onsemi



Product Description

The NVG500A75L4DSF2 is part of VE Trac Dual family of power modules with dual side cooling and compact footprints for Hybrid (HEV) and Electric Vehicle (EV) traction inverter application.

The module consists of two narrow mesa Field Stop (FS4) IGBTs in a half bridge configuration. The chipset utilizes the new narrow mesa IGBT technology in providing high current density and robust short circuit protection with higher blocking voltage to deliver outstanding performance in EV traction applications.

Liquid cooling heatsink reference design, loss models and CAD models are available to support customers in inverter designs.

Features

Dual Side Cooling

Integrated Chip Level Temperature and Current Sensor

T_{vi max} = 175 C for Continuous Operation

Low Stray Inductance

Low Conduction and Switching Losses

Automotive Grade

4.2 kV Isolated DBC Substrate

AEC Qualified and PPAP Capable

This Device is Pb Free and is RoHS Compliant

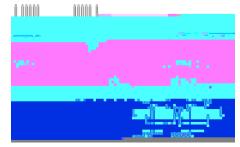
Typical Applications

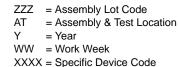
Hybrid and Electric Vehicle Traction Inverter High Power DC DC Boost Converter

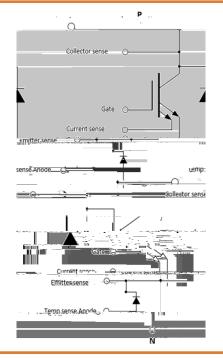


AHPM13-CGA MODULE CASE MODHR

MARKING DIAGRAM







ORDERING INFORMATION

See detailed ordering and shipping information on page 10 of this data sheet.

PIN DESCRIPTION

Pin #	Pin	Pin Function Description	Pin Arrangement
1	Ν	Low Side Emitter	2
2	Р	High Side Collector	3 0
3	H/S COLLECTOR SENSE	High Side Collector Sense	
4	H/S CURRENT SENSE	High Side Current Sense	
5	H/S GATE	High Side Gate	
6	H/S EMITTER SENSE	High Side Emitter Sense	7 0
7	H/S TEMP SENSE (ANODE)	High Side Temp sense Diode Anode	8 13 O
8	~	Phase Output	
9	L/S CURRENT SENSE	Low Side Current Sense	
10	L/S EMITTER SENSE	Low Side Emitter Sense	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
11	L/S GATE	Low Side Gate	12 0
12	L/S TEMP SENSE (ANODE)	Low Side Temp sense Diode Anode	1
13	L/S COLLECTOR SENSE	Low Side Collector Sense	

DBC Substrate

Al₂O₃ isolated substrate, basic isolation, and copper on both sides.

Lead Frame

Copper with Tin electro plating.

Flammability Information

All materials present in the power module meet UL flammability rating class 94V 0.

MODULE CHARACTERISTICS

Symbol	Parameter	Rating	Unit
T _{vj}	Continuous Operating Junction Temperature Range	-40 to 175	С
T _{STG}	Storage Temperature range	-40 to 125	С
V _{ISO}	Isolation Voltage, AC, f = 50 Hz, t = 1 s	4200	V
CTI	Comparative Tracking Index	V ⊕)Sid1re	aå)5Hi ∄ %HDp

