

Automotive Power MOSFET Module

NXV08H250DT1

Features

- 2 Phase MOSFET Module
 At Customer Side this Module Can Be Used as 1/2 Bridge MOSFET
 Module by Combining 2 Phase Out Power Terminals
- Electrically Isolated DBC Substrate for Low Rthjc
- Compact Design for Low Total Module Resistance
- Module Serialization for Full Traceability
- Module Level AQG324 Qualified. Components Inside are AEC Q101 (MOSFET) & AEC Q200 (Passives) Qualified
- UL 94 V-0 Compliant
- This Device is Pb-Free and is RoHS Compliant
- ESD Tested for HBM and CDM per AEC Q101, JS-001, JS-002

Applications

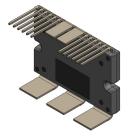
• 48 V Inverter, 48 V Traction

Benefits

- Enable Design of Small, Efficient and Reliable System for Reduced Vehicle Fuel Consumption and CO₂ Emission
- Simplified Vehicle Assembly
- Low Thermal Resistance to Junction to Heat Sink by Direct Mounting via Thermal Interface Material between Module Case and Heat Sink

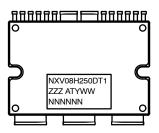
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• Low Inductance



APM17-MDC CASE MODHH

MARKING DIAGRAM



NXV08H250DT1 = Specific Device Code

ZZZ = Lot ID

AT = Assembly & Test Location

Y = Year WW = Work Week NNN = Serial Number

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ORDERING INFORMATION

Part Number	Package	Pb–Free and RoHS Compliant	Operating Ambient Temperature Range	Packing Method
NXV08H250DT1	APM17-MDC	yes	-40~125°C	Tube

Pin Configuration

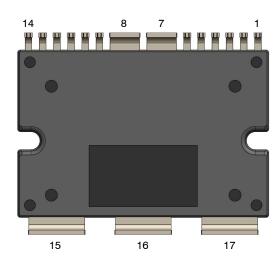


Figure 1. Pin Configuration

PIN DESCRIPTION

Pin No.	Description	Remark
1	Q2 Gate	
2	Q2 Source Sense	
3	B+ #2 Sense	
4	Q4 Gate	
5	Q4 Source Sense	
6	NTC1	
7	Phase Out2	For 3 phase motor inverter, those 2 pins can be used as one
8	Phase Out1	phase out
9	NTC2	
10	Q3 Source Sense	
11	Q3 Gate	
12	B+ #1 Sense	
13	Q1 Source Sense	
14	Q1 Gate	
15	B+ #1	
17	B+ #2	

Block Diagram

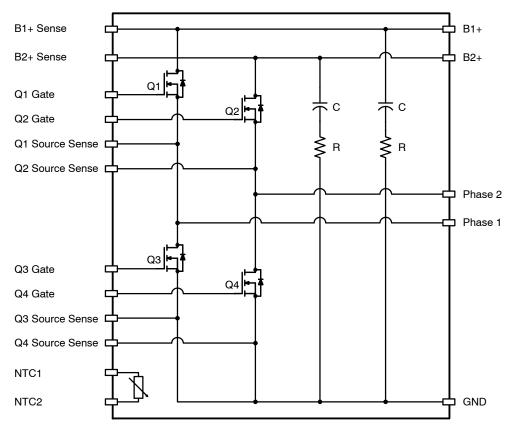


Figure 2. Schematic

Flammability Information

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

Compliance to RoHS Directives

The power module is 100% lead free and RoHS compliant 2000/53/C directive.

Solder

Solder used is a lead free SnAgCu alloy.

Base of the leads, at the interface with the package body should not be exposed to more than 200°C during mounting on the PCB, this to prevent the remelt of the solder joints.

