

Features and Benefits

- TO-220F-7L package
- Lead (Pb) free compliance
- The built-in startup circuit reduces the number of external components and lowers standby power consumption
- Multi-mode control allows high efficiency operation across the full range of loads
- Auto burst oscillation mode for standby mode, for improving low standby power at no load: input power < 30 mW at 100 VAC and < 50 mW at 230 VAC
- Bottom-skip mode minimizes switching loss at medium to low loads
- Internal MOSFET V_{DSS}(min) is 650 V
- Internal MOSFET $R_{DS(on)}(max)$ 1.9 Ω (STR-Y6753) or 1.4 Ω (STR-Y6754)
- Built-in soft start function reduces stress applied to the incorporated power MOSFET and peripheral components
- Step-on burst oscillation minimizes transformer audible noise
- Built-in leading edge blanking (LEB) function eliminates

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Package: 7-Pin TO-220F



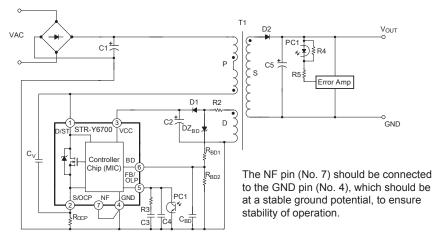
Description

The STR-Y6753 and STR-Y6754 each comprise a power MOSFET and a multi-functional monolithic integrated circuit (MIC) controller designed for controlling switch mode power supplies. The quasi-resonant mode of operation, coupled with the bottom-skip function, allows high efficiency and low noise at low to high operational levels, while burst oscillation mode ensures minimum power consumption at standby.

In order to sustain low power consumption under low load and in standby mode, the controller has built-in startup and standby circuits. This enables output power for the STR-Y6753 up to 60 W with universal input or 100 W with a 380 VDC input, and for the STR-Y6754 up to 67 W with universal input or 120 W with a 380 VDC input.

The compact 7-pin full mold package (TO220F-7L) reduces board space by requiring a minimum of external components, thus simplifying circuit design. This IC, including various protection functions, is an excellent choice for standardized, compact power supplies.

Typical Application



Features and Benefits (continued)

external filter components

- Built-in Bias Assist function enables stable startup operation
- \bullet V_{CC} operational range expanded
- Internal power MOSFET is avalanche energy guaranteed; twochip structure
- Protection functions
- Overcurrent protection (OCP): pulse by pulse basis, low dependence on input voltage
- Overload protection (OLP): latched shutoff*
- Overvoltage protection (OVP): latched shutoff*
- Maximum on-time limitation
- Thermal shutdown protection (TSD): latched shutoff*

*Latched shutoff means the output is kept in a shutoff mode for protection, until reset.

Selection Guide

Part Number	V _{DSS} (min) (V)	R _{DS(on)} (max) (Ω)	Package	Packing
STR-Y6753	650	1.9	TO-220F	50 pieces per tube
STR-Y6754	000	1.4	10-2201	

Absolute Maximum Ratings Unless specifically noted, $T_A = 25^{\circ}C$ and $V_{CC} = 20 V$

