

SE5400 series

Volt sensing relays for rail applications

Standard Part Numbers

35VS3b-080, Dropout/pull-in = 80/83v, delay=20s

35VS3b-097, Dropout/pull-in = 97/100v, delay=60s

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The SE5400 design series are ruggedized voltage sense relays for rail applications, designed to EN50155 standard..

Utilising recent advances in semiconductor technology, they replace the outdated VS-3 relays, with a smaller footprint, wider operating range, yet dissipating only 25% of the power.

The reduced power consumption improves transient handling, and enables full lifetime to be achieved at maximum voltage, temperature and altitude, without de-rating.

Visibility in daylight conditions is excellent due to the InGaAs LED's used... Each assembly is coated with a tough solvent resistant acrylic based conformal coating which provides moisture, mould protection, tropic proofing and UV protection to MIL STD 810C.

The SE5400 design series uses traditional, robust analog componentry, utilizing modern design approaches, and implemented in space saving SMD components. The relays are available in a robust glass-filled polycarbonate 35mm wide module with standard circuit breaker cross section

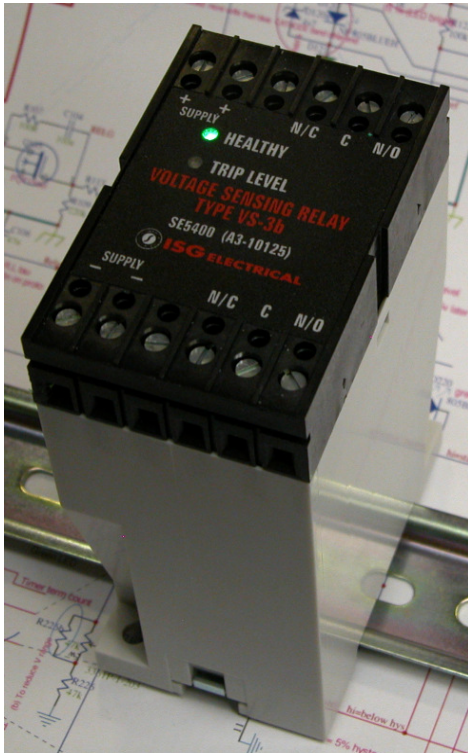


Fig1 50VS3b tall profile



Fig 2 35VS3b low profile

Electrical specification:

Unless noted otherwise, standard conditions are $V_{in}=120v$, 55C ambient, sea level, 50% humidity, vibration < 100mg RMS. , mounted vertically on DIN Rail.

Parameter.	Condition	VS3b	Orig. VS3	Available range
Nominal voltage	-10 to +55°C	110V d.c.	110V d.c.	48v to 120v d.c.
Maximum surge voltage	< 100ms	400V	480V	
Transient rejection	<100µs	2500V	2500V	
Superimposed AC voltage >20Hz	77v < V_{in} < 138v	40vRMS	20vRMS	
Supply current: Healthy	83v < V_{in} < 120v	<10mA	<15mA	
Supply current: Healthy with surge	$V_{in} = 160v$	~5mA	~60mA	
Supply current: Brown out (< 20sec)	50v < V_{in} < 80v	12 to 8mA	3 to 15mA	
Supply current: Tripped:	50v < V_{in} < 80v	~2mA	3 to 15mA	
Operating ambient at max continous	$V_{in}=138v$	-20 to 60°C	-20 to 40°C	
Operating ambient at 3000m altitude	$V_{in}=138v$	-20 to 60°C	-20 to 40°C	
Trip voltage	-10 to +55°C	80v +/-0.3v	80v +/-0.3v	30v to 140v #1
Pull in voltage	-10 to +55°C	83v +/-0.3v	83v +/-0.3v	1% to 6% of V_{trip} #2
Delay time T_d	-10 to +55°C	20+/-0.5sec	20+/-0.5sec	30% to 300% T_d nom #3
Start delay time T_s	-10 to +55°C	20+/-0.5sec	20+/-0.5sec	0, 1/16, 1/8, 1/4, 1/2 x T_d #4
Service life (excluding relay) #5	$T_{amb}=55°C$	18.2yrs	5yrs	

Service life, relay switching hourly ^{#5}	5A AC, 1A DC	11.4yrs	11.4yrs	
Operating humidity	Tamb=40°C	5 to 95%	5 to 95%	
Protection class		IP54	IP54	
Vibration level(MIL-810F)	@50Hz	1g rms		
Half sine impulse , 20ms		5g peak		

