

# STR-A6151 AND STR-A6159

## Universal-Input/13 or 16 W Flyback Switching Regulators



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

Control Supply Voltage, $V_{CC}$ . . . . .	<b>35 V</b>
Drain-Source Voltage, $V_{DSS}$ . . . . .	<b>650 V</b>
Drain Switching Current, $I_D$	
STR-A6151 . . . . .	<b>2.5 A*</b>
STR-A6159 . . . . .	<b>1.8 A*</b>
Peak Drain Switching Current, $I_{DM}$	
STR-A6151 . . . . .	<b>2.5 A</b>
STR-A6159 . . . . .	<b>1.8 A</b>
Single-Pulse Avalanche Energy, $E_{AS}$	
STR-A6151 . . . . .	<b>72 mJ</b>
STR-A6159 . . . . .	<b>24 mJ</b>
Start-Up-Pin Voltage Range, $V_{startup}$ . . . . .	<b>-0.3 V to +600 V</b>
OCV Voltage Range, $V_{OCP}$ . . . . .	<b>-0.5 V to +6 V</b>
FB/OLP Voltage Range, $V_{FB/OLP}$ . . . . .	<b>-0.5 V to +10 V</b>
Package Power Dissipation, $P_D$	
control ( $V_{CC} \times I_{CC(ON)}$ ) . . . . .	<b>0.15 W</b>
MOSFET ( $V_{DSS} \times I_D$ ) . . . . .	<b>1.35 W</b>
total . . . . .	<b>1.5 W</b>
MOSFET Channel Temp., $T_J$ . . . . .	<b>+150°C</b>
Internal Frame Temp., $T_F$ . . . . .	<b>+125°C</b>
Operating Temperature Range, $T_A$ . . . . .	<b>-20°C to +125°C†</b>
Storage Temperature Range, $T_S$ . . . . .	<b>-40°C to +125°C</b>

\* 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 Allegro's Sales Representative.

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  $\Omega$  or 6  $\Omega$  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

