

Features and Benefits (continued)

- Soft Start function: reduces stress on internal power MOSFET and secondary output rectifier diode at startup
- Protection Functions:
 - Overcurrent Protection function (OCP); pulse-by-pulse, built-in compensation circuit to minimize OCP point variation on AC input voltage
 - Overload Protection function (OLP); auto restart, built-in timer, reduces heat during overload condition, and no external components required
 - Overvoltage Protection function (OVP); auto restart
 - Thermal Shutdown function (TSD); auto restart

Selection Guide

Part Number	f _{osc} (kHz)	MOSFET		P _{OUT} * (W)		OVP/TSD
		V _{DSS(min)} (V)	R _{DS(on)(max)} (Ω)	230 VAC	85 to 265 VAC	
STR3A151D	67	650	4.0	24	16	Auto restart
STR3A152D			3.0	30	23	
STR3A153D			1.9	36	30	
STR3A154D			1.4	40	32	
STR3A155D			1.1	43	35	

*The listed output power is based on the thermal ratings, and the peak output power can be 120% to 140% of the value stated here. At low output voltage and short duty cycle, the output power may be less than the value stated here.

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

Absolute Maximum Ratings Unless specifically noted, T_A is 25°C

Characteristic	Symbol	Notes		Pins	Rating	Unit
Drain Peak Current ¹	I _{DPEAK}	STR3A151D	Single pulse	8–1	3.6	A
		STR3A152D			4	A
		STR3A153D			5.2	A
		STR3A154D			6.4	A
		STR3A155D			7.2	A
Avalanche Energy ²	E _{AS}	STR3A151D	Single pulse, I _{LPEAK} = 2.13 A	8–1	53	mJ
		STR3A152D	Single pulse, I _{LPEAK} = 2.19 A		56	mJ
		STR3A153D	Single pulse, I _{LPEAK} = 2.46 A		72	mJ
		STR3A154D	Single pulse, I _{LPEAK} = 2.66 A		83	mJ
		STR3A155D	Single pulse, I _{LPEAK} = 3.05 A		110	mJ
S/OCP Pin Voltage	V _{OCP}			1–3	–2 to 6	V
Control Part Input Voltage	V _{CC}			2–3	32	V
FB/OLP Pin Voltage	V _{FB}			4–3	–0.3 to 14	V
FB/OLP Pin Sink Current	I _{FB}			4–3	1.0	mA
MOSFET Power Dissipation ³	P _{D1}	STR3A151D STR3A152D	Mounted on 15 mm × 15 mm printed circuit board	8–1	1.68	W
		STR3A153D STR3A154D			1.76	W
		STR3A155D			1.81	W
Control Part Power Dissipation	P _{D2}	V _{CC} × I _{CC}		2–3	1.3	W
Operating Ambient Temperature	T _{OP}			–	–40 to 125	°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.

³Refer to MOSFET Temperature versus Power Dissipation Curve.

Electrical Characteristics of Control Part Unless specifically noted, T_A is 25°C, $V_{CC} = 18\text{ V}$

Characteristic	Symbol	Test Conditions		Pins	Min.	Typ.	Max.	Unit
Operation Start Voltage	$V_{CC(ON)}$			2 – 3	13.8	15.3	16.8	V
Operation Stop Voltage*	$V_{CC(OFF)}$			2 – 3	7.3	8.1	8.9	V
Circuit Current in Operation	$I_{CC(ON)}$	$V_{CC} = 12\text{ V}$		2 – 3	–	–	2.5	mA
Minimum Start Voltage	$V_{ST(ON)}$			8 – 3	–	40	–	V
Startup Current	$I_{STARTUP}$	$V_{CC} = 13.5\text{ V}$		2 – 3	–3.9	–2.5	–1.1	mA
Startup Current Threshold Biasing Voltage*	$V_{CC(BIAS)}$			2 – 3	8.5	9.5	10.5	V
Average Operation Frequency	$f_{OSC(AVG)}$			8 – 3	60	67	74	kHz
Frequency Modulation Deviation	Δf			8 – 3	–	5	–	kHz
Maximum Duty Cycle	D_{MAX}			8 – 3	65	74	83	%
Leading Edge Blanking Time	t_{BW}			–	–	350	–	ns
OCP Compensation Coefficient	DPC			–	–	17	–	mV/μs
OCP Compensation Duty Cycle Limit	D_{DPC}			–	–	36	–	%
OCP Threshold Voltage at Zero Duty Cycle	$V_{OCP(L)}$			1 – 3	0.69	0.78	0.87	V
OCP Threshold Voltage at 36% Duty Cycle	$V_{OCP(H)}$			1 – 3	0.79	0.88	0.97	V
Maximum Feedback Current	$I_{FB(MAX)}$			4 – 3	–110	–70	–35	μA
Minimum Feedback Current	$I_{FB(MIN)}$			4 – 3	–30	–15	–7	μA
FB/OLP Oscillation Stop Threshold Voltage	$V_{FB(OFF)}$	STR3A151D STR3A152D STR3A153D	$V_{CC} = 32\text{ V}$	4 – 3	1.09	1.21	1.33	V
		STR3A154D STR3A155D	$V_{CC} = 32\text{ V}$	4 – 3	0.85	0.98	1.09	V
OLP Threshold Voltage	$V_{FB(OLP)}$	$V_{CC} = 32\text{ V}$		4 – 3	7.3	8.1	8.9	V
OLP Operation Current	$I_{CC(OLP)}$	$V_{CC} = 12\text{ V}$		2 – 3	–	230	–	μA
OLP Delay Time	t_{OLP}			–	54	70	86	ms
FB/OLP Clamp Voltage	$V_{FB(CLAMP)}$			4 – 3	11.0	12.8	14.0	V
OVP Threshold Voltage	$V_{CC(OVP)}$			2 – 3	27.5	29.5	31.5	V
Thermal Shutdown Activating Temperature	$T_{J(TSD)}$			–	135	–	–	°C

