

# STR-S6707 THRU STR-S6709

## OFF-LINE SWITCHING REGULATORS – WITH BIPOLAR SWITCHING TRANSISTOR

The STR-S6707, STR-S6708, and STR-S6709 are specifically designed to meet the requirement for increased integration and reliability in off-line quasi-resonant flyback converters. These devices incorporate the primary control and proportional drive circuit with a third-generation high-voltage bipolar switching transistor.

Crucial system parameters such as maximum ON time and OFF time are fixed during manufacture. Local control circuit decoupling and layout are optimized within each device.

Cycle-by-cycle current limiting, under-voltage lock-out with hysteresis, over-voltage protection, and thermal shutdown protect these devices during all normal and overload conditions. Over-voltage protection and thermal shutdown are latched after a short delay. A versatile triple-level inhibit circuit includes the OFF time synchronization required to establish quasi-resonant operation. The inhibit function has also been expanded to initiate operation in stand-by mode in which the power supply delivers a small fraction of the steady-state output power. The dual requirements of dielectric isolation and low transient thermal impedance are satisfied in an over-molded single-in-line power package.

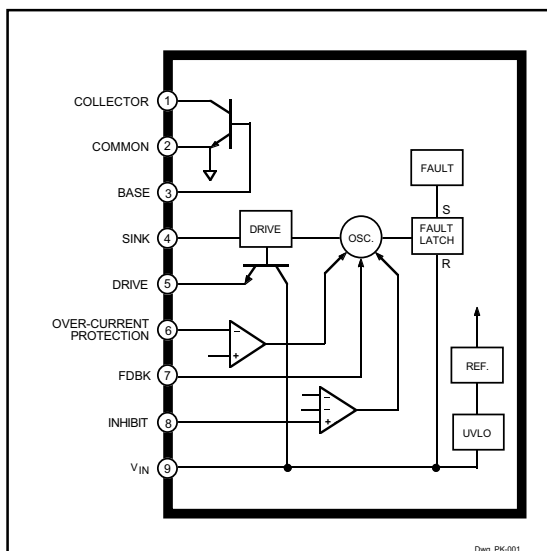
Proven in substantial volumes, these devices and their fixed-frequency counterparts represent a significant advance in off-line SMPS reliability growth and integration.

### FEATURES

- Quasi-Resonant Operation for Low EMI and High Efficiency
- Output Power to 220 W
- Low-Power Output Standby Mode
- Pulse-by-Pulse Over-Current Protection
- Latched Over-Voltage and Thermal Protection
- Third-Generation Switching Transistor with Proportional Drive
- Maximum ON Time and Off Time Set During Manufacture
- Internal Under-Voltage Lockout with Hysteresis
- Over-Molded SIP with Integral Isolated Heat Spreader

Always order by complete part number:

Part Number	Max. Cont. Current, $I_C$	Peak Current, $I_{CM}$	Max. Sink Current, $I_S$
STR-S6707	6 A	12 A	1.5 A
STR-S6708	7.5 A	15 A	1.5 A
STR-S6709	10 A	20 A	2 A