Characteristic	Symbol		Notes	Pins	Rating	Unit
Duraine Querrantit		STR-Y6753	Cinele nules	4 0	9.2	A
Drain Current ¹	I _{DPEAK}	STR-Y6754	Single pulse	1 – 2	11.0	A
Maximum Quitabia a Quimant		STR-Y6753	T = 00%0 to 405%0	4 0	9.2	A
Maximum Switching Current	IDMAX	STR-Y6754	$T_A = -20^{\circ}C$ to $125^{\circ}C$	1 – 2	11.0	A
Single Pulse Avalanche Energy ²	E _{AS}	STR-Y6753	Single pulse, V_{DD} = 99 V, L= 20 mH, I _{LPEAK} = 2.9 A	1 – 2	99	mJ
Single Fulse Avalancie Energy	⊏AS	STR-Y6754	Single pulse, V_{DD} = 99 V, L= 20 mH, I _{LPEAK} = 4.1 A	1 – 2	198	mJ
Input Voltage in Control Part (MIC)	V _{CC}			3 – 4	35	V
Startup (D/ST) Pin Voltage	V _{STARTUP}			1 – 4	-1.0 to V _{DSS}	V
OCP Pin Voltage	V _{OCP}			2 – 4	-2.0 to 6.0	V
FB Pin Voltage	V _{FB}			5 – 4	-0.3 to 7.0	V
FB Pin Sink Current ³	I _{FB}			5 – 4	10.0	mA
BD Pin Voltage	V _{BD}			6 – 4	-6.0 to 6.0	V
		STR-Y6753	With an infinite heatsink	1-2	20.2	W
Power Dissipation in MOSFET ⁴	P _{D1}	STR-Y6754	With an infinite fleatsink	1 – 2	21.5	W
		Without heats	ink	1 – 2	1.8	W
Power Dissipation in Control Part (MIC)	P _{D2}			_	0.8	W
Internal Frame Temperature in Operation	T _F	Recommended internal frame temperature is T_F = 105°C (max).		-	-20 to 115	°C
Operating Ambient Temperature	T _{OP}			_	-20 to 115	°C
Storage Temperature	T _{stg}			_	-40 to 125	°C
Channel Temperature	T _{ch}			_	150	°C

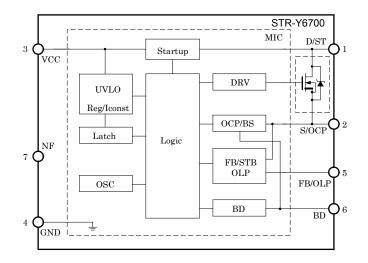
¹Refer to MOSFET Safe Operating Area Curve.

²Refer to MOSFET Avalanche Energy Derating Coefficient Curve.

³The polarity value for current specifies a sink as "+ ," and a source as "-," referencing the IC.

⁴Refer to MOSFET Temperature versus Power Dissipation Curve.

Functional Block Diagram



Pin List Table

Name	Number	Function
1	D/ST	MOSFET drain and Startup circuit input
2	S/OCP	MOSFET source and overcurrent detection signal input
3	VCC	Control circuit power supply input
4	GND	Ground
5	FB/OLP	Constant Voltage Control signal input, Standby control, and overload detection signal input
6	BD	Bottom Detection signal input, Input Compensation detection signal input
7	NF	For stable operation, connect to GND pin, using the shortest possible path

All performance characteristics given are typical values for circuit or system baseline design only and are at the nominal operating voltage and an ambient temperature, T_A , of 25°C, unless otherwise stated.