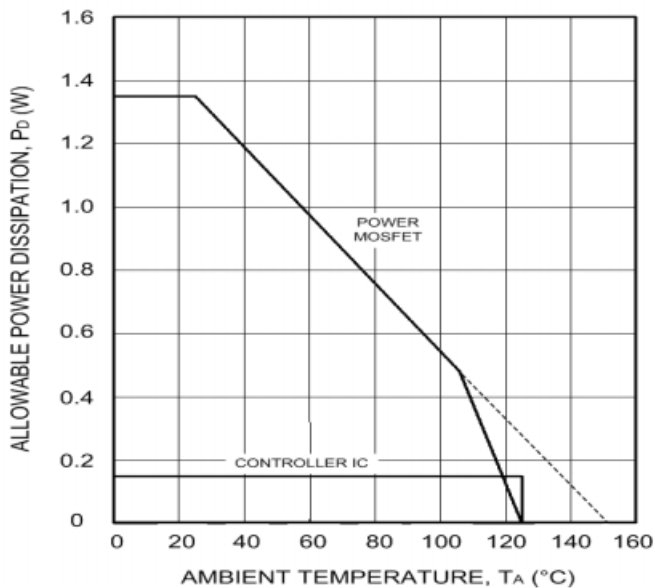
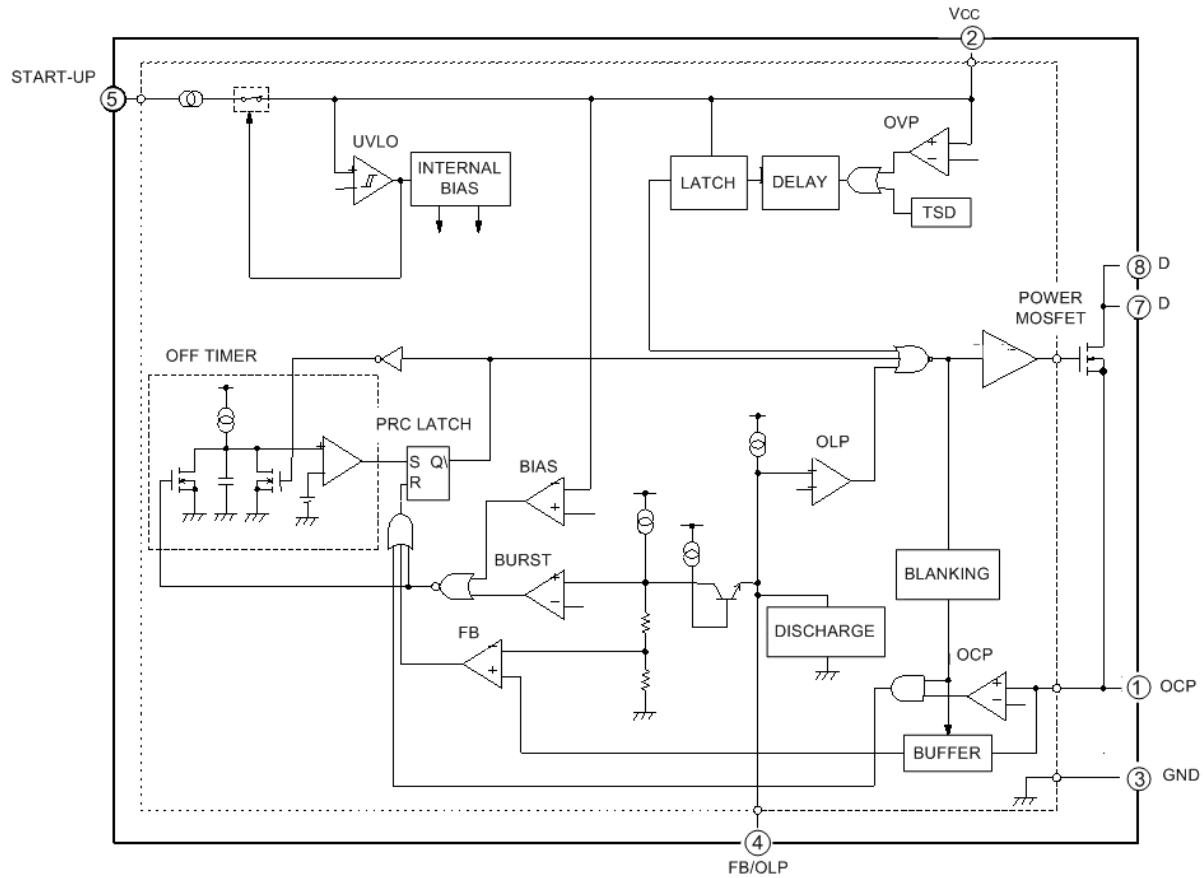
— continued

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

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

**Switching  
Regulators**

**FUNCTIONAL BLOCK DIAGRAM**



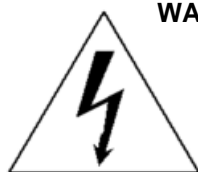
**FEATURES AND BENEFITS (cont'd)**

- 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

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

**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	$V_{(BR)DSS}$	$I_D = 300\ \mu\text{A}$ , $V_1 - V_3 = 0\text{ V}$ (short)	650	-	-	V
Drain Leakage Current	8 - 1	$I_{DSS}$	$V_{DS} = 650\text{ V}$ , $V_1 - V_3 = 0\text{ V}$ (short)	-	-	300	$\mu\text{A}$
On-State Resistance	8 - 1	$r_{DS(on)}$	STR-A6151, $I_D = 0.4\text{ A}$	-	-	3.95	$\Omega$
			STR-A6159, $I_D = 0.4\text{ A}$	-	-	6.00	$\Omega$
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	$\mu\text{A}$
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	$\mu\text{s}$
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	$\mu\text{A}$
Maximum FB Current	4 - 3	$I_{FB(MAX)}$	-	227	300	388	$\mu\text{A}$
Start-Up Current	5 - 3	$I_{startup}$	$V_{CC} = 15\text{ V}$	340	790	1230	$\mu\text{A}$
Start-Up Circuit Leakage Current	5 - 3	$I_{start(leak)}$	-	-	-	30	$\mu\text{A}$
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	$\mu\text{A}$
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.