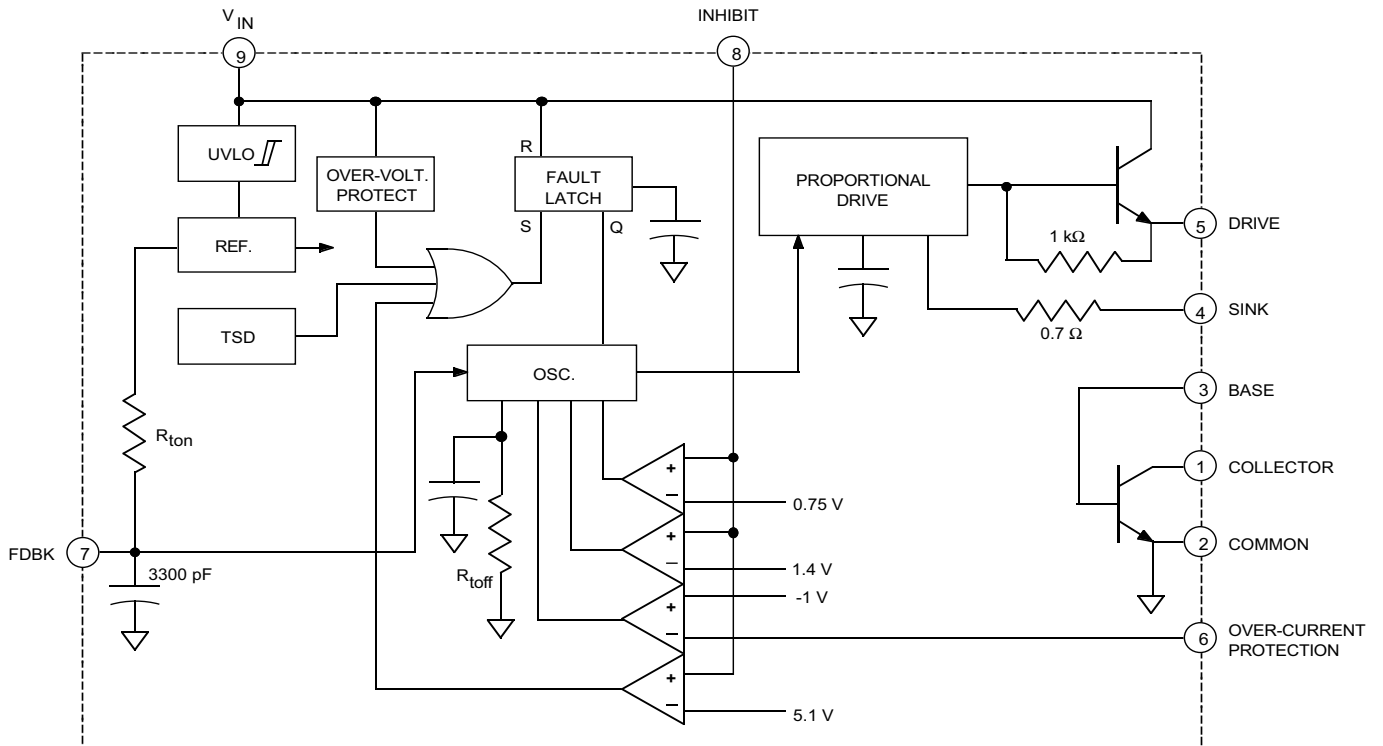
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### ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $V_{IN}$	15 V
Output Voltage, $V_{CEX}$	850 V
$V_{EBO}$	7 V
Continuous Output Current, $I_C$	See Table
1 ms Single-Pulse Output Current, $I_{CM}$	See Table
Sink Current, $I_S$	See Table
Drive Current, $I_D$	-700 mA
Feedback Current, $I_{FDBK}$	20 mA
Inhibit Voltage, $V_{INH}$	15 V
Over-Current Protection Voltage Range, $V_{OCP}$	$\pm 3.5$ V
Insulation Voltage, $V_{WM(RMS)}$	2000 V
Package Power Diss., $P_D$	See Graph
Output Junction Temperature, $T_J$	+150°C
Internal Frame Temperature, $T_F$	+125°C
Operating Temperature Range, $T_A$	-20°C to +125°C
Storage Temperature Range, $T_{stg}$	-40°C to +125°C