Off-Line Quasi-Resonant Switching Regulators

Electrical Characteristics of Control Part (MIC) Unless specifically noted, T_A = 25°C and V_{CC} = 20	V
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Characteristic	Symbol	Test Conditio	ns Pins	Min.	Тур.	Max.	Unit
Power Supply Startup Operation			·				
Operation Start Voltage	V _{CC(ON)}		3 – 4	13.8	15.1	17.3	V
Operation Stop Voltage ¹	V _{CC(OFF)}		3 – 4	8.4	9.4	10.7	V
Circuit Current in Operation	I _{CC(ON)}		3 – 4	_	1.3	3.7	mA
Circuit Current in Non-Operation	I _{CC(OFF)}	V _{CC} = 13 V	3 – 4	-	4.5	50	μA
Startup Circuit Operation Voltage	V _{START(ON)}		1 – 4	42	57	72	V
Startup Current	I _{CC(STARTUP)}	V _{CC} = 13 V	3 – 4	-4.5	-3.1	-1.0	mA
Startup Current Supply Threshold Voltage ¹	V _{CC(BIAS)}		3 – 4	9.5	11.0	12.5	V
Operation Frequency	f _{OSC}		1 – 4	18.4	21.0	24.4	kHz
Soft Start Operation Duration	t _{SS}		1 – 4	_	6.05	_	ms
Normal Operation			· ·				
Bottom-Skip Operation Threshold Voltage 1	V _{OCP(BS1)}		2 - 4	0.487	0.572	0.665	V
Bottom-Skip Operation Threshold Voltage 2	V _{OCP(BS2)}		2 - 4	0.200	0.289	0.380	V
Quasi-Resonant Operation Threshold Voltage 1 ²	V _{BD(TH1)}		6 – 4	0.14	0.24	0.34	V
Quasi-Resonant Operation Threshold Voltage 2 ²	V _{BD(TH2)}		6 – 4	-	0.17	-	V
Maximum Feedback Current	I _{FB(MAX)}		5 – 4	-320	-205	-120	μA
Stand-by Operation							
Standby Operation Threshold Voltage	V _{FB(STBOP)}		5 – 4	0.45	0.80	1.15	V
Protected Operation							
Maximum On-Time	t _{ON(MAX)}		1 – 4	30.0	40.0	50.0	μs
Looding Edge Displying Time		STR-Y6753	1-4	-	470	-	ns
Leading Edge Blanking Time	t _{ON(LEB)}	STR-Y6754	1-4	-	455	-	ns
Overcurrent Detection Threshold Voltage (Normal Operation)	V _{OCP(H)}	V _{BD} = 0 V	2 – 4	0.820	0.910	1.000	V
Overcurrent Detection Threshold Voltage (Input Compensation in Operation)	V _{OCP(L)}	V _{BD} = -3 V	2 – 4	0.560	0.660	0.760	V
Overcurrent Detection Threshold Voltage (Latched shutoff) ³	V _{OCP(La.OFF)}		2-4	1.65	1.83	2.01	V

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Electrical Characteristics of Control Part (MIC) (Continued) Unless specifically noted, T_A = 25°C and V_{CC} = 20 V

Characteristic	Symbol	Test Conditions	Pins	Min.	Тур.	Max.	Unit
BD Pin Source Current	I _{BD(O)}		6 – 4	-250	-83	-30	μA
OLP Bias Current	I _{FB(OLP)}		5 – 4	-15	-10	-5	μA
OLP Threshold Voltage	V _{FB(OLP)}		5 – 4	5.50	5.96	6.40	V
OVP Threshold Voltage	V _{CC(OVP)}		3 – 4	28.5	31.5	34.0	V
FB Pin Maximum Voltage in Feedback Operation	V _{FB(MAX)}		5 – 4	3.70	4.05	4.40	V
Thermal Shut Down Temperature	T _{J(TSD)}		_	135	-	-	°C

Note: The polarity value for current specifies a sink as "+ ," and a source as "-," referencing the IC.

¹The relation of V_{CC(BIAS)} > V_{CC(OFF)} is maintained. ²The relation of V_{BD(TH1)} > V_{BD(TH2)} is maintained in each product.

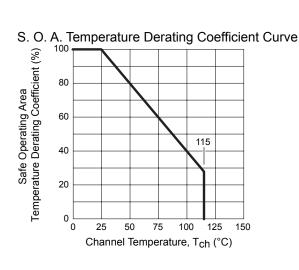
²The latch circuit means a circuit operated OVP, OLP, OCP (latch-off), or TSD.

Electrical Characteristics of MOSFET Unless specifically noted, $T_A = 25^{\circ}C$ and $V_{CC} = 20 V$

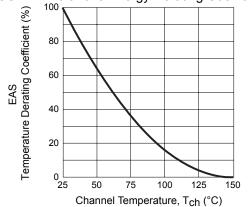
Characteristic	Symbol	Test Conditions		Pins	Min.	Тур.	Max.	Unit
Voltage Between Drain and Source	V _{DSS}			1 – 2	650	-	-	V
Drain Leakage Current	I _{DSS}			1 – 2	-	_	300	μA
On-Resistance	R _{DS(on)}	STR-Y6753		1 – 2	_	_	1.9	Ω
		STR-Y6754		1 – 2	_	_	1.4	Ω
Switching Time	t _f	STR-Y6753		1 – 2	_	_	250	ns
		STR-Y6754		1 – 2	-	_	300	ns
Thermal Resistance R _{0ch-F}	Rech-F	STR-Y6753	of the MOSFET	-	-	2.7	3.1	°C/W
	001=1	STR-Y6754	and the internal leadframe	-	-	2.4	2.7	°C/W

