

A 750 , 950 A



950 75 4 B

Product Description

The NVH950S75L4SPB is a power module from the VE-Trac™ Direct family of highly integrated power modules with industry standard footprints for Hybrid (HEV) and Electric Vehicle (EV) traction inverter application.

The module integrates six Field Stop 4 (FS4) 750 V Narrow Mesa IGBTs in a 6-pack configuration, which excels in providing high current density, while offering robust short circuit protection and increased blocking voltage. Additionally, FS4 750 V Narrow Mesa IGBTs show low power losses during lighter loads, which helps to improve overall system efficiency in automotive applications.

For assembly ease and reliability, a new generation of press-fit pins are integrated into the power module signal terminals. In addition, the power module has an optimized pin-fin heatsink in the baseplate.

Features

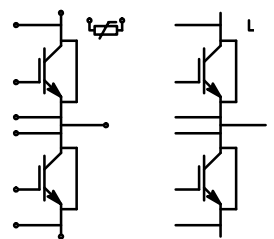
- Direct Cooling w/ Integrated Pin-fin Heatsink
- Ultra-low Stray Inductance
- $T_{vjmax} = 175^{\circ}\text{C}$ Continuous Operation
- Low V_{CESAT} and Switching Losses
- Automotive Grade FS4 750 V Narrow Mesa IGBT
- Fast Recovery Diode Chip Technologies
- 4.2 kV Isolated DBC Substrate
- Easy to Integrate 6-pack Topology
- This Device is Pb-Free and is RoHS Compliant

Typical Applications

- Hybrid and Electric Vehicle Traction Inverter
- High Power Converters



SSDC33, 154.50x92.0 (SPB)
CASE 183AB



ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

NVH950S75L4SPB

Pin Description

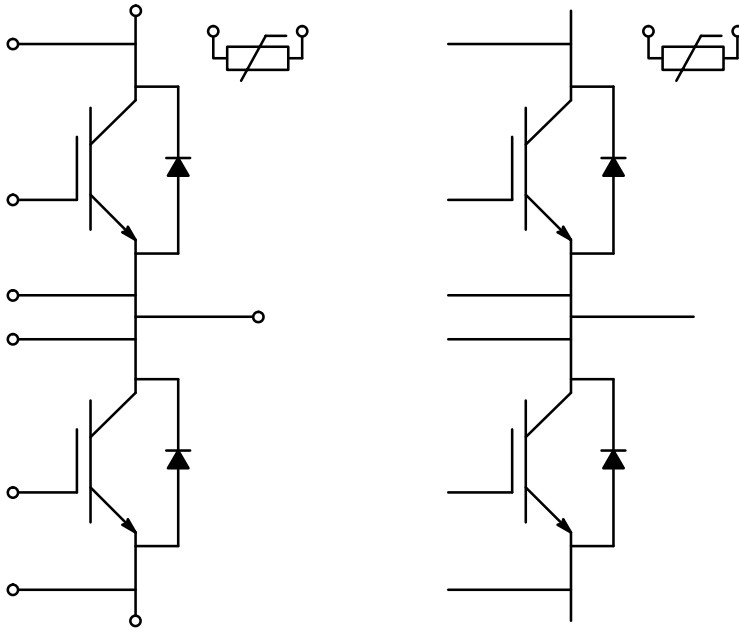


Figure 1. Pin Description

NVH950S75L4SPB

MODULE CHARACTERISTICS (T_{vj} = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Rating	Unit
T _{vj}	Operating Junction Temperature	-40 to 175	°C
T _{STG}	Storage Temperature	-40 to 125	°C
V _{ISO}	Isolation Voltage (DC, 0 Hz, 1 s)	4200	V
L _{sCE}	Stray Inductance	8	nH
RCC'+EE'	Module Lead Resistance, Terminals – Chip	0.75	mΩ
G			