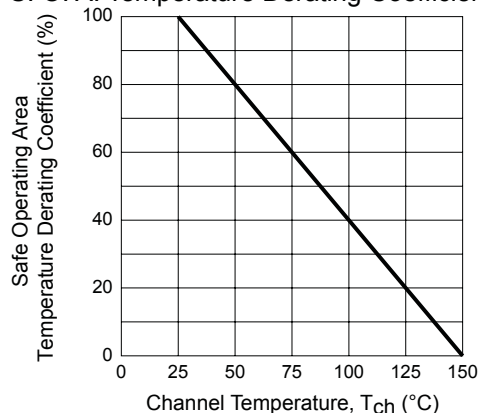
* $V_{CC(BIAS)} > V_{CC(OFF)}$ always.

Electrical Characteristics of MOSFET Unless specifically noted, T_A is 25°C

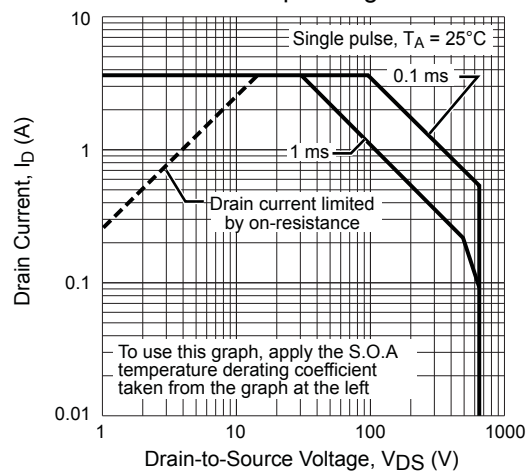
Characteristic	Symbol	Test Conditions		Pins	Min.	Typ.	Max.	Unit
Drain-to-Source Breakdown Voltage	V _{DSS}			8 – 1	650	–	–	V
Drain Leakage Current	I _{DSS}			8 – 1	–	–	300	μA
On-Resistance	R _{DS(ON)}	STR3A151D		8 – 1	–	–	4.0	Ω
		STR3A152D			–	–	3.0	Ω
		STR3A153D			–	–	1.9	Ω
		STR3A154D			–	–	1.4	Ω
		STR3A155D			–	–	1.1	Ω
Switching Time	t _f			8 – 1	–	–	250	ns
Thermal Resistance	R _{θch-C}	STR3A151D STR3A152D STR3A153D	The thermal resistance between channel and case. Case temperature (T _C) is measured at the center of the branded side.	–	–	–	18	°C/W
		STR3A154D STR3A155D		–	–	–	17	°C/W

Characteristic Performance STR3A151D

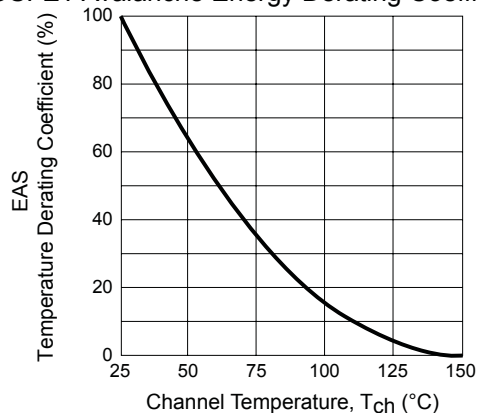
S. O. A. Temperature Derating Coefficient Curve