Conditions Min Тур Parameters Max unit $\begin{array}{c} T_{vj} = 25 \ C \\ T_{vj} = 150 \ C \\ T_{vj} = 175 \ C \end{array}$ V VCESAT Collector to Emitter Saturation Voltage V_{GE} = 15 V, I_C = 400 A, 1.32 1.45 _ 1.37 _ _ 1.39 _ T_{vj} = 25 C $V_{GE} = 15 \text{ V}, I_{C} = 500 \text{ A},$ 1.39 _ _ $T_{vj} = 150 C$ $T_{vj} = 175 C$ _ 1.51 _ _ 1.55 _ Collector to Emitter Leakage Current V_{GE} = 0, V_{CE} = 750 V $T_{vj} = 25 C$ 1 mΑ ICES _ $T_{vj} = 175 C$ 8 _ _ $V_{CE} = 0, V_{GE} = 20 V$ Gate - Emitter Leakage Current _ _ 400 nA I_{GES} $V_{CE} = V_{GE}, I_{C} = 500 \text{ mA}$ 4.5 6.5 V Vth **Threshold Voltage** 5.6 QG **Total Gate Charge** $V_{GF} = -8$ to 15 V, $V_{CF} = 400$ V, _ 0.96 _ μC $I_{\rm C} = 400 \, {\rm A}$ R_{Gint} Internal Gate Resistance _ 2 _ Ω Cies V_{CF} = 30 V, V_{GF} = 0 V, f = 1 MHz Input Capacitance _ 36 _ nF Coes V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz **Output Capacitance** 0.7 _ nF _ V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz Cres **Reverse Transfer Capacitance** _ 0.09 _ nF $T_{vj} = 25 C$ T_{d.on} Turn On Delay, Inductive Load $I_{C} = 400 \text{ A}, V_{CE} = 400 \text{ V}$ 168 _ ns _ $T_{vj} = 150 C$ $T_{vj} = 175 C$ $V_{GF} = +15/-8V$ 192 _ _ 197 Rg.on = 3.9Ω _ _ Tr Rise Time, Inductive Load I_C = 400 A, V_{CE} = 400 V $T_{vj} = 25 C$ 67 ns _ _ $T_{vj} = 150 C$ $T_{vj} = 175 C$ $V_{GE} = +15/-8V$ _ 82 _ Rg.on = 3.9Ω 86 _ _ $I_{C} = 400 \text{ A}, V_{CE} = 400 \text{ V}$ $V_{GE} = +15/-8 \text{ V}$ T_{d.off} Turn Off Delay, Inductive Load $T_{vj} = 25 C$ 801 _ _ ns $T_{vj} = 150 C$ $T_{vj} = 175 C$ 872 _ _ Rg.off = 15Ω _ 884 _ $T_{vj} = 25 C$ $T_{vj} = 150 C$ $I_{C} = 400 \text{ A}, V_{CE} = 400 \text{ V}$ Tf Fall Time, Inductive Load _ 112 _ ns V_{GE} = +15/-8 V 165 _ _ Rg.off = 15 Ω $T_{vi} = 175 C$ _ 196 _ Turn-On Switching Loss (Including $I_{C} = 400 \text{ A}, V_{CE} = 400 \text{ V}$ $T_{vi} = 25 C$ 10.49 EON _ _ mJ $T_{vj} = 150 C$ $T_{vj} = 175 C$ Diode Reverse Recovery Loss) V_{GE} = +15/-8 V 16.20 _ _ Rg.on = 3.9 Ω _ 17.84 _ Ls = 25 nH $di/dt (T_{vj} = 25 C) = 5.04 A/ns$ $di/dt (T_{vj} = 175 C) = 4.15 A/ns$ $I_{C} = 400 \text{ A}, V_{CE} = 400 \text{ V}$ $V_{GE} = +15/-8 \text{ V}$ EOFF 14.52 Turn-Off SwitchingLoss $T_{vj} = 25 C$ mJ _ _ $T_{vj} = 150 C$ _ 23.31 _ T_{vj} = 175 C $Rg.off = 15 \Omega$ 23.88 _ _ Ls = 25 nH dv/dt (T_{vi}=25 C) = 3.0 V/ns dv/dt $(T_{vj}=175 \text{ C}) = 2.24 \text{ V/ns}$ $T_{vj} = 25 C \\ T_{vj} = 175 C$ Esc Minimum Short Circuit Energy V_{GE} 15 V, V_{CE} = 400 V 3.0 J _ 3.0 Withstand _

CHARACTERISTICS OF IGBT (Tvj = 25 C, unless otherwise specified)

TYPICAL CHAI 0 1 rgPICALrac

TYPICAL CHARACTERISTICS

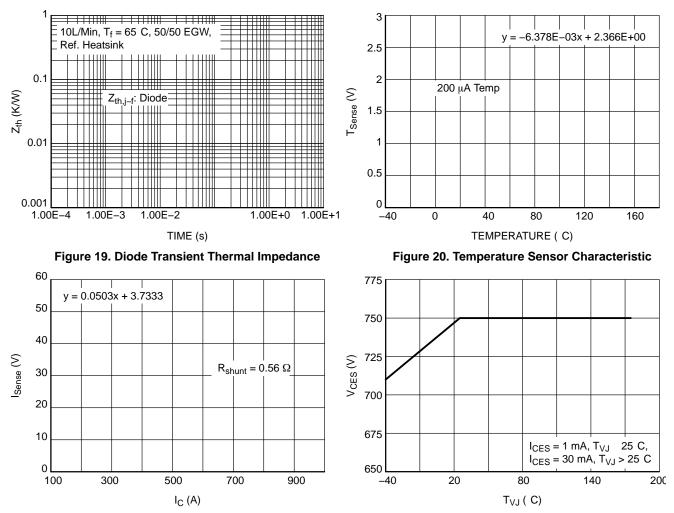


Figure 21. Current Sensor Characteristic

Figure 22. Maximum Allowed V_{CE}

ORDERING INFORMATION

Part Number	Package	Shipping
NVG500A75L4DSF2	AHPM13–CGA Module Case MODHR (Pb–Free)	36 Units / 2x Blister Tray

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AHPM13 CGA MODULE

AHPM13 CGA MODULE CASE MODHR ISSUE B

DATE 19 MAY 2023

GENERIC MARKING DIAGRAM*

ZZZ = Assembly Lot Code AT = Assembly & Test Location Y = Year

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