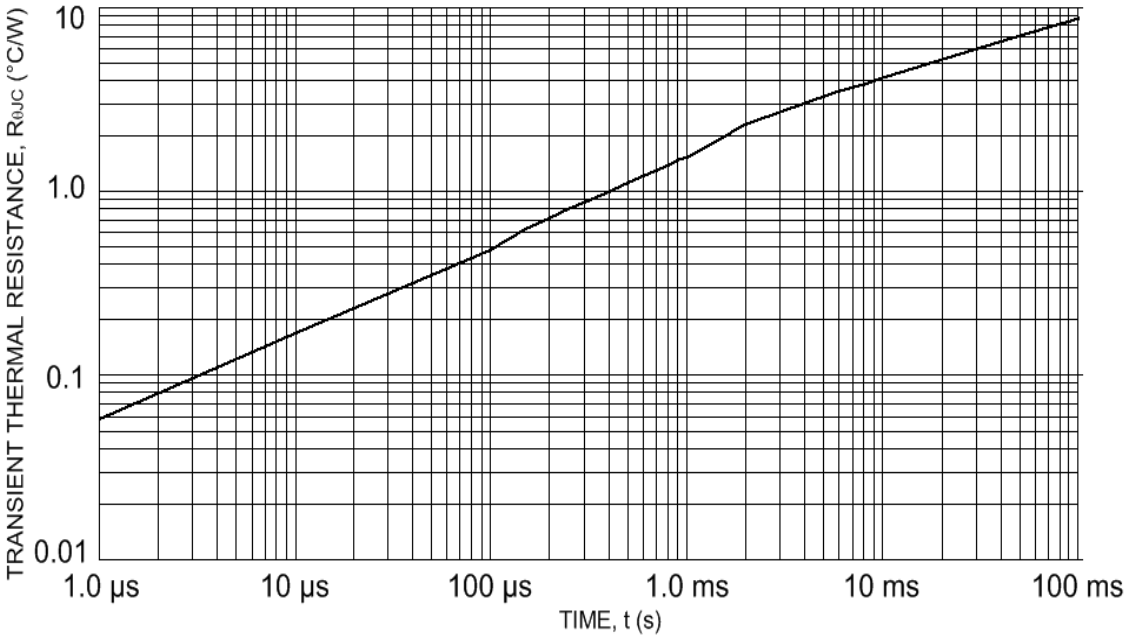


Avalanche energy is measured at V_{DD} = 99 V, L = 20 mH, I_L = 1.2 A.

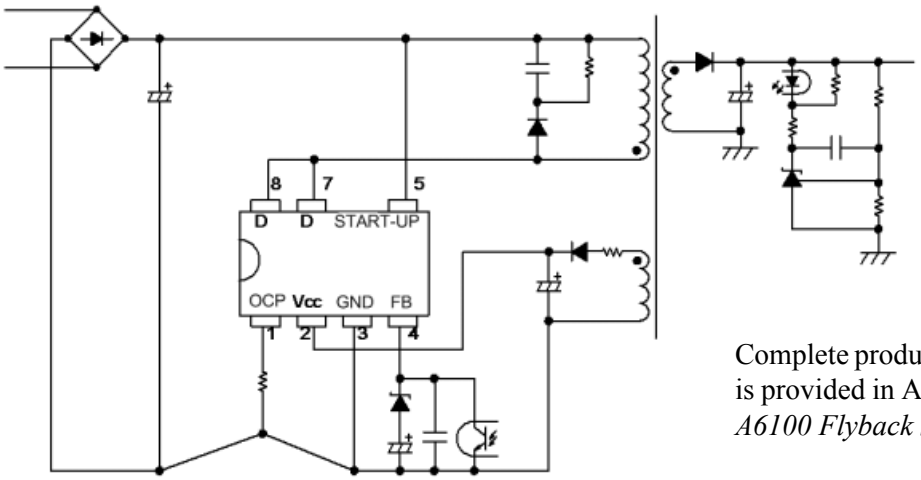




MOSFET TYPICAL CHARACTERISTICS (cont'd)



APPLICATIONS INFORMATION



Typical Application

Complete product description and applications information is provided in Application Note 28102.20, *Series STR-A6100 Flyback Switching Regulators*.

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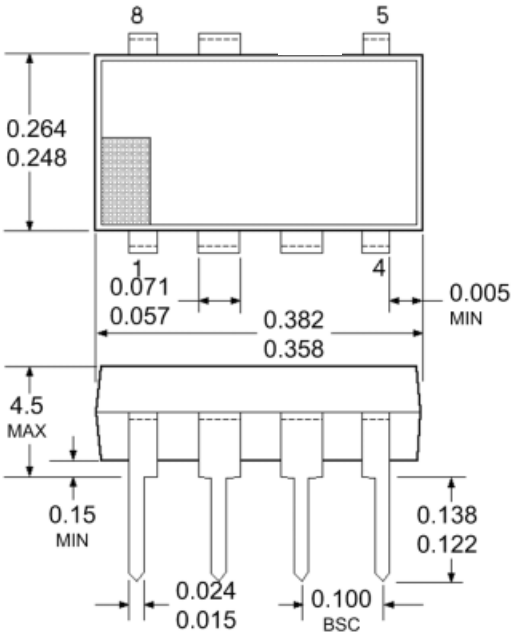
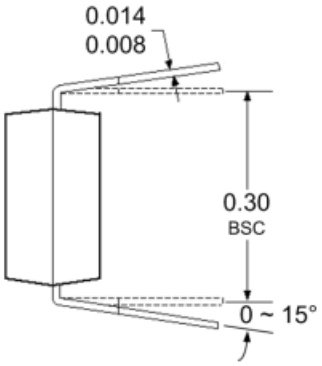
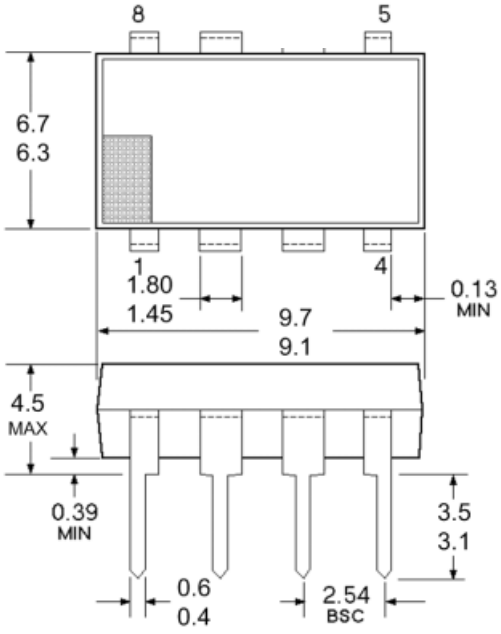
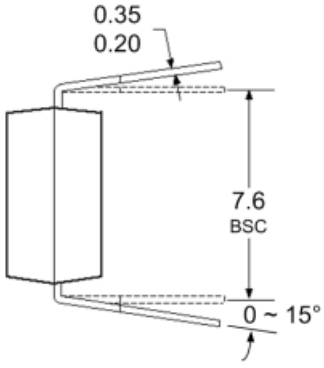
PACKAGE DIMENSIONS





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.