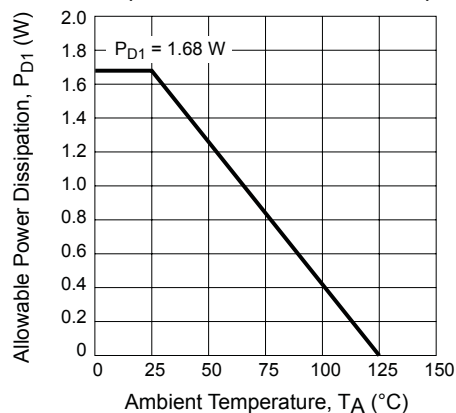
MOSFET Safe Operating Area Curve



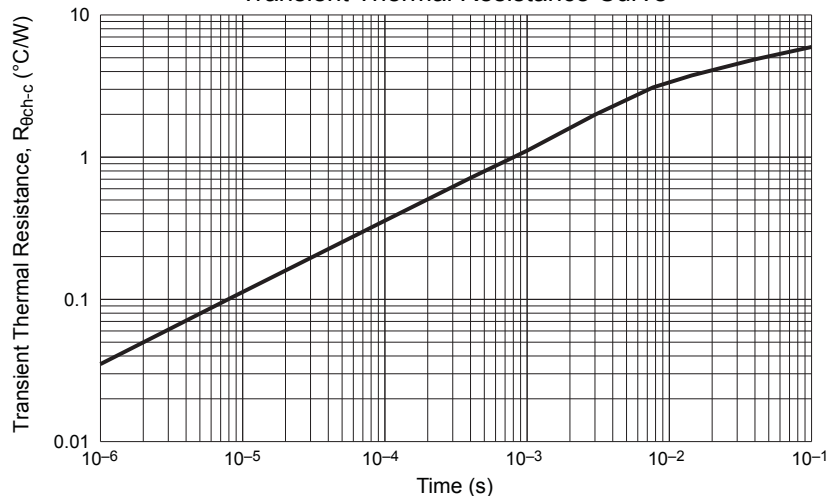
MOSFET Avalanche Energy Derating Coefficient Curve



MOSFET Temperature versus Power Dissipation Curve

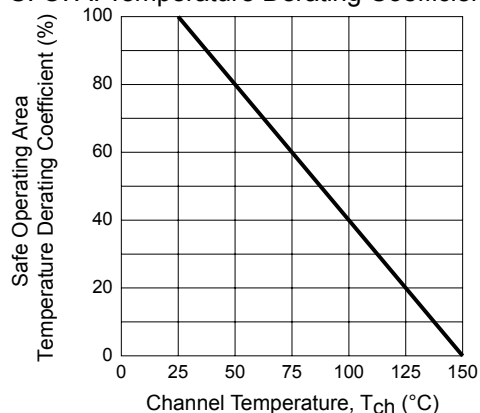


Transient Thermal Resistance Curve

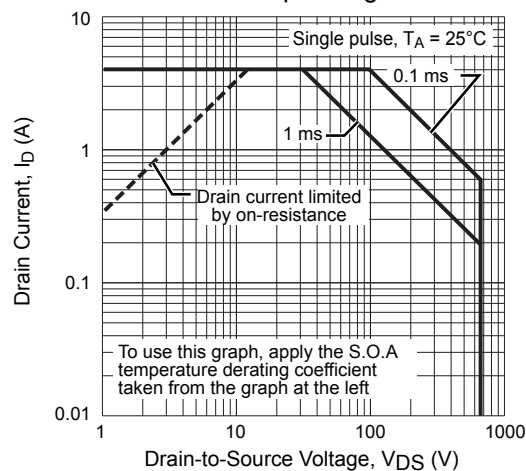


Characteristic Performance STR3A152D

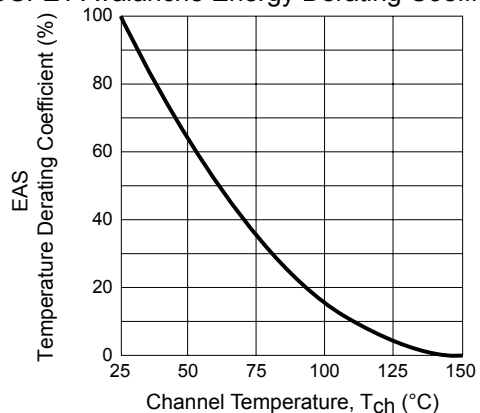
S. O. A. Temperature Derating Coefficient Curve