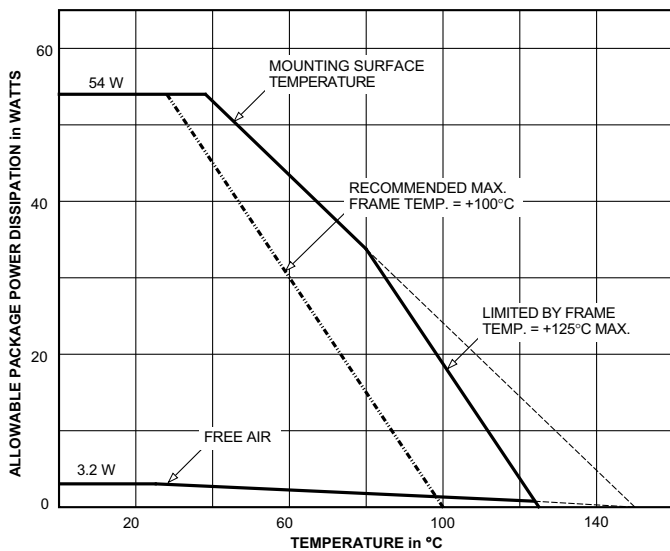
# STR-S6707 THRU STR-S6709 OFF-LINE QUASI-RESONANT FLYBACK SWITCHING REGULATORS

## STR-S6707 AND STR-S6708 FUNCTIONAL BLOCK DIAGRAM



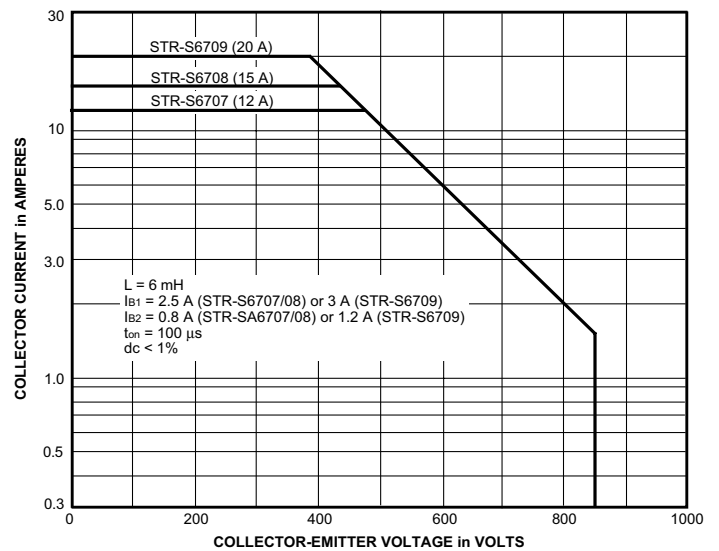
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## ALLOWABLE PACKAGE POWER DISSIPATION



Dwg. GK-003-2

## MAXIMUM SAFE OPERATING AREA



Dwg. GK-002

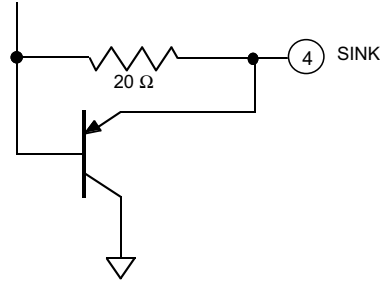


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# STR-S6707 THRU STR-S6709 OFF-LINE QUASI-RESONANT FLYBACK SWITCHING REGULATORS