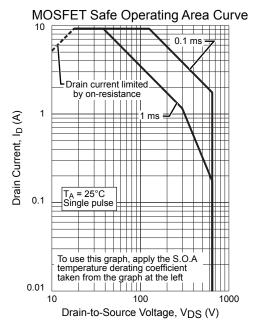
Off-Line Quasi-Resonant Switching Regulators

Characteristic Performance (STR-Y6753)

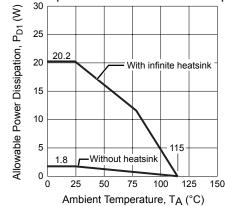


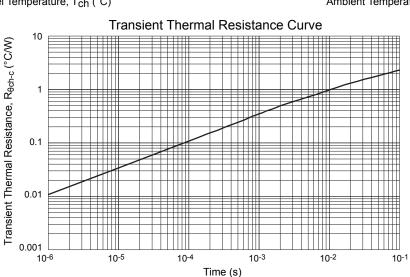
MOSFET Avalanche Energy Derating Coefficient Curve





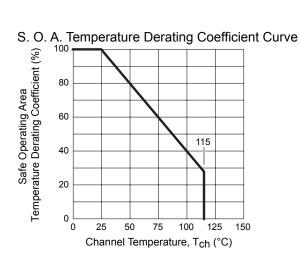
MOSFET Temperature versus Power Dissipation Curve



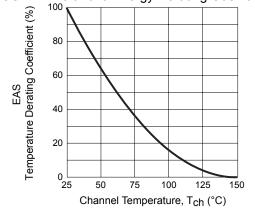


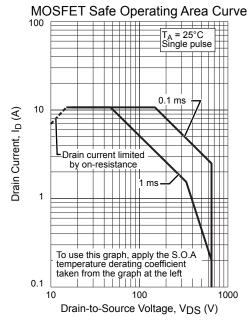
Off-Line Quasi-Resonant Switching Regulators

Characteristic Performance (STR-Y6754)

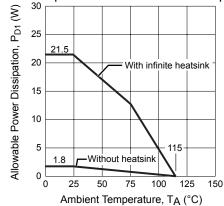


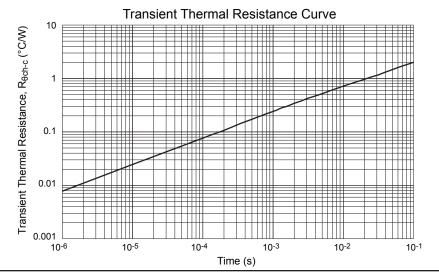
MOSFET Avalanche Energy Derating Coefficient Curve

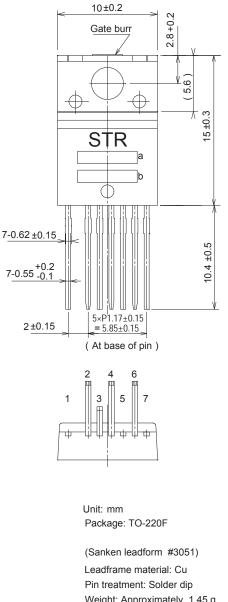




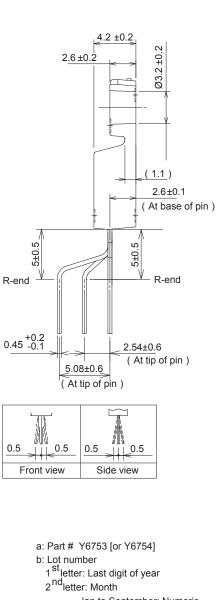
MOSFET Temperature versus Power Dissipation Curve