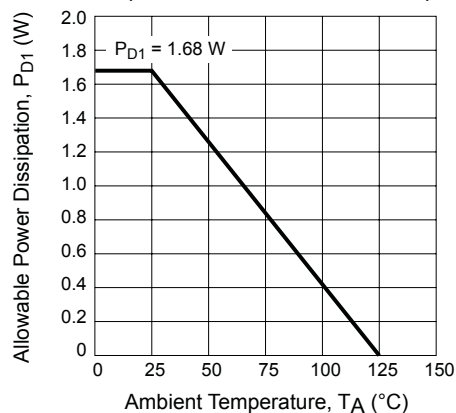
MOSFET Safe Operating Area Curve



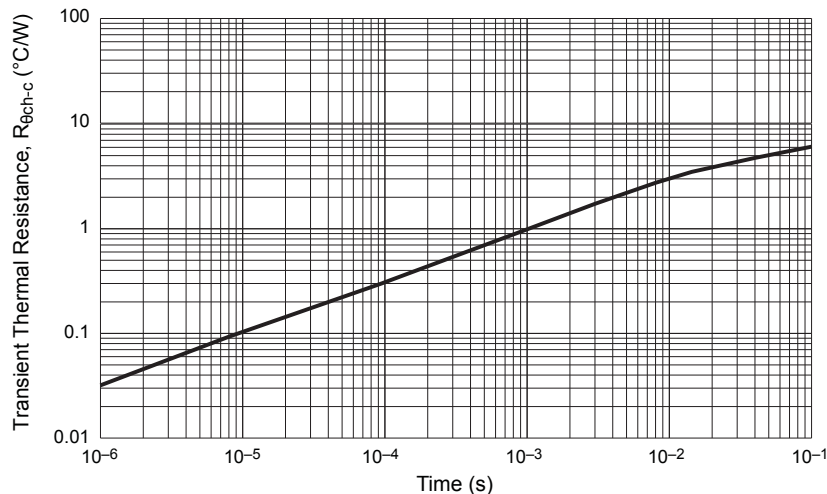
MOSFET Avalanche Energy Derating Coefficient Curve



MOSFET Temperature versus Power Dissipation Curve

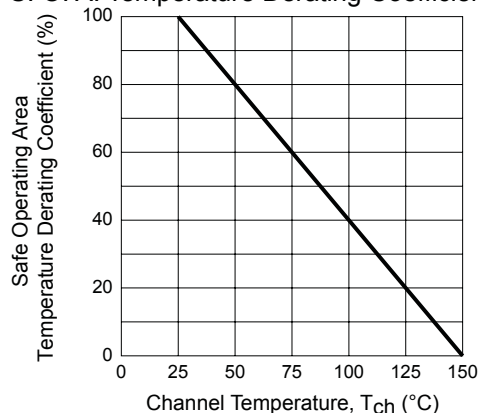


Transient Thermal Resistance Curve

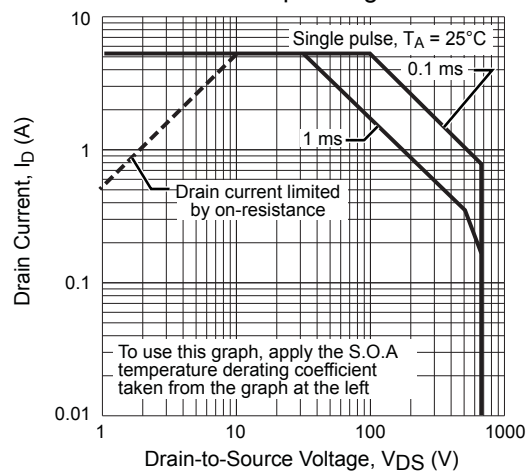


Characteristic Performance STR3A153D

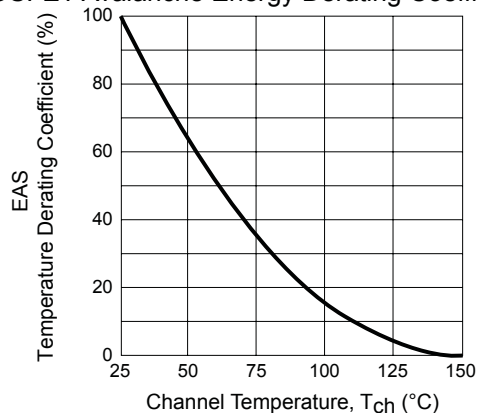
S. O. A. Temperature Derating Coefficient Curve