ABSOLUTE MAXIMUM RATINGS (T_J = 25°C unless otherwise specified)

Symbol	Parameter	Max.	Unit
VDS(Q1~Q4)	Drain-to-Source Voltage	80	V
VGS(Q1~Q4)	Gate-to-Source Voltage	±20	V
EAS(Q1~Q4)	Single Pulse Avalanche Energy (Note 1)	1946	mJ
T _J	Maximum Junction Temperature	175	°C
T _{STG}	Storage Temperature	125	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Starting $T_J = 25^{\circ}C$, L = 0.47 mH, $I_{AS} = 91$ A, $V_{DD} = 72$ V during inductor charging and $V_{DD} = 0$ V during time in avalanche.

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$, unless otherwise noted)

	Characteristic	Condition	Min	Тур	Max	Unit
BVDSS	Drain-to-Source Breakdown Voltage	I _D = 1 mA, V _{GS} = 0 V	80	-	_	
VGS(th)	Gate-to-Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 1$ mA	2	-	4.6	V
VSD	Source-to-Drain Diode Voltage	I _{SD} = 160 A, V _{GS} = 0 V	-	0.79	1.1	V
Measured RDS(ON) Q1, Q2	Q1, Q2 (High Side) MOSFET (Notes 2, 3)	$V_{GS} = 12 \text{ V}, I_D = 160 \text{ A}, T_J = 25^{\circ}\text{C}$	-	0.757	1.039	mΩ
Measured RDS(ON) Q3, Q4	Q3, Q4 (Low Side) MOSFET (Notes 2, 3)	V _{GS} = 12 V, I _D = 160 A, T _J = 25°C	-	0.549	0.762	mΩ
IGSS	Gate-to-Source Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}, T_{J} = 25^{\circ}\text{C}$	-100	-	+100	nA
IDSS	Drain-to-Source Leakage Current	$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 25^{\circ}\text{C}$	-	-	2	μΑ
Module RDS(ON) for 0 From B+1 (or B+2), via (Note 3)	Q1 and Q2: a Q1 (or Q2), to Phase Out 1 (Phase Out 2)	V _{GS} = 12 V, I _D = 160 A, T _J = 25°C	-	1.024	1.355	mΩ
Module RDS(ON) for 0 From Phase Out 1 (Ph (Note 3)	Q3 and Q4: lase Out 2), via Q3 (Q4), to GND PINs	V _{GS} = 12 V, I _D = 160 A, T _J = 25°C	-	0.966	1.270	mΩ

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- 2. All bare die MOSFETs have same die size and same level of Rdson value. However the different Rdson values listed in the datasheet are due to the different access points available inside the module for Rdson measurement. Q3 and Q4 (Low side FETs) has the shortest Rdson measurement path in the layout, in this reason, so Q3 or Q4 Rdson value can be used for the Rdson value per switch for simple power loss calculation.
 - Each Rdson measurement paths are as below table, "Resistance Measurement Methods"
- 3. Module Rdson means total resistance of the measurement path btw Power terminals, referring to the resistance measurement methods table.

RESISTANCE MEASUREMENTS METHODS

	+ Force Pin#	- Force Pin#	+ Sense Pin#	- Sense Pin#
FET Rdson Q1	B1+	Phase1	B1+ Sense	Q1 Source Sense
FET Rdson Q2	B2+	Phase2	B2+ Sense	Q2 Source Sense
FET Rdson Q3	Phase1	GND	Q1 Source Sense	Q3 Source Sense
FET Rdson Q4	Phase2	GND	Q2 Source Sense	Q4 Source Sense
Module Rdson Q1	B1+	Phase1	B1+	Phase1
Module Rdson Q2	B2+	Phase2	B2+	Phase2
Module Rdson Q3	Phase1	GND	Phase1	GND
Module Rdson Q4	Phase2	GND	Phase2	GND

TEMPERATURE SENSE (NTC THERMISTOR)

Parameter		Min	Тур	Max	Unit
Voltage	Current = 1 mA, Temperature = 25°C	7.5	_	12	V

THERMAL RESISTANCE

Parameter		Min	Тур	Max	Unit