**STR-S6709  
FUNCTIONAL BLOCK DIAGRAM  
AS ABOVE  
EXCEPT FOR SINK OUTPUT**



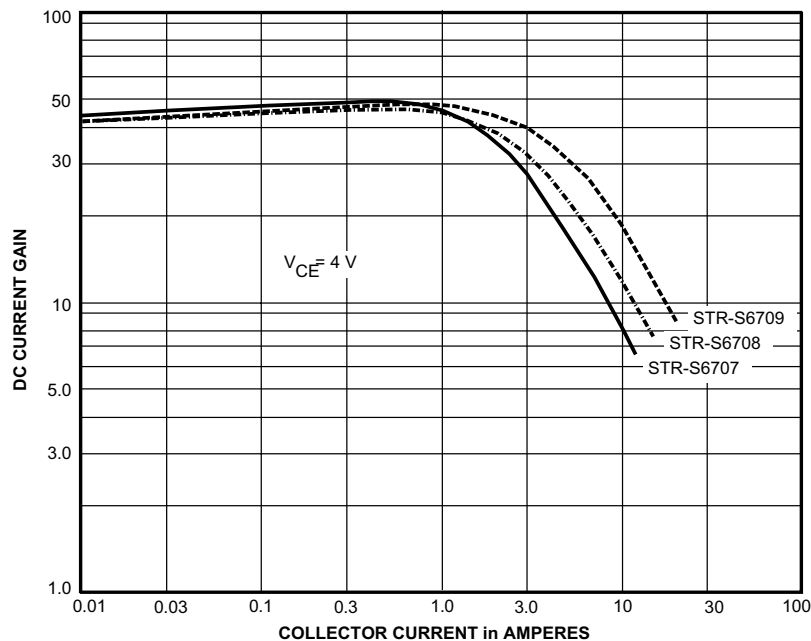
**ELECTRICAL CHARACTERISTICS** at  $T_A = +25^\circ\text{C}$ ,  $V_{IN} = 8.5\text{ V}$ , voltage measurements are referenced to Common (pin 2) (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
On-State Voltage	$V_{INT}$	Turn-on, increasing $V_{IN}$	7.6	8.0	8.4	V
Under-Voltage Lockout	$V_{INQ}$	Turn-off, decreasing $V_{IN}$	4.6	4.9	5.2	V
Over-Voltage Threshold	$V_{OVP(th)}$		9.2	∅	10.7	V
Output Leakage Current	$I_{CEX}$	$V_{CE} = 850\text{ V}$ , $V_{BE} = -1.5\text{ V}$	∅	∅	100	$\mu\text{A}$
Output Saturation Voltage	$V_{CE(sat)}$	STR-S6707, $I_C = 2\text{ A}$ , $I_B = 400\text{ mA}$	∅	∅	400	mV
		STR-S6708, $I_C = 3\text{ A}$ , $I_B = 600\text{ mA}$	∅	∅	400	mV
		STR-S6709, $I_C = 4\text{ A}$ , $I_B = 800\text{ mA}$	∅	∅	400	mV
	$V_{BE(sat)}$	STR-S6707, $I_C = 2\text{ A}$ , $I_B = 400\text{ mA}$	∅	∅	1.5	V
		STR-S6708, $I_C = 3\text{ A}$ , $I_B = 600\text{ mA}$	∅	∅	1.5	V
		STR-S6709, $I_C = 4\text{ A}$ , $I_B = 800\text{ mA}$	∅	∅	1.5	V
DC Current Gain	$h_{FE}$	$V_{CE} = 4\text{ V}$ , $I_C = 1\text{ A}$	29	∅	61	∅
Maximum ON Time	$t_{on}$		33	∅	41	$\mu\text{s}$
Minimum OFF Time	$t_{off}$		45	∅	55	$\mu\text{s}$
Over-Current Threshold	$V_{OCP(th)}$		-0.9	-1.0	-1.1	V
Feedback Threshold Volt.	$V_{FDBK(th)}$		∅	650	∅	mV
Inhibit Threshold Voltage	$V_{INH(th)}$	Oscillation stops	0.65	0.75	0.85	V
		Oscillation synchronized	∅	1.4	2.0	V
		Oscillation stops (fault latch set)	3.2	5.1	5.6	V
Latch Holding Current	$I_{INH}$	$V_{IN}$ reduced from 10.7 V to 4 V	∅	∅	500	$\mu\text{A}$
Latch Reset Voltage	$V_Q$	$I_{IN} \leq 100\ \mu\text{A}$ , $V_{IN}$ reduced from 10.7 V	2.5	3.1	∅	V
Supply Current	$I_{IN(ON)}$	Operating	15	∅	29	mA
	$I_{IN(OFF)}$		∅	∅	200	$\mu\text{A}$
Insulation RMS Voltage	$V_{WM(RMS)}$	All terminals simultaneous reference metal plate against backside	2000	∅	∅	V
Thermal Shutdown	$T_J$		125	150	∅	$^\circ\text{C}$
Thermal Resistance	$R_{\theta JM}$	Output junction to mounting surface	∅	2.0	∅	$^\circ\text{C/W}$

NOTES: Negative current is defined as coming out of (sourcing) the specified device terminal.  
Typical Data is for design information only.