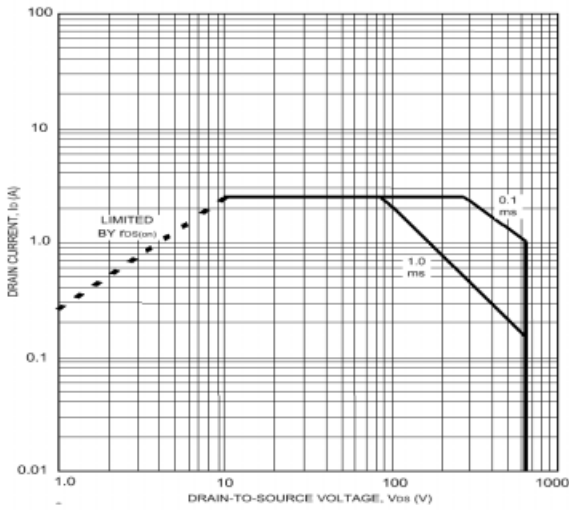
The use of an isolation transformer is recommended during circuit development and breadboarding.

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

**Switching  
Regulators**

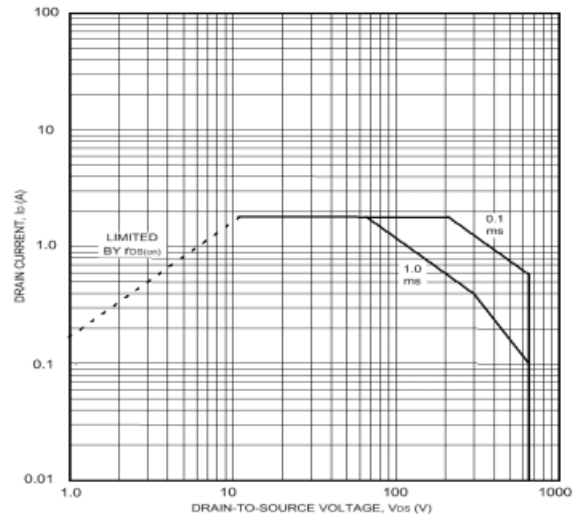
**MOSFET TYPICAL CHARACTERISTICS**

**STR-A6151**

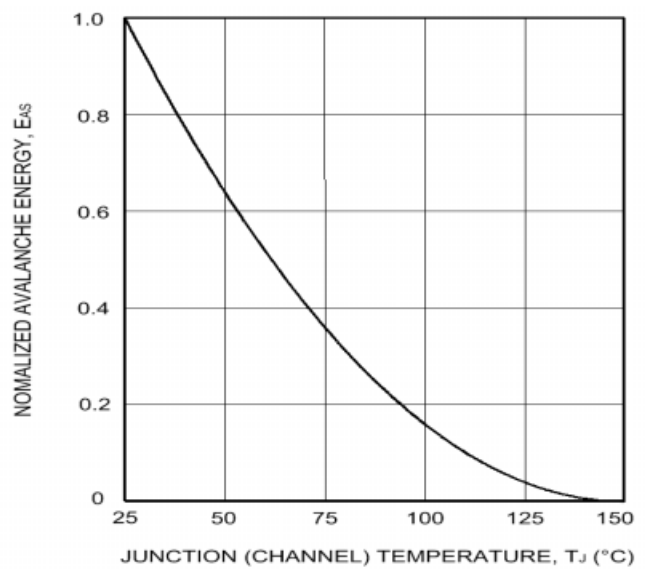
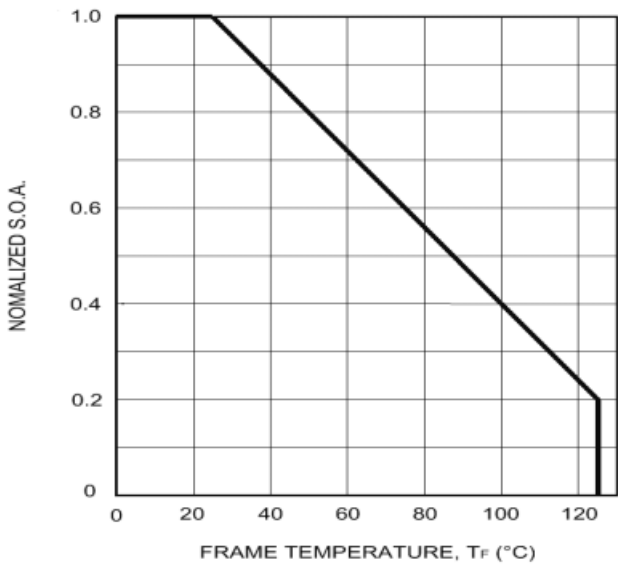


Avalanche energy is measured at  $V_{DD} = 99$  V,  
 $L = 20$  mH,  $I_L = 2.5$  A.