- #1 User adjustment is +/-10v typically, can be factory set anywhere in operating range.
- #2 User adjustment range 1% to 6%, can be factory set anywhere in operating range
- #3 User adjustment range 10:1 , smaller ranges can be factory set, and nominal timing period can be factory set from milliseconds to hours
- #4 Jumper selectable, the start delay (i.e. relay hold time when the voltage first crosses 30v) can be jumper selected from none, or binary divisor of nominal delay, 1/16, 1/8, 1/4, 1/2, 1 x Nominal delay.
- #5 see relay figures
- #5 Excluding relay contact wear, service life is reached when the blackout ride-through time has halved from initial value (ie dropped to 1s for VS3b and 1/2sec for VS3).

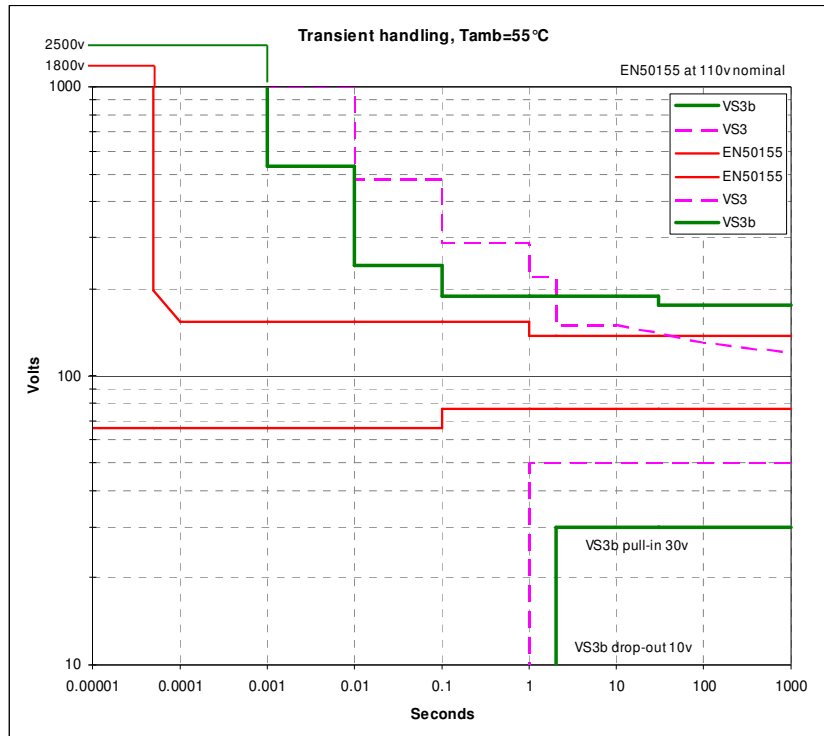


Figure 3 Surge and transient envelope

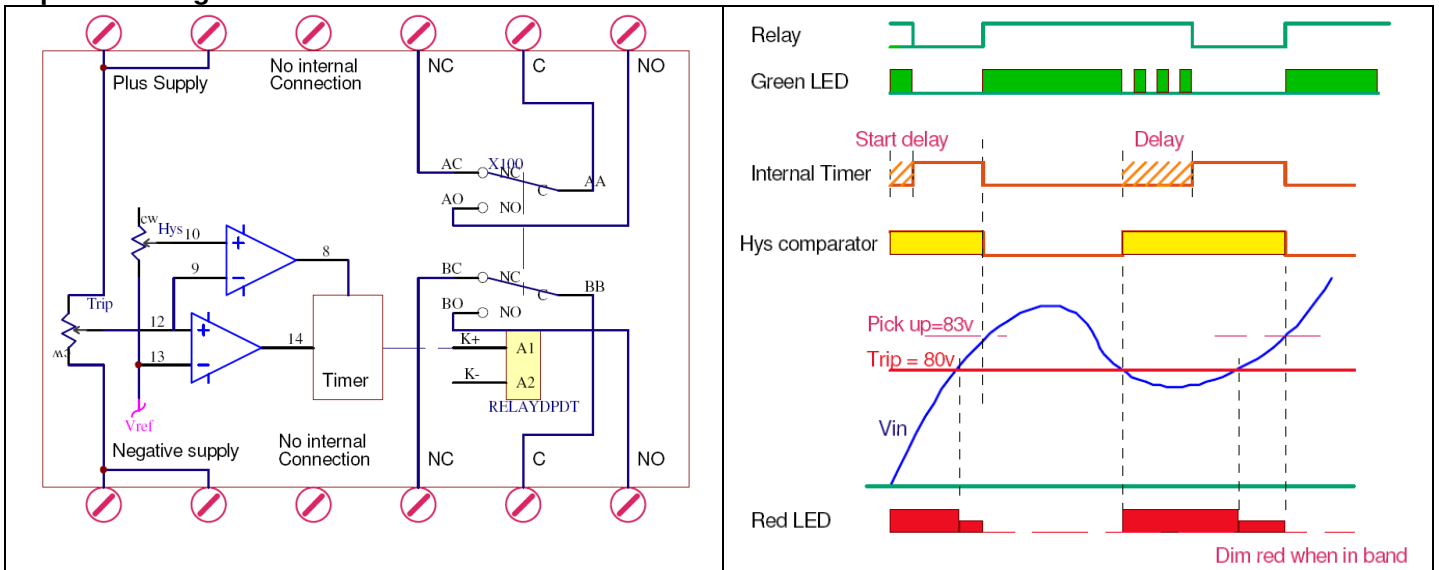
Mechanical Specifications

Parameter	Maximum	Unit
Maximum dimensions (35mm low profile)	36.5W x 94.5H x 58.2D	mm
Maximum dimensions (50mm tall enclosure)	50.1W x 75.5H x 110.0D	mm
Weight (35mm low profile)		gms
Weight (50mm tall enclosure)		gms
Terminal wire size	4	mm
DIN rail mounting	TS36	

- Installation Notes:** When correctly mounted the DIN rail catch should be facing down. Ensure the module is secure and the catch has engaged fully.
- Wiring:** The wires used should be multistranded 0.5mm² to 1.6mm² to (16g to 22g) ; and fitted with ferrules.. Terminals will accept up to 4mm ferrule.
- Important:** The wiring must be supported at a distance of 150mm or less from the connectors (using cable ties or similar) to prevent vibration from fatiguing the wires where they enter the connector.