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**QUASI-RESONANT FLYBACK**  
**SWITCHING REGULATORS**

**TYPICAL CHARACTERISTICS**

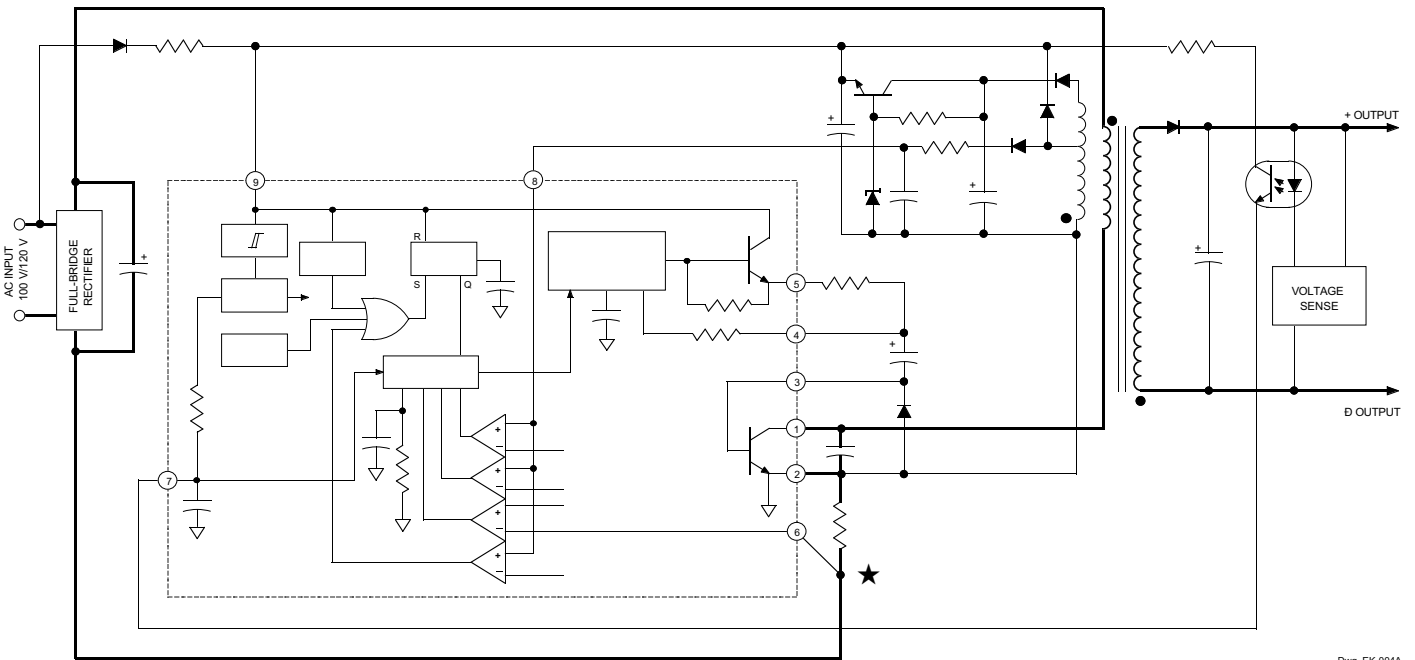


Dwg. GK-001

# STR-S6707 THRU STR-S6709 OFF-LINE QUASI-RESONANT FLYBACK SWITCHING REGULATORS

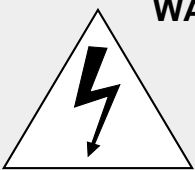
## TYPICAL QUASI-RESONANT FLYBACK CONVERTER

**WARNING:** lethal potentials are present. See text.



Dwg. EK-004A

## APPLICATIONS INFORMATION



**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.

Recommended mounting hardware torque:

