

A 750 V, 640 A
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6-Pack Power Module
E- a™ Di Mb
N^V H640 75L4 PB

Product Description

The NVH640S75L4SPB 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 four 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.

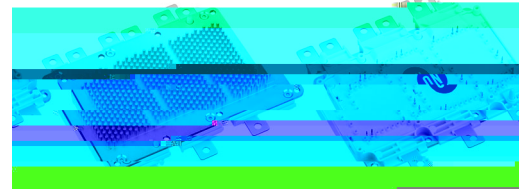
For assembly ease and reliability, a new generation of press-fit pins are integrated into the power module signal terminals. In addition, the power module has an optimized pin-fin heatsink in the baseplate.

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

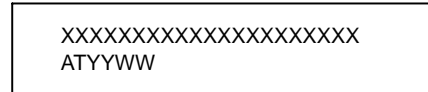
Typical Applications

- Hybrid and Electric Vehicle Traction Inverter
- High Power Converters

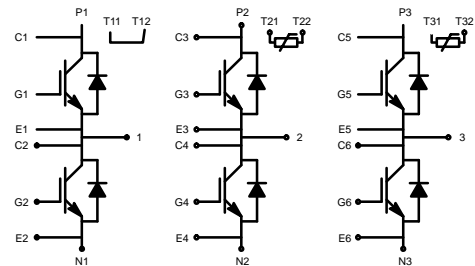


SSDC33, 154.50x92.0 (SPB)
CASE 183AB

MARKING DIAGRAM



XXXXXX = Specific Device Code
AT = Assembly & Test Site Code
YYWW = Year and Work Week Code



ORDERING INFORMATION

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

VE Trac™ Direct Module NVH640S75L4SPB

Pin Description

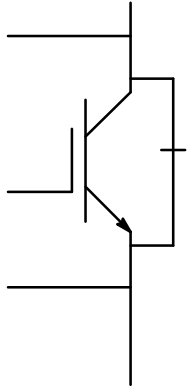


Figure 1. Pin Description

VE Trac™ Direct Module NVH640S75L4SPB

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	0.8	mΩ
G	Module Weight	700	g
CTI	Comparative Tracking Index	>200	–
d _{creep}	Creepage: Terminal to Heatsink Terminal to Terminal	9.0 9.0	mm
d _{clear}	Clearance: Terminal to Heatsink Terminal to Terminal	4.5 4.5	mm

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
Δp	Pressure Drop in Cooling Circuit	10 L/min, 65°C, 50/50 EGW	–	95	–	mbar
P (Note 1)	Maximum Pressure in Cooling Loop (relative)	T _{Baseplate} < 40°C T _{Baseplate} > 40°C	– –	– –	2.5 2.0	bar

1. EPDM rubber 50 durometer 'O' ring used.

ABSOLUTE MAXIMUM RATINGS (T_{vj} = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Rating	Unit
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IGBT

V _{CES}	Collector to Emitter Voltage	750	V
V _{GES}	Gate to Emitter Voltage	±20	V
I _{CN}	Implemented Collector Current	640	A
I _{C nom}	Continuous DC Collector Current, T _{vj} = 175°C, T _F = 65°C, Ref. Heatsink	450 (Note 2)	A
I _{CRM}	Pulsed Collector Current @ V _{GE} = 15 V, t _p = 1 mS	1280	A
P _{tot}	Total Power Dissipation T _{vj} = 175°C, T _F = 65°C, Ref. Heatsink	680	W

Diode

V _{R RM}	Repetitive Peak Reverse Voltage	750	V
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VE Trac™ Direct Module NVH640S75L4SPB

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)	$V_{GE} = 15\text{ V}$, $I_C = 450\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	-	1.35	1.64	V
	Collector to Emitter Saturation Voltage (Chip)	$V_{GE} = 15\text{ V}$, $I_C = 450\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	-	1.27	1.56	
			$T_{vj} = 150^{\circ}\text{C}$	-	1.39	-	
		$T_{vj} = 175^{\circ}\text{C}$	-	1.45	-		
		$V_{GE} = 15\text{ V}$, $I_C = 640\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	-	1.46	-	
			$T_{vj} = 150^{\circ}\text{C}$	-	1.68	-	
			$T_{vj} = 175^{\circ}\text{C}$	-	1.76	-	
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	$V_{CE} = V_{GE}$, $I_C = 60\text{ mA}$		4.8	5.5	6.6	V
Q_G	Total Gate Charge	$V_{GE} = -8\text{ to }15\text{ V}$, $V_{CE} = 400\text{ V}$		-	1.8	-	μC
R_{Gint}	Internal Gate Resistance			-	2.5	-	Ω
C_{ies}	Input Capacitance	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$		-	47	-	nF
C_{oes}	Output Capacitance	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$		-	1.3	-	nF
C_{res}	Reverse Transfer Capacitance	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$		-	= 400 V=436 554.96 Tc 4705.3 re51 .90709		