- Cleaning:** After installation and subsequently the module should be cleaned with an alcohol based cleaner or damp cloth. **Do not** use abrasive or alkali based cleaners.
- Usage notes:** With voltage applied there will always be one LED illuminated, otherwise the unit has failed.
- Maintenance:** Annual inspection of the wiring and rear panel connectors is recommended.
- Electromagnetic compatibility:** The relay design withstands typical electrostatic discharge caused by contact with static charged persons and equipment and near by lightning strikes. Additionally it will withstand switching spikes to be found on typical vehicle power supplies; figure 4 shows the transient rejection as a function of pulse width. Note, however, where it is expected that a supply over voltage condition exceeds that in EN10155 then

supplemental protection measures will be required to protect not only this module but other electronics installed on the vehicle.

Operation diagram.



The relay operates according to the condition of an internal hysteresis comparator, that changes state on a downward crossing of the trip threshold (e.g. 80v) or the upward crossing of the hysteresis threshold. (3v more)
 An internal timer extends the falling edge by e.g. 20s
 The green LED is ON when the relay is on, solid green when above the pickup voltage, and flashing while the extend timer is running.
 The red LED is ON below the pickup voltage, and is brighter when below the trip voltage.
 Each supply connection is bridged (rated current 10A) across two terminals to ease external wiring. Two additional terminals are unconnected and may be used for looping

Relay Endurance:

The VSR module uses an OMRON G2R-2-48DC relay internally, this relay has switching life switching limitations, as shown below