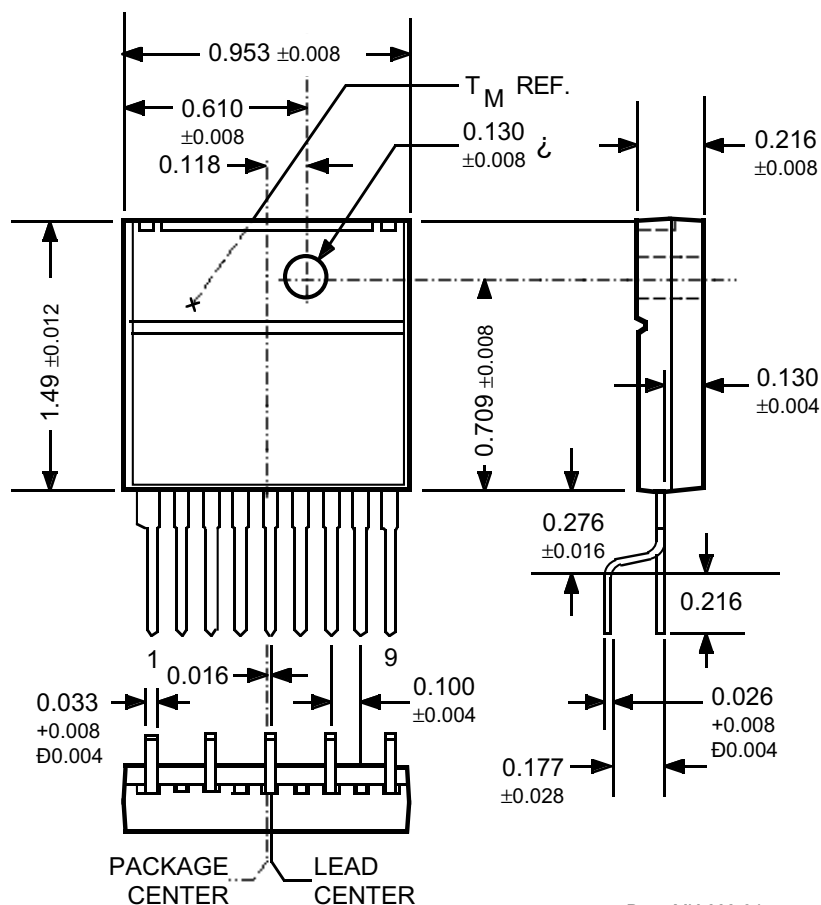
4.34 ÷ 5.79 lbf·ft (6 ÷ 8 kg·cm or 0.588 ÷ 0.784 Nm).

Recommended metal-oxide-filled, alkyl-degenerated oil base, silicone grease:

Dow Corning 340, or equivalent

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**Dimensions in Inches**  
 (for reference only)