NVH950S75L4SPB

CHARACTERISTICS OF IGBT ($T_{vj} = 25^{\circ}\text{C}$, Unless Otherwise Specified)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit	
V_{CESAT}	Collector to Emitter Saturation Voltage (Terminal)	$V_{GE} = 15\text{ V}$, $I_C = 600\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.30	1.55	V
	Collector to Emitter Saturation Voltage (Chip)	$V_{GE} = 15\text{ V}$, $I_C = 600\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.25	1.50	
			$T_{vj} = 150^{\circ}\text{C}$	–	1.37	–	
		$T_{vj} = 175^{\circ}\text{C}$	–	1.40	–		
		$V_{GE} = 15\text{ V}$, $I_C = 950\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.47	–	
			$T_{vj} = 150^{\circ}\text{C}$	–	1.71	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	1.77	–	
I_{CES}	Collector to Emitter Leakage Current	$V_{GE} = 0$, $V_{CE} = 750\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	–	–	500	μA
			$T_{vj} = 150^{\circ}\text{C}$	–	2.0	–	mA
I_{GES}	Gate – Emitter Leakage Current	$V_{CE} = 0$, $V_{GE} = \pm 20\text{ V}$		–	–	± 300	nA
V_{th}	Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 90\text{ mA}$		4.8	5.7	6.6	V
Q_G	Total Gate Charge	$V_{GE} = -8\text{ to }15\text{ V}$, $V_{CE} = 400\text{ V}$		–	2.3	–	μC
R_{Gint}	Internal Gate Resistance			–	1.7	–	Ω
C_{ies}	Input Capacitance	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$		–	60	–	nF
C_{oes}	Output Capacitance	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$		–	1.90	–	nF
C_{res}	Reverse Transfer Capacitance	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$		–	0.2	–	nF
$T_{d,on}$	Turn On Delay, Inductive Load	$I_C = 600\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $R_{g,on} = 4\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	–	315	–	ns
			$T_{vj} = 150^{\circ}\text{C}$	–	320	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	322	–	
T_r	Rise Time, Inductive Load	$I_C = 600\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $R_{g,on} = 4\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	–	108	–	ns
			$T_{vj} = 150^{\circ}\text{C}$	–	127	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	132	–	
$T_{d,off}$	Turn Off Delay, Inductive Load	$I_C = 600\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $R_{g,off} = 12\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	–	1063	–	ns
			$T_{vj} = 150^{\circ}\text{C}$	–	1196	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	1203	–	
T_f	Fall Time, Inductive Load	$I_C = 600\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $R_{g,off} = 12\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	–	85	–	ns
			$T_{vj} = 150^{\circ}\text{C}$	–	144	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	151	–	
E_{ON}	Turn On Switching Loss (Including Diode Reverse Recovery Loss)	$I_C = 600\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $L_s = 22\text{ nH}$, $R_{g,on} = 4\ \Omega$	$di/dt = 4.5\text{ A/ns}$, $T_{vj} = 25^{\circ}\text{C}$	–	26	–	mJ
			$di/dt = 3.9\text{ A/ns}$, $T_{vj} = 150^{\circ}\text{C}$	–	36	–	
			$di/dt = 3.6\text{ A/ns}$, $T_{vj} = 175^{\circ}\text{C}$	–	38	–	
E_{OFF}	Turn Off Switching Loss	$I_C = 600\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $L_s = 22\text{ nH}$, $R_{g,off} = 12\ \Omega$	$dv/dt = 2.7\text{ V/ns}$, $T_{vj} = 25^{\circ}\text{C}$	–	33	–	mJ
			$dv/dt = 1.9\text{ V/ns}$, $T_{vj} = 150^{\circ}\text{C}$	–	46	–	
			$dv/dt = 1.9\text{ V/ns}$, $T_{vj} = 175^{\circ}\text{C}$	–	50	–	
E_{SC}	Minimum Short Circuit Energy Withstand	$V_{GE} = 15\text{ V}$, $V_{CC} = 400\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	9	–	–	J
			$T_{vj} = 175^{\circ}\text{C}$	4.5	–	–	

NVH950S75L4SPB

CHARACTERISTICS OF INVERSE DIODE ($T_{vj} = 25^{\circ}\text{C}$, Unless Otherwise Specified)

