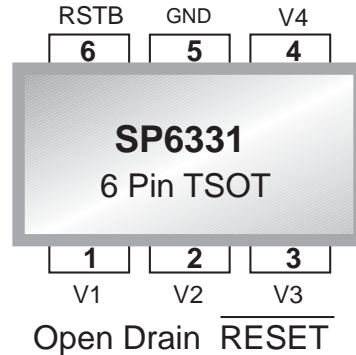


Quad μ Power Supervisory Circuit

FEATURES

- Low operating voltage of 1.6V
- Low operating current of 20 μ A typical
- Monitors up to four supplies simultaneously
- Adjustable inputs monitor down to 0.5V
- Reset asserted down to 0.9V
- 2% accuracy over temperature range
- Open Drain (OD) or CMOS Active Low Reset (RSTB) output or CMOS RST output
- 4 Reset Timeout Periods:
50ms, 100ms, 200ms and 400 ms
- 6 Pin TSOT package



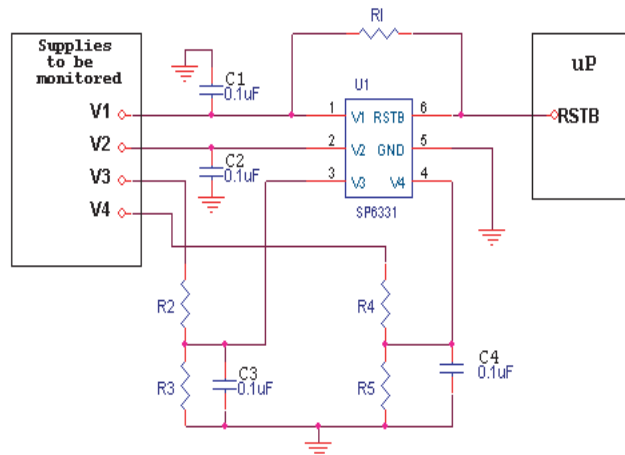
**SEE PAGE 2 FOR OTHER
AVAILABLE PINOUTS**

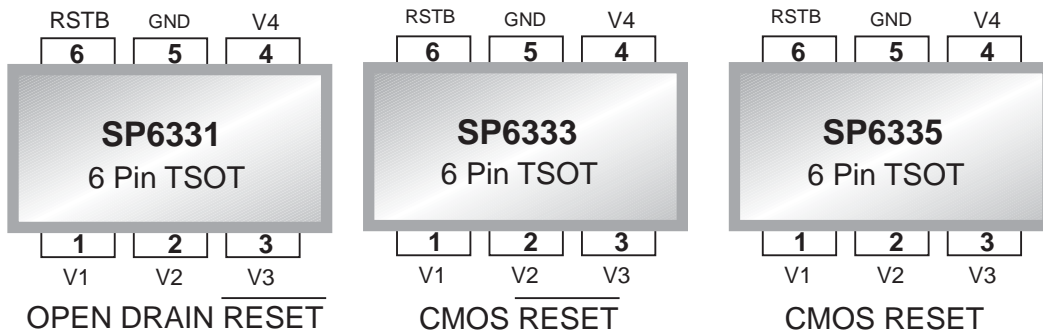
Available in Lead Free Packaging

DESCRIPTION

SP6331-SP6333-SP6335 Quad μ Power Supervisory Circuits are a family of microprocessor reset supervisory circuits with multiple reset voltages. The 3 device family provides low voltage monitoring ability for up to four supplies with two precision factory-set thresholds and two user defined custom thresholds. These circuits perform a single function: if any of the input supply voltages drops below its associated threshold, reset outputs are asserted. SP6331, SP6333 and SP6335 are packaged in a 6-pin TSOT package. All devices are fully specified over -40°C to $+85^{\circ}\text{C}$ temperature range.

TYPICAL APPLICATION CIRCUIT





PART NUMBER	V1	V2	V3	V4	Reset
SP6331					OD Active Low
SP6333					CMOS Active Low
SP6335					CMOS Active High

Feature and Pinout Diagram

ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability and cause permanent damage to the device.