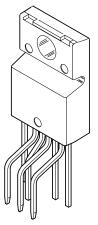






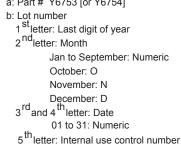
Package Outline Drawing



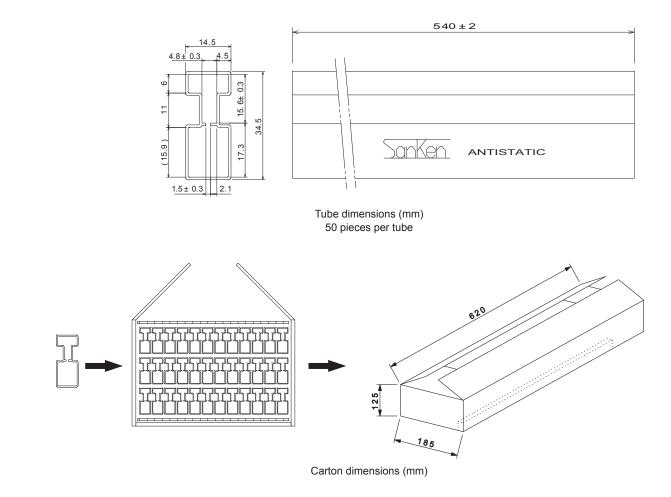


Weight: Approximately 1.45 g "Gate Burr" shows area where 0.3 mm (max) gate burr may be present

Pin treatment Pb-free. Device composition compliant with the RoHS directive.



Packing Specifications



36 tubes per carton (maximum) 1800 pieces maximum per carton

Off-Line Quasi-Resonant Switching Regulators

Because reliability can be affected adversely by improper storage environments and handling methods, please observe the following cautions.

Cautions for Storage

- Ensure that storage conditions comply with the standard temperature (5°C to 35°C) and the standard relative humidity (around 40% to 75%); avoid storage locations that experience extreme changes in temperature or humidity.
- Avoid locations where dust or harmful gases are present and avoid direct sunlight.
- Reinspect for rust on leads and solderability of products that have been stored for a long time.

Cautions for Testing and Handling

When tests are carried out during inspection testing and other standard test periods, protect the products from power surges from the testing device, shorts between the product pins, and wrong connections.

Remarks About Using Silicone Grease with a Heatsink

- When silicone grease is used in mounting this product on a heatsink, it shall be applied evenly and thinly. If more silicone grease than required is applied, it may produce excess stress.
- Volatile-type silicone greases may crack after long periods of time, resulting in reduced heat radiation effect. Silicone grease with low consistency (hard grease) may cause cracks in the mold resin when screwing the product to a heatsink.
- Our recommended silicone greases for heat radiation purposes, which will not cause any adverse effect on the product life, are indicated below:

Туре	Suppliers
G746	Shin-Etsu Chemical Co., Ltd.
YG6260	MOMENTIVE Performance Materials, Inc.
SC102	Dow Corning Toray Co., Ltd.

Heatsink Assembly

 Attachment torque should be in the range 0.588 to 0.785 N•m (6 to 8 kgf•cm).

Soldering

- The leadframe temperature should never exceed T_F = 105°C(max).
- When soldering the products, please be sure to minimize the working time, within the following limits: 260±5°C 10 s
 - 350±5°C 3 s (solder iron)
- Soldering iron should be at a distance of at least 2.0 mm from the body of the products.

Electrostatic Discharge

- When handling the products, the operator must be grounded. Grounded wrist straps worn should have at least 1 M Ω of resistance from the operator to ground to prevent shock hazard, and it should be placed near the operator.
- Workbenches where the products are handled should be grounded and be provided with conductive table and floor mats.
- When using measuring equipment such as a curve tracer, the equipment should be grounded.
- When soldering the products, the head of soldering irons or the solder bath must be grounded in other to prevent leak voltages generated by them from being applied to the products.
- The products should always be stored and transported in Sanken shipping containers or conductive containers, or be wrapped in aluminum foil.

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