Symbol	Parameters	Conditions		Min	Typ	Max	Unit
V_F	Diode Forward Voltage (Terminal)	$I_F = 600 \text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.70	1.95	V
	Diode Forward Voltage (Chip)	$I_F = 600 \text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.60	1.85	
			$T_{vj} = 150^{\circ}\text{C}$	–	1.55	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	1.50	–	
	$I_F = 950 \text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.73	–		
			$T_{vj} = 150^{\circ}\text{C}$	–	1.75	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	1.74	–	
E_{rr}	Reverse Recovery Energy	$I_F = 600 \text{ A}, V_R = 400 \text{ V},$ V					

NVH950S75L4SPB

TYPICAL CHARACTERISTICS

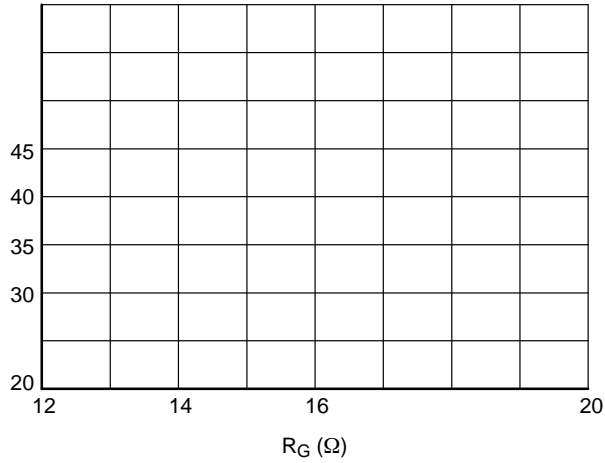


Figure 8. E_{OFF} vs. R_G

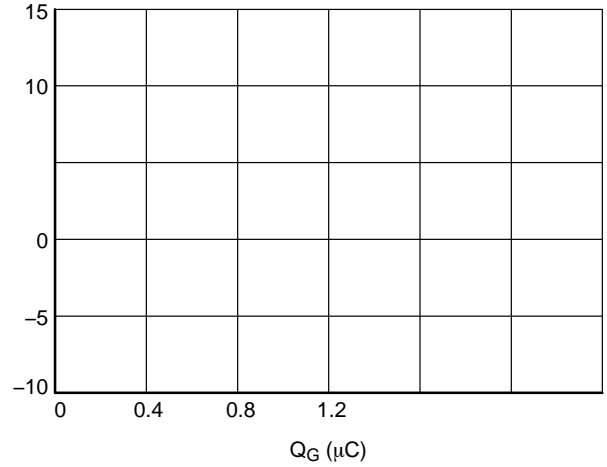