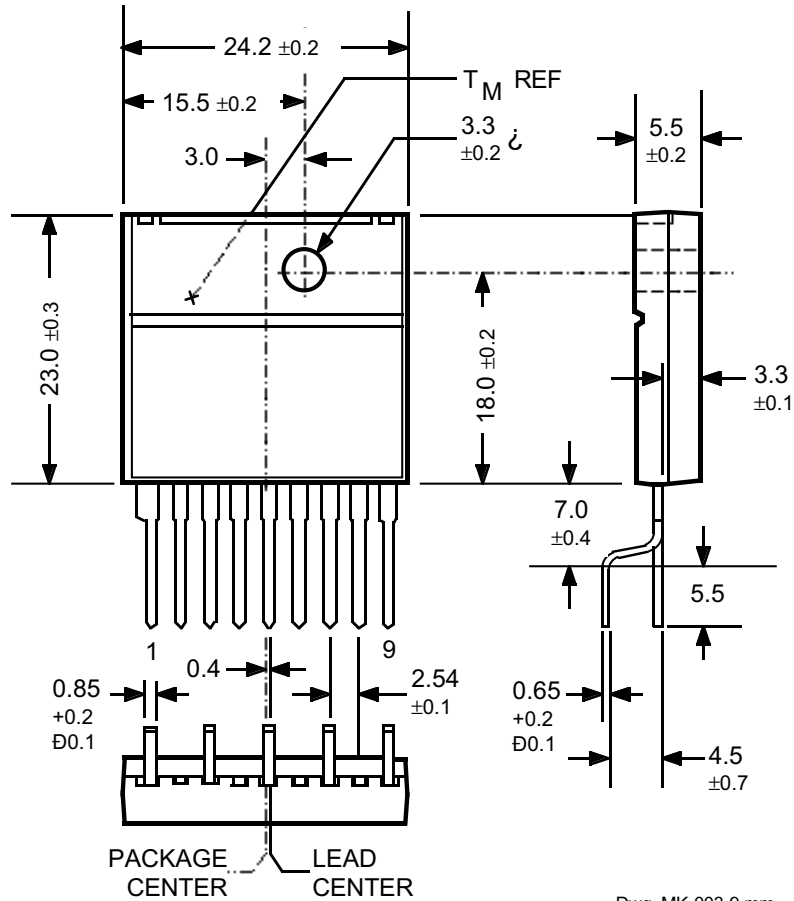


Dwg. MK-003-9 in

NOTE: Exact body and lead configuration at vendor's option within limits shown.

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**Dimensions in Millimeters**  
 (controlling dimensions)



Dwg. MK-003-9 mm

NOTE: Exact body and lead configuration at vendor's option within limits shown.

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**QUASI-RESONANT FLYBACK**  
**SWITCHING REGULATORS**

**POWER CONVERSION/POWER MANAGEMENT**  
**SELECTION GUIDES**

**SWITCHING REGULATOR PMCMs**

Part Number*	Application	V <sub>I</sub>	Max P <sub>O</sub>		Power Switch	
3002M	5 V Switching Regulator and a 9 V Switching Regulator†	7.0-33 V	–	–	500 mA 400 mA	Bipolar Bipolar
3004M	5 V Switching Regulator and Dual 9 V Switching Regulator	7.0-33 V	–	–	500 mA 2 x 400 mA	Bipolar Bipolar
S5703	Quasi-Resonant Flyback Converter	110/120 V	140 W	500 V	6 A	Bipolar
S5707	Quasi-Resonant Flyback Converter	85-265 V 220/240V	90 W 140 W	850 V	6 A	Bipolar
S5708	Quasi-Resonant Flyback Converter	85-265 V 220/240 V	120 W 180 W	850 V	7.5 A	Bipolar
S6703	Quasi-Resonant Flyback Converter	110/120V	140 W	500 V	6 A	Bipolar
S6704	Quasi-Resonant Flyback Converter	110/120 V	100 W	500 V	5 A	Bipolar
S6707	Quasi-Resonant Flyback converter	85-265 V 220/240 V	90 W 140 W	850 V	6 A	Bipolar
S6708	Quasi-Resonant Flyback Converter	85-265 V 220/240 V	120 W 180 W	850 V	7.5 A	Bipolar
S6709	Quasi-Resonant Flyback Converter	85-265 V 220/240 V	160 W 220 W	850 V	10 A	Bipolar
8033S	3.3 V Switching Regulator	5.5-28 V	–	–	3 A	Bipolar
8050S	5.0 V Switching Regulator	7.0-40 V	–	–	3 A	Bipolar
8090S	9.0 V Switching Regulator	12-40V	–	–	3 A	Bipolar
8120S	12 V Switching Regulator	15-40 V	–	–	3 A	Bipolar
8150S	15 V Switching Regulator	18-40 V	–	–	3 A	Bipolar

\* Complete part number includes additional characters to indicate operating temperature range and/or package style.

† Also includes linear regulator output for 15.7 V at 1.0 A.



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