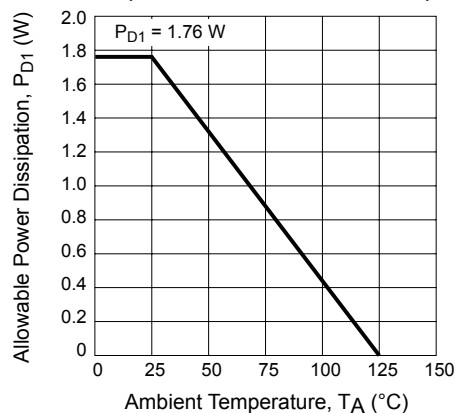
MOSFET Safe Operating Area Curve



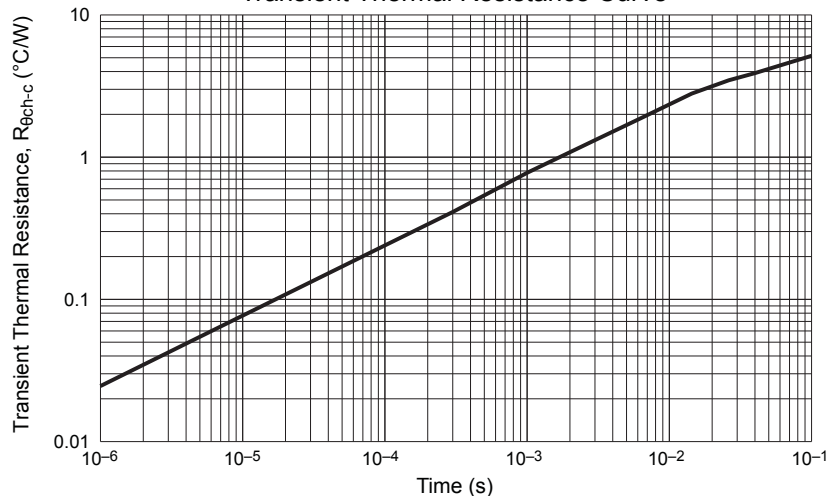
MOSFET Avalanche Energy Derating Coefficient Curve



MOSFET Temperature versus Power Dissipation Curve

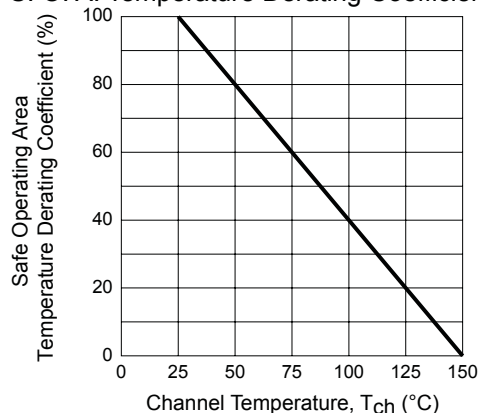


Transient Thermal Resistance Curve

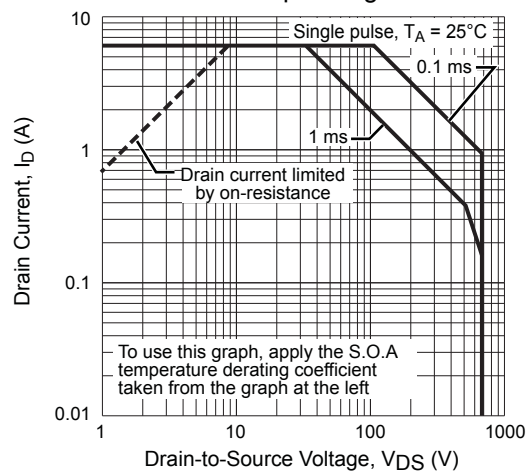


Characteristic Performance STR3A154D

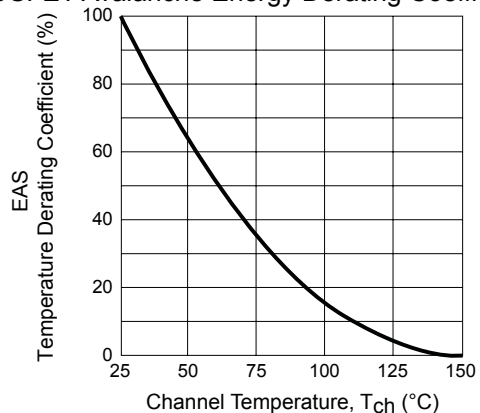
S. O. A. Temperature Derating Coefficient Curve