Figure 9. Gate Charge Characteristic

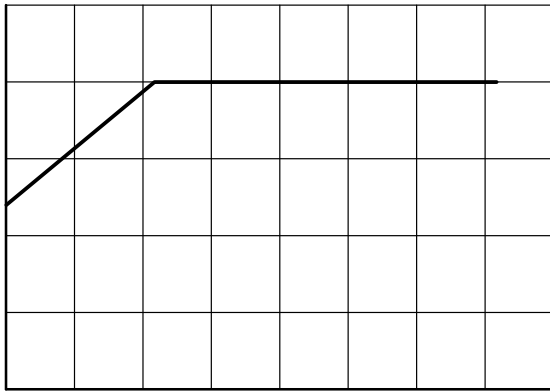


Figure 10. Maximum Allowed V_{CE}

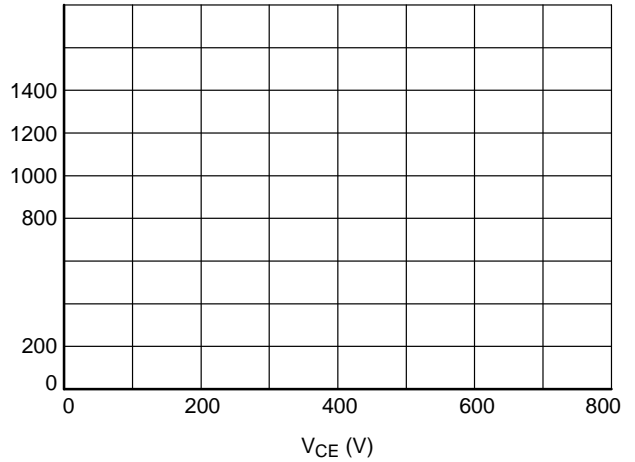
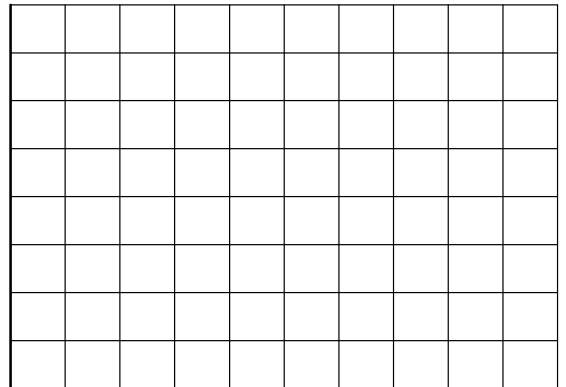
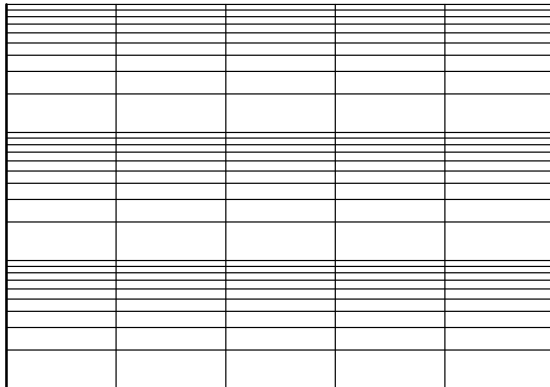


Figure 11. Reverse Bias Safe Operating Area



NVH950S75L4SPB

TYPICAL CHARACTERISTICS

NVH950S75L4SPB

TYPICAL CHARACTERISTICS

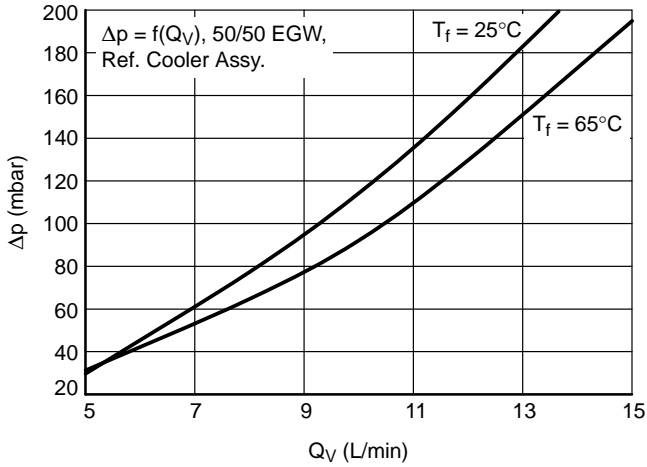


Figure 20. Pressure Drop in Cooling Circuit

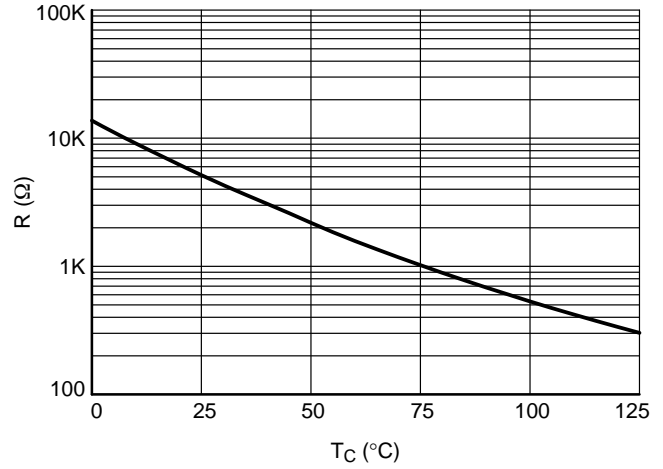


Figure 21. NTC Thermistor – Temperature Characteristic (Typ.)

SSDC33, 154.50x92.0 (SPB)
CASE 183AB
ISSUE A

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XXXXX = Specific Device Code
G = Pb-Free Package
AT = Assembly & Test Site Code

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