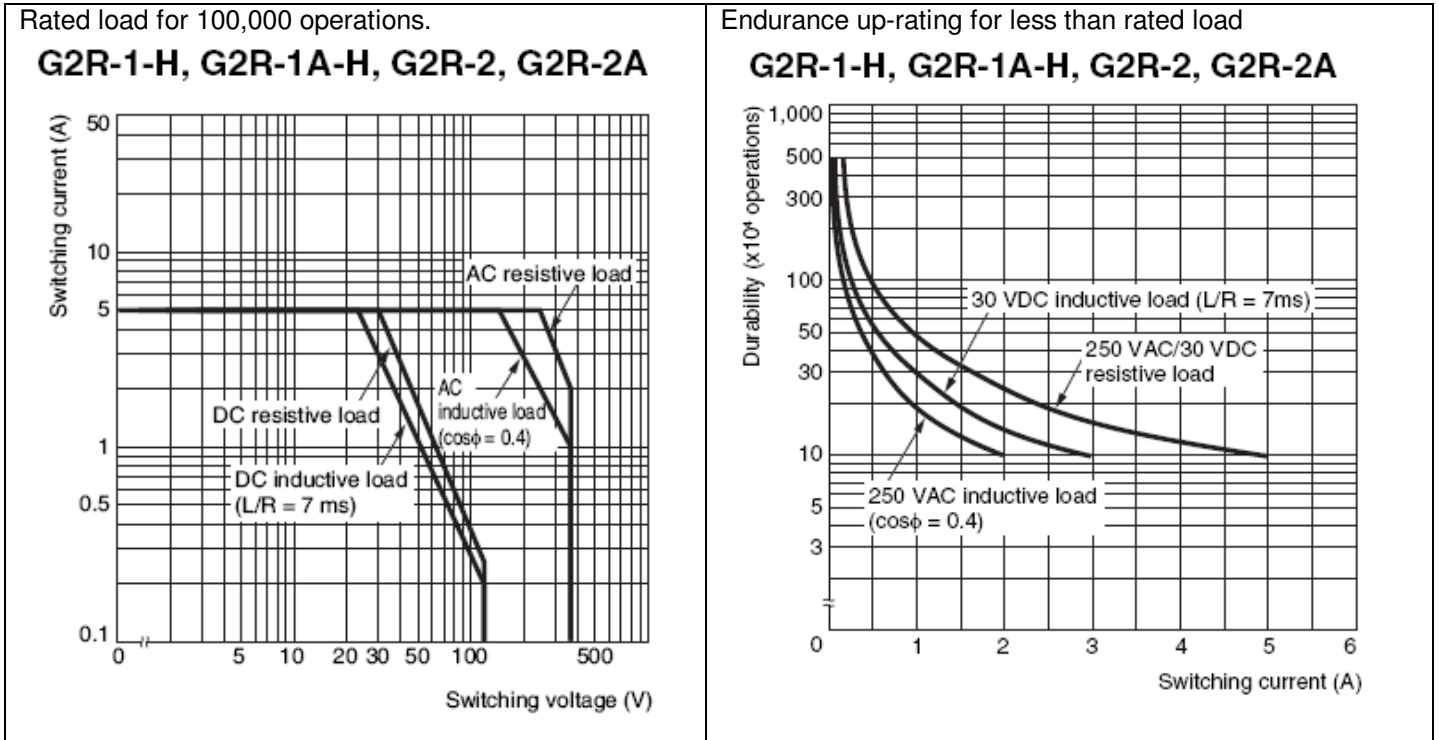


Figure 4a,b , Relay switching endurance

Detailed type number breakdown:**SE 35 V S3b -2L -080 -R -20 -01n**

Module Size GF Polycarbonate 35=35mm low profile 50=50x70x110							Manufacturer revision code SE5400 design, 01 = low profile 35mm 02 = retrofit 50mm
Type V=Voltage							Operating time 20=20secs
Sub type VS3b= Volt Sense							Coating/Environ. Spec R=Railway(EN50155)
Poles/Function 2L=DPDT, low trip							Operating (trip) volts 80 = 80v 97 = 97v

Short form order codes for standard rail spec parts:


In low profile breaker style housing 35W x 70H x 58D(mm)

35VS3b-080	Type= SE35VS3b-2L-080-R-20-01N Dwg = SE5401E101n Dropout = 80v, pull-in=83v, delay=20s, start delay=20s
35VS3b-097	Type= SE50VS3b-2L-097-R-60-01N Dwg = SE5401E101n 01N Dropout = 97v, pullin=100v, delay=60s, start delay=60s

In tall housing 50W x 75H x 110D (mm)

50VS3b-080	Type= SE50VS3b-2L-080-R-20-02N Dwg = SE5402E102n Dropout = 80v, pullin=83v, delay=20s, start delay=20s ,
50VS3b-097	Type= SE50VS3b-2L-097-R-60-02N Dwg = SE5402E102n 01N Dropout = 97v, pullin=100v, delay=60s, start delay=60s

Applicable standards

EMI Compatibility	EN50121 , (ref to EN6100-4)
Electronic equipment for Rolling Stock	EN50155
Regulatory Compliance Mark	 5677
Flammability	Flame retardant UL94-V0 (15sec vertical burn)