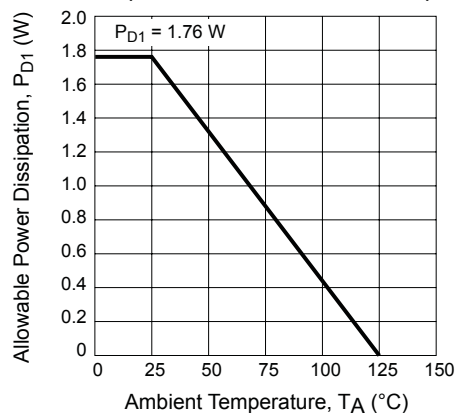
MOSFET Safe Operating Area Curve



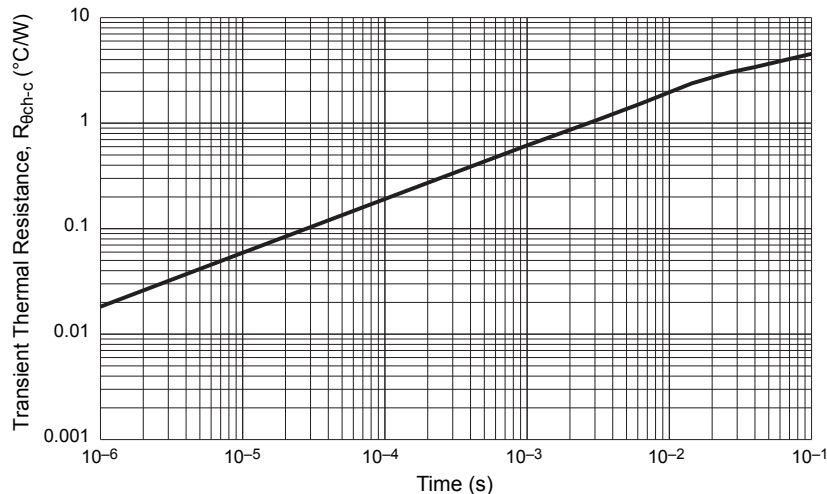
MOSFET Avalanche Energy Derating Coefficient Curve



MOSFET Temperature versus Power Dissipation Curve

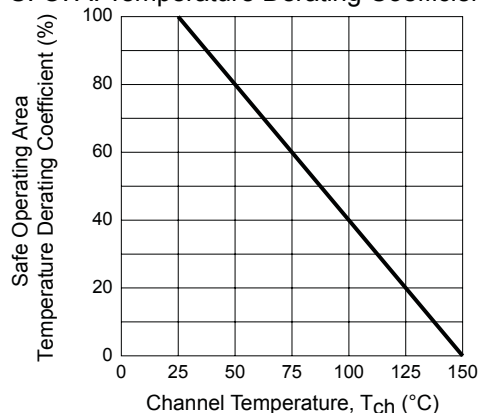


Transient Thermal Resistance Curve

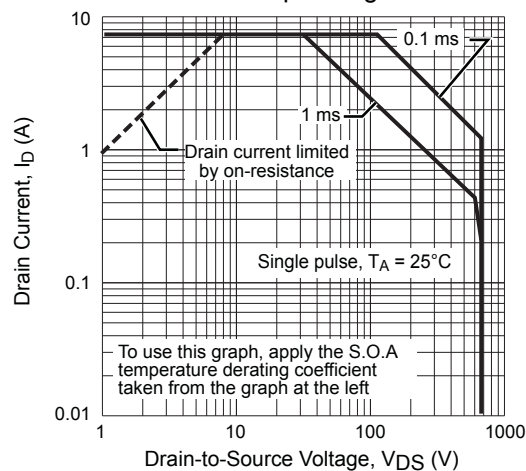


Characteristic Performance STR3A155D

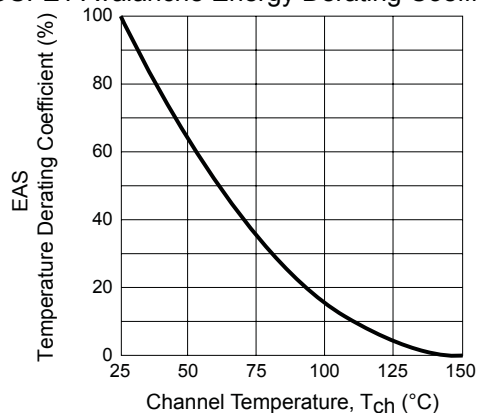
S. O. A. Temperature Derating Coefficient Curve