**STR-A6159**

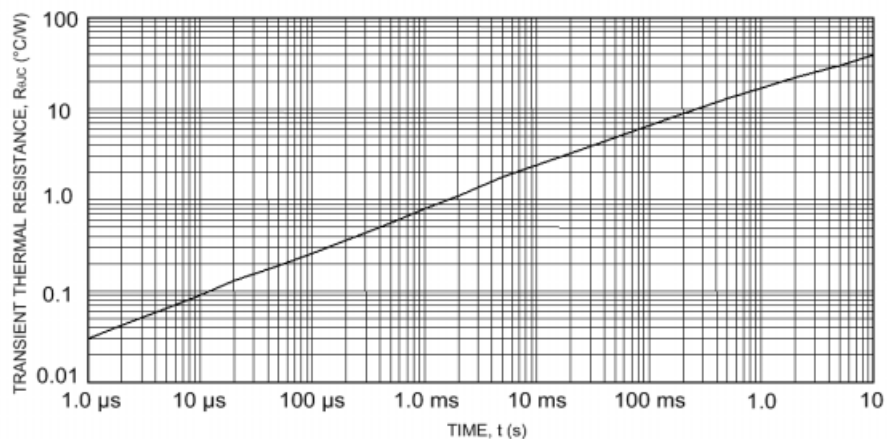


Avalanche energy is measured at  $V_{DD} = 99$  V,  
 $L = 20$  mH,  $I_L = 1.8$  A.