Terminal Voltage (with respect to GND)

V1, V2..... -0.3 to +6V
V3, V4.....-0.3 to (V1+0.3V)
Open-Drain RSTB,-0.3 to +6V
CMOS RST, RSTB..... -0.3 to (V1+0.3V)

Input Current/Output Current.....20mA

Operating Temperature Range.....-40°C to +85°C

Storage Temperature Range.....-65°C to 150°C

Thermal Resistance θ_{JA}134°C/W

ELECTRICAL CHARACTERISTICS

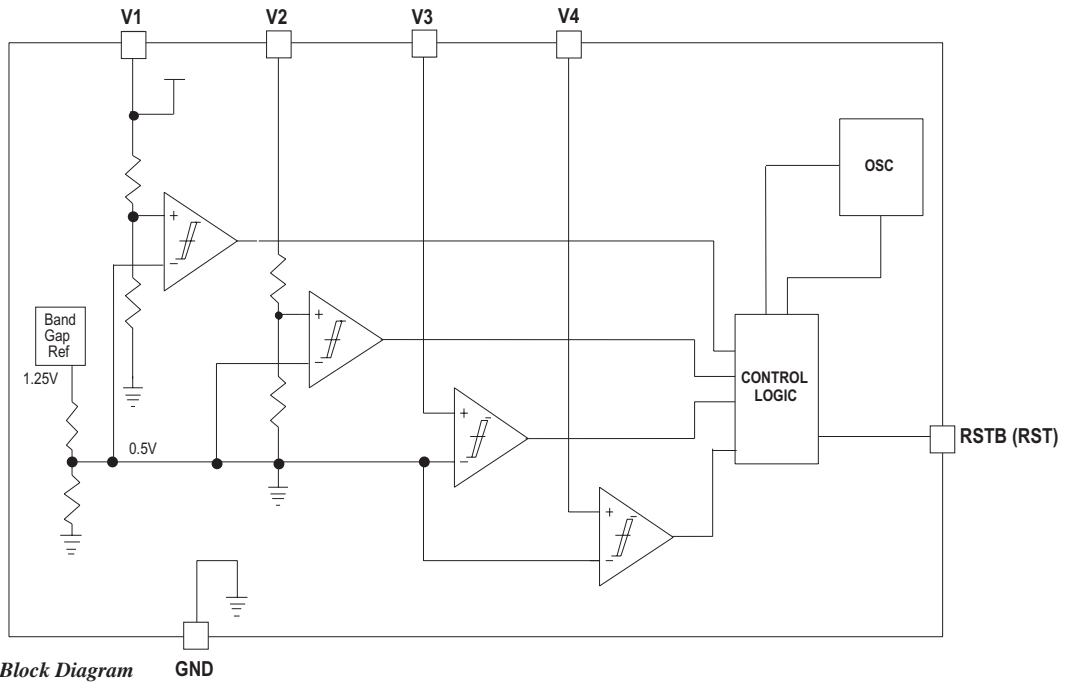
PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
V1 =1.6V to 5.5V; TA = -40°C to +85°C; unless otherwise noted. Typical values are at TA =+25°C					
Operating Voltage Range	0.9		5.5	V	TA = -40°C to +85°C
Supply Current		20	30	uA	V1 < 5.5V, V2 < 3.60V, all I/O pins open
		15	25		V1 < 3.6V, V2 < 2.75V, all I/O pins open
V1 Reset Threshold	4.532	4.625	4.718	V	Z (valid for V1 falling)
	4.287	4.375	4.463		Y (valid for V1 falling)
	3.013	3.075	3.137		X (valid for V1 falling)
	2.866	2.925	2.984		W (valid for V1 falling)
	2.572	2.625	2.678		V (valid for V1 falling)
	2.273	2.320	2.367		U (valid for V1 falling)
	2.146	2.190	2.234		T (valid for V1 falling)
	1.636	1.670	1.704		S (valid for V1 falling)
	1.548	1.580	1.612		R (valid for V1 falling)
V2 Reset Threshold	2.266	2.313	2.360	V	J (valid for V2 falling)
	2.144	2.188	2.232		I (valid for V2 falling)
	1.631	1.665	1.698		H (valid for V2 falling)
	1.543	1.575	1.607		G (valid for V2 falling)
	1.360	1.388	1.416		F (valid for V2 falling)
	1.286	1.313	1.340		E (valid for V2 falling)
	1.087	1.110	1.133		D (valid for V2 falling)
	1.029	1.050	1.071		C (valid for V2 falling)
	0.816	0.833	0.850		B (valid for V2 falling)
	0.772	0.788	0.804		A (valid for V2 falling)
Threshold 1 Tempco		0.06		mV/°C	
Threshold 2 Tempco		0.04		mV/°C	
Threshold 1 Hysteresis		0.64		%	reference to Vth1 typical
Threshold 2 Hysteresis		0.5		%	reference to Vth2 typical
V1 to RST/RSTB Delay		50		us	V1 = Vth1 to (Vth1-0.1V), Vth1 = 3.075
V2 to RST/RSTB Delay		50		us	V2 = Vth2 to (Vth2-0.1V), Vth2 = 1.575
Reset Timeout Period (T1)	37	50	63	ms	TOPT-1
Reset Timeout Period (T2)	74	100	126	ms	TOPT-2
Reset Timeout Period (T3)	148	200	252	ms	TOPT-3
Reset Timeout Period (T4)	296	400	504	ms	TOPT-4