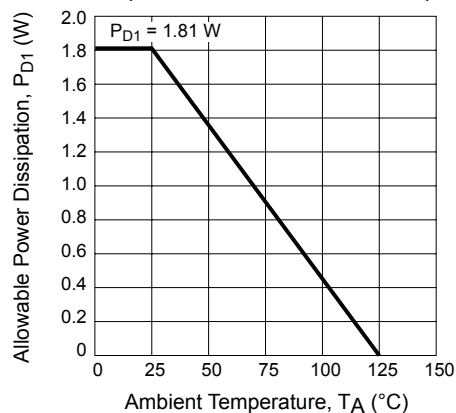
MOSFET Safe Operating Area Curve



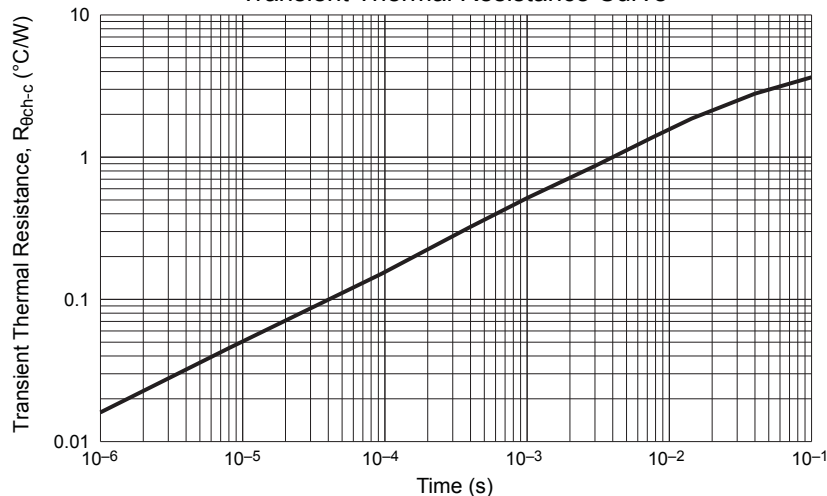
MOSFET Avalanche Energy Derating Coefficient Curve



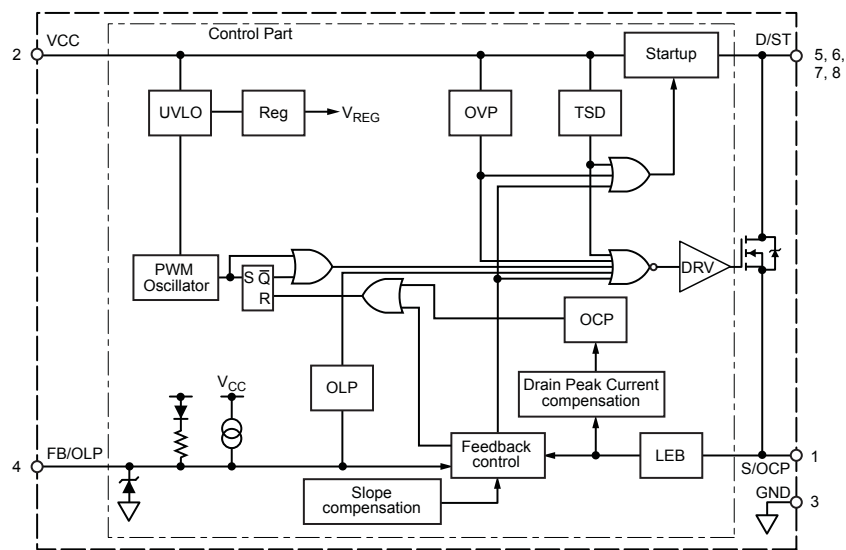
MOSFET Temperature versus Power Dissipation Curve