VE Trac™ Direct Module NVH640S75L4SPB

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)	$I_F = 450\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.70	2.02	V
	Diode Forward Voltage (Chip)	$I_F = 450\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.59	1.91	
			$T_{vj} = 150^{\circ}\text{C}$	–	1.54	–	
		$I_F = 640\text{ A}$	$T_{vj} = 25^{\circ}\text{C}$	–	1.79	–	
			$T_{vj} = 150^{\circ}\text{C}$	–	1.80	–	
			$T_{vj} = 175^{\circ}\text{C}$	–	1.81	–	
E_{rr}	Reverse Recovery Energy	$I_F = 450\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = -8\text{ V}$, $R_{g.on} = 2.8\ \Omega$	$di/dt = 2.8\text{ A/ns}$, $T_{vj} = 25^{\circ}\text{C}$	–	2.3	–	mJ
			$di/dt = 2.7\text{ A/ns}$, $T_{vj} = 150^{\circ}\text{C}$	–	6.1	–	
			$di/dt = 2.6\text{ A/ns}$, $T_{vj} = 175^{\circ}\text{C}$	–	7.3	–	
Q_{RR}	Recovered Charge	$I_F = 450\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = +15/-8\text{ V}$, $R_{g.on} = 2.8\ \Omega$	$di/dt = 2.8\text{ A/ns}$, $T_{vj} = 25^{\circ}\text{C}$	–	9.6	–	μC
			$di/dt = 2.7\text{ A/ns}$, $T_{vj} = 150^{\circ}\text{C}$	–	23.6	–	
			$di/dt = 2.6\text{ A/ns}$, $T_{vj} = 175^{\circ}\text{C}$	–	27.6	–	
I_{rr}	Peak Reverse Recovery Current	$I_F = 450\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = -8\text{ V}$, $R_{g.on} = 2.8\ \Omega$	$di/dt = 2.8\text{ A/ns}$, $T_{vj} = 25^{\circ}\text{C}$	–	115	–	A
			$di/dt = 2.7\text{ A/ns}$, $T_{vj} = 150^{\circ}\text{C}$	–	185	–	
			$di/dt = 2.6\text{ A/ns}$, $T_{vj} = 175^{\circ}\text{C}$	–	197	–	

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

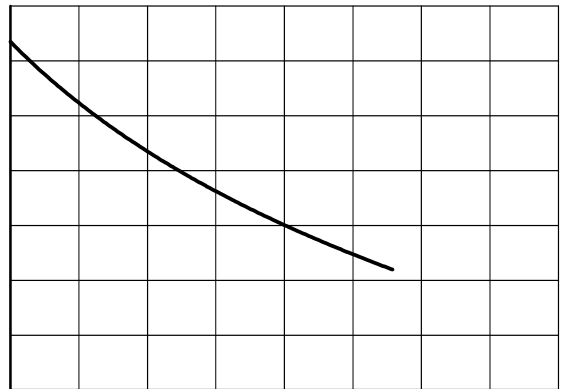
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
R_{25}						

VE Trac™

VE

VE Trac™ Direct Module NVH640S75L4SPB

TYPICAL CHARACTERISTICS



VE Trac™ Direct Module NVH640S75L4SPB

TYPICAL CHARACTERISTICS

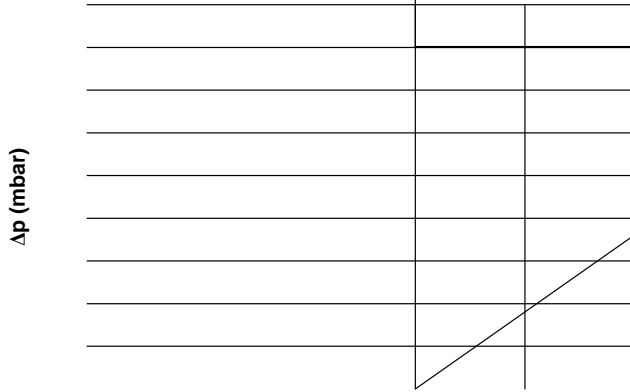


Figure 20. Pressure Drop in Cooling Circuit

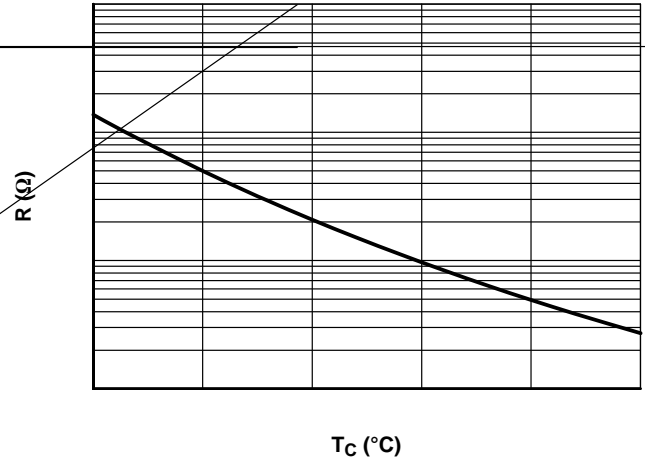


Figure 21. NTC Thermistor Temperature Characteristic (Typical)

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

DATE 05 DEC 2019

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

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