ELECTRICAL CHARACTERISTICS (CONT'D)

PARAMETER	MIN	TYP	MAX	UNITS	CONDITIONS
V1 =1.6V to 5.5V; TA = -40°C to +85°C; unless otherwise noted. Typical values are at TA =+25°C					
V3 RESET COMPARATOR INPUT					
V3 Input Threshold	490	500	510	mV	
V3 Input Current	-50		50	nA	TA = +25°C
V3 Threshold Hysteresis		1.5		mV	
V4 RESET COMPARATOR INPUT					
V4 Input Threshold	490	500	510	mV	
V4 Input Current	-50		50	nA	TA = +25°C
V4 Threshold Hysteresis		1.5		mV	
RESET OUTPUTS RST / RSTB					
RSTB (CMOS or OD)			0.4	V	V1 = Vth1 - 0.1V, Isink = 1mA, output asserted
RSTB (CMOS)	0.8*V1			V	V1 = Vth1 + 0.1V, Isource = 1mA, output not asserted
RST (CMOS)	0.8*V1			V	V1 = Vth1 - 0.1V, Isource = 1mA, output asserted
RST (CMOS)			0.4	V	V1 = Vth1 + 0.1V, V2 > Vth2, V3 > 0.5, V4 > 0.5, Isource = 1mA, output not asserted
RSTB Output OD Leakage Current		2		nA	TA = +25°C

PIN DESCRIPTION

Pin #	Name	Description
1	V1	First supply voltage input. Also powers internal circuitry. Trip threshold voltage internally set.
2	V2	Second supply voltage input. Trip threshold voltage internally set.
3	V3	Input for the third supply voltage. Trip threshold is 0.5V.
4	V4	Input for the fourth supply voltage. Trip threshold is 0.5V.
5	GND	Common ground reference pin.
6	RST/RSTB	Reset output. Open-Drain or CMOS, active high or low. Reset is asserted when any of the four supply inputs is below its trip threshold. It stays asserted for 200 ms (typical / default) after the last supply input traverses its trip threshold. Reset is guaranteed to be in the correct state for V1>0.9V. RST/RSTB asserts when V1 or V2 or V3 or V4 drop below their corresponding reset thresholds. RST/RSTB remains asserted for the reset timeout period after V1 and V2 and V3 and V4 exceed their corresponding reset thresholds. Open-drain outputs require an external pull-up resistor. CMOS outputs are referenced to V1.



The SP6331, SP6333, and SP6335 include a low-voltage precision bandgap reference, four precision comparators, an oscillator, a digital counter chain, a logic control block, trimmed resistor divider chains and additional supporting circuitry. The family is designed to supervise up to 4 independent

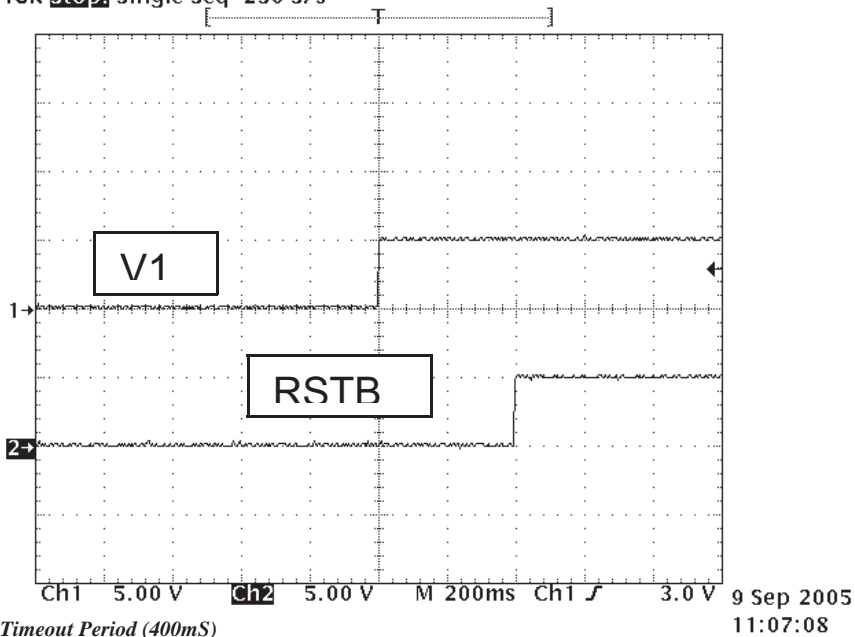
supply voltages. V1 and V2 supply inputs have their resistor dividers on the chip. Their trip thresholds are factory trimmed. V3 and V4 inputs allow user to customize two additional supply thresholds to be monitored by means of external resistor dividers.