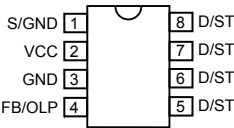
Transient Thermal Resistance Curve



Functional Block Diagram



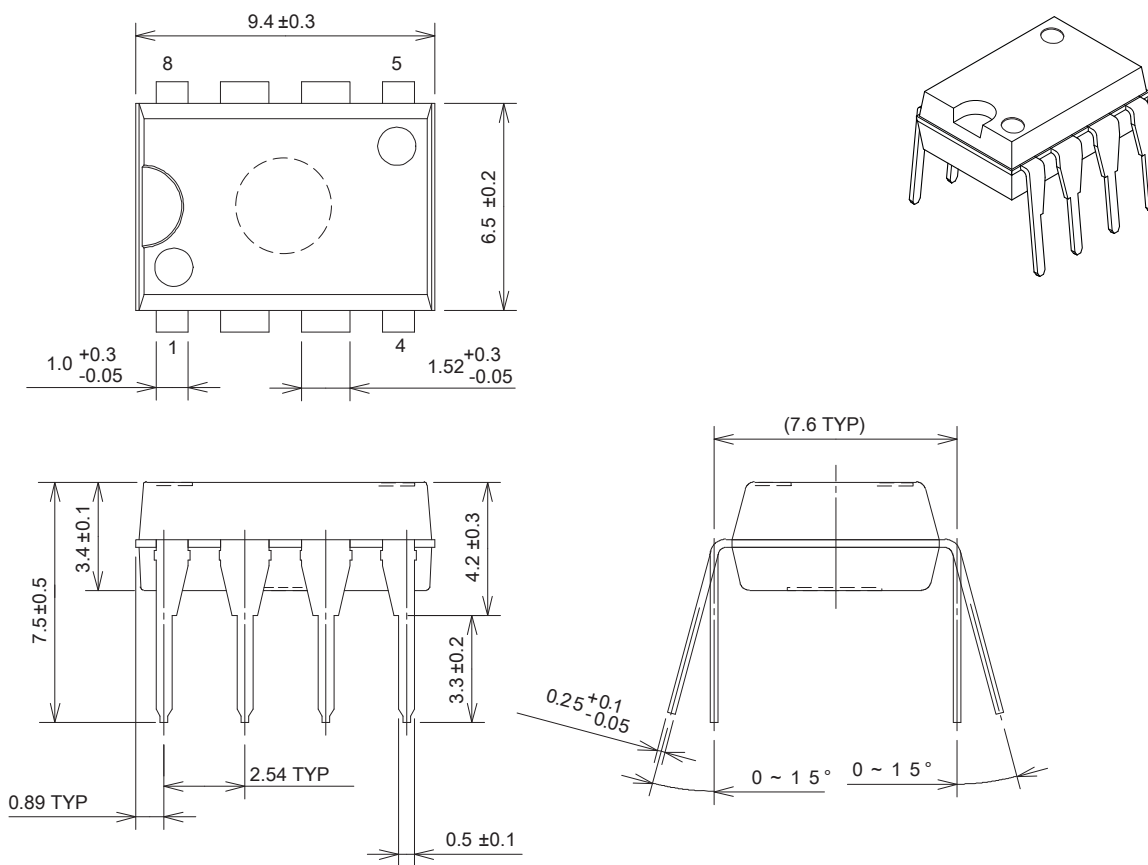
Pin-out Diagram



Pin List Table

Number	Name	Function
1	S/OCP	MOSFET source and input of Overcurrent Protection (OCP) signal
2	VCC	Power supply voltage input for Control Part and input of Overvoltage Protection (OVP) signal
3	GND	Ground
4	FB/OLP	Feedback signal input for constant voltage control signal and input of Overload Protection (OLP) signal
5, 6, 7, 8	D/ST	MOSFET drain pin and input of the startup current

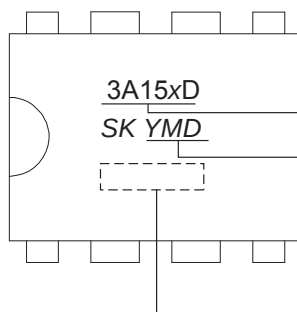
Package Diagram
DIP8 package



Unit: mm



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



Part Number

Lot Number

Y is the last digit of the year (0 to 9)

M is the month (1 to 9, O, N, or D)

D is a period of days:

1 – 1st to 10th

2 – 11th to 20th

3 – 21st to 31st

Sanken Control Number

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 the 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. Ensure all test parameters are within the ratings specified by Sanken for the products.

Remarks About Using Silicone Grease with a Heatsink

- When silicone grease is used in mounting the products 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 greases with low consistency (hard grease) may cause cracks in the mold resin when screwing the products 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:

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

Soldering

- When soldering the products, please be sure to minimize the working time, within the following limits:
260±5°C 10±1 s (Flow, 2 times)
380±10°C 3.5±0.5 s (Soldering iron, 1 time)
- Soldering should be at a distance of at least 1.5 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 MΩ 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 order 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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- In the case that you use Sanken products or design your products by using Sanken products, the reliability largely depends on the degree of derating to be made to the rated values. Derating may be interpreted as a case that an operation range is set by derating the load from each rated value or surge voltage or noise is considered for derating in order to assure or improve the reliability. In general, derating factors include electric stresses such as electric voltage, electric current, electric power etc., environmental stresses such as ambient temperature, humidity etc. and thermal stress caused due to self-heating of semiconductor products. For these stresses, instantaneous values, maximum values and minimum values must be taken into consideration.

In addition, it should be noted that since power devices or IC's including power devices have large self-heating value, the degree of derating of junction temperature affects the reliability significantly.

- When using the products specified herein by either (i) combining other products or materials therewith or (ii) physically, chemically or otherwise processing or treating the products, please duly consider all possible risks that may result from all such uses in advance and proceed therewith at your own responsibility.
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