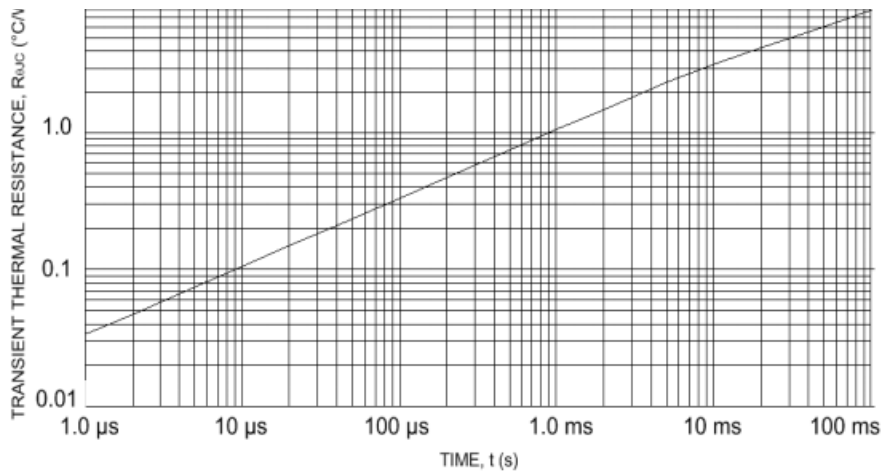


**MOSFET TYPICAL CHARACTERISTICS (cont'd)**

**STR-A6151**



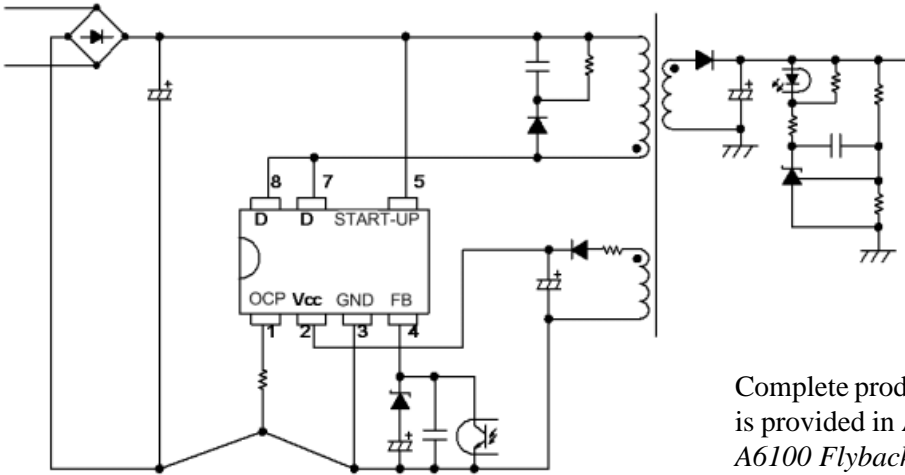
**STR-A6159**



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

Switching  
Regulators

## APPLICATIONS INFORMATION



Typical Application

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

The products described herein are manufactured in Japan by Sanken Electric Co., Ltd. for sale by Allegro MicroSystems, Inc.

Sanken and Allegro reserve the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the performance, reliability, or manufacturability of its products. Therefore, the user is cautioned to verify that the information in this publication is current before placing any order.

When using the products described herein, the applicability and suitability of such products for the intended purpose shall be reviewed at the users responsibility.

Although Sanken undertakes to enhance the quality and reliability of its products, the occurrence of failure and defect of semiconductor products at a certain rate is inevitable.

Users of Sanken products are requested to take, at their own risk, preventative measures including safety design of the equipment or systems against any possible injury, death, fires or damages to society due to device failure or malfunction.

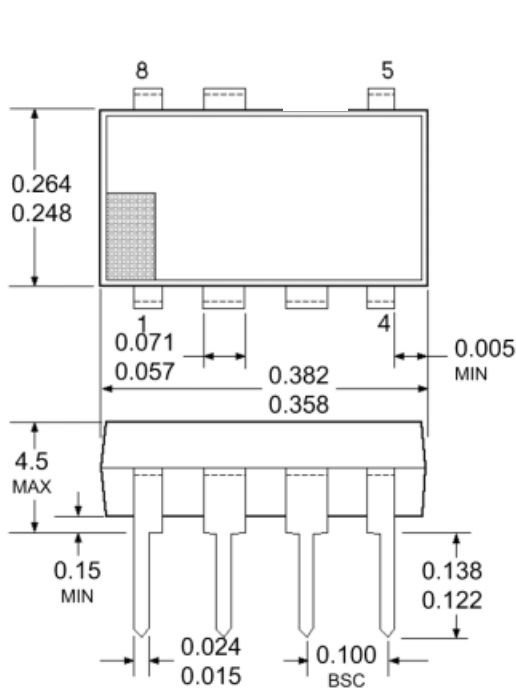
Sanken products listed in this publication are designed and intended for use as components in general-purpose electronic equipment or apparatus (home appliances, office equipment, telecommunication equipment, measuring equipment, etc.). Their use in any application requiring radiation hardness assurance (e.g., aerospace equipment) is not supported.

When considering the use of Sanken products in applications where higher reliability is required (transportation equipment and its control systems or equipment, fire- or burglar-alarm systems, various safety devices, etc.), contact a company sales representative to discuss and obtain written confirmation of your specifications.

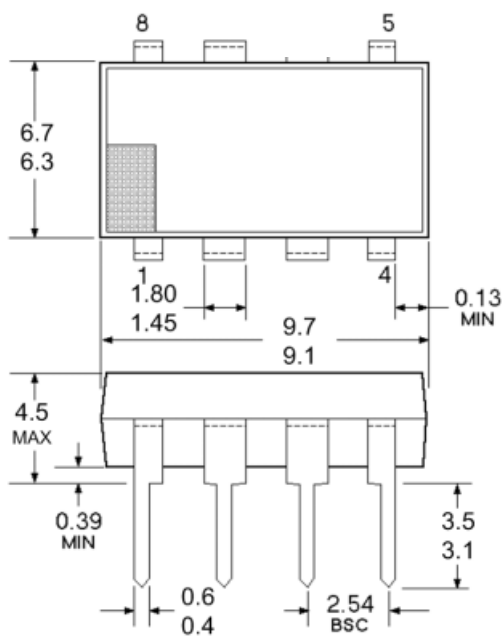
The use of Sanken products without the written consent of Sanken in applications where extremely high reliability is required (aerospace equipment, nuclear power-control stations, life-support systems, etc.) is strictly prohibited.

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.

**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.