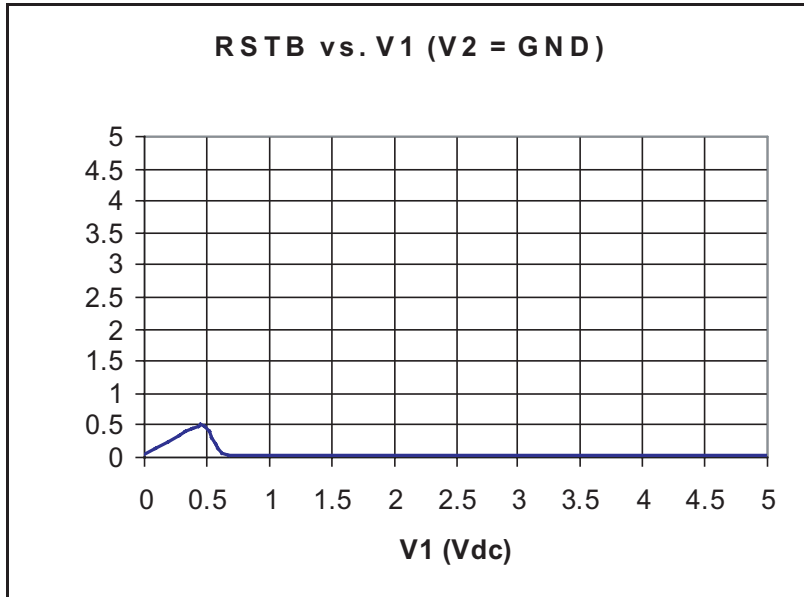
Waveform Diagram for SP6331, SP6332, and SP6335

APPLICATION INFORMATION

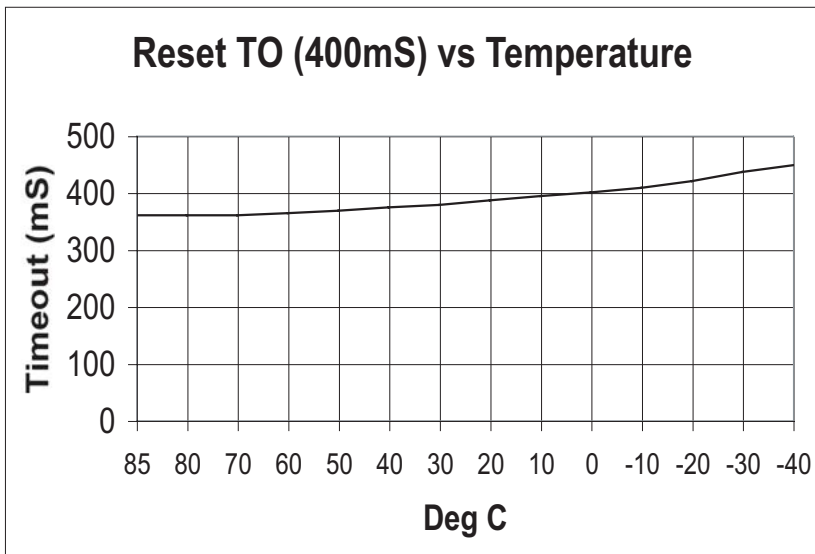
Tek Stop: Single Seq 250 S/s



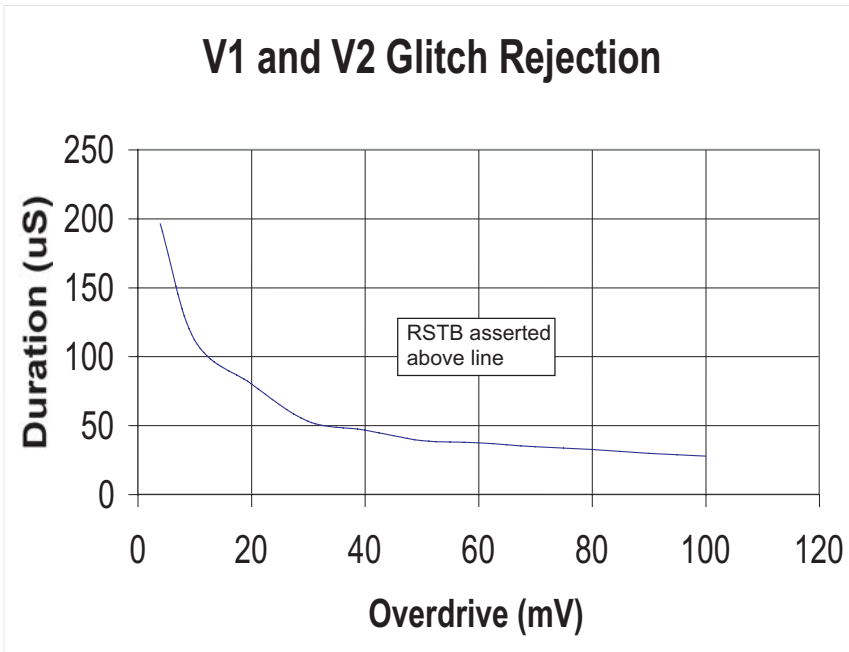
ResetB Timeout Period (400ms)



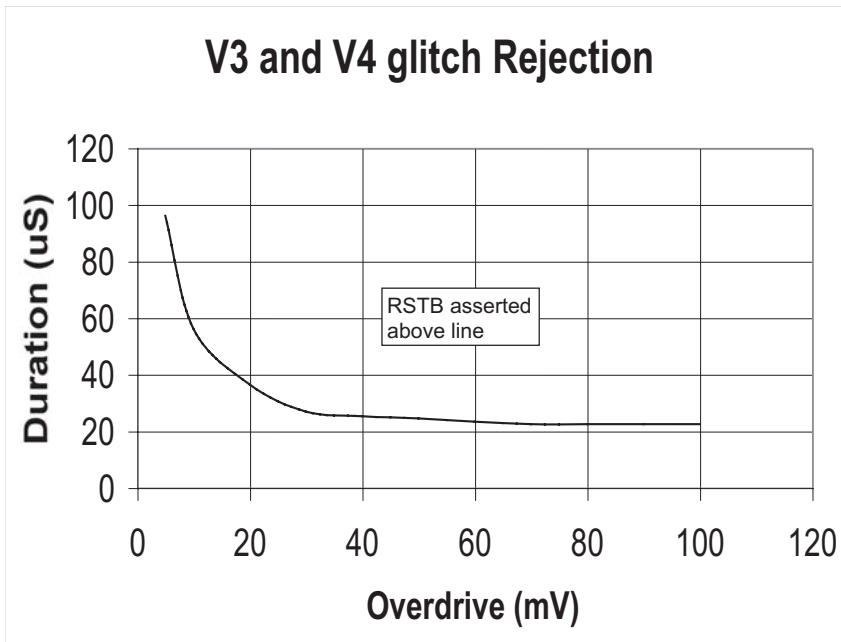
Reset Good



Reset Timeout vs. Temperature



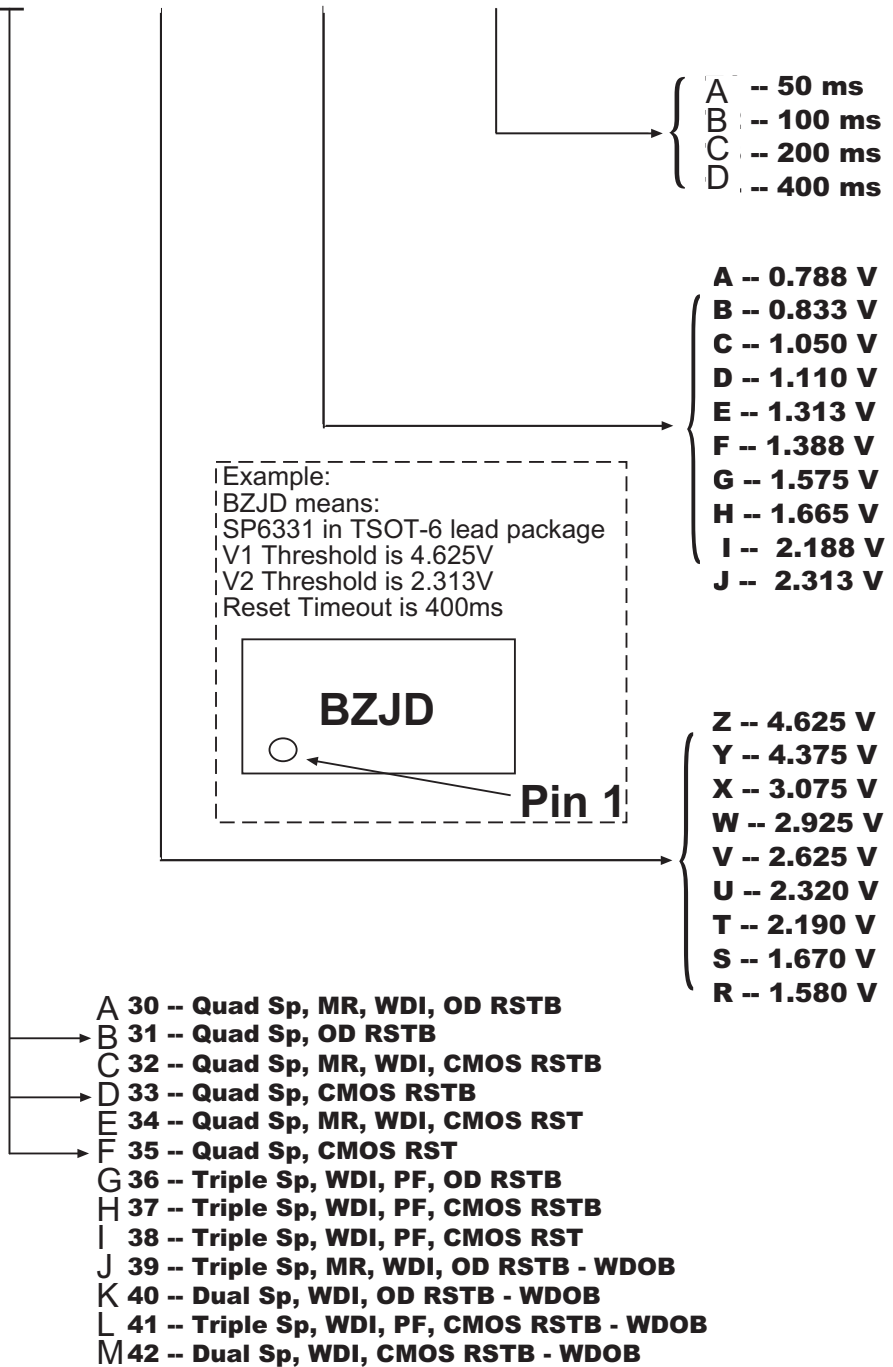
V1 and V2 Glitch Rejection



V3 and V4 Glitch Rejection

Part Naming Nomenclature

SP63N - Th1 - Th2 - TOPT



ORDERING INFORMATION

Model	Temperature Range	Package Types
SP6331EK1-L-X-X-X.....	-40°C to +85°C.....	Lead Free 6-Pin TSOT
SP6331EK1-L-X-X-X/TR.....	-40°C to +85°C.....	Lead Free 6-Pin TSOT
SP6333EK1-L-X-X-X.....	-40°C to +85°C.....	Lead Free 6-Pin TSOT
SP6333EK1-L-X-X-X/TR.....	-40°C to +85°C.....	Lead Free 6-Pin TSOT
SP6335EK1-L-X-X-X.....	-40°C to +85°C.....	Lead Free 6-Pin TSOT
SP6335EK1-L-X-X-X/TR.....	-40°C to +85°C.....	Lead Free 6-Pin TSOT

Available in Lead-Free packaging only.

Pack quantity minimum 2,500 for TSOT. /TR = Tape and Reel.

Contact Factory for availability of particular voltage threshold and reset timeout options. Note that the Ordering Information denoting those options corresponds to the Part Naming Nomenclature shown on the previous page.

Ordering example: SP6331EK1-L-W-G-C/TR == W -- 2.925V for Voltage Threshold 1; G -- 1.575V for Voltage Threshold 2; and C -- 200ms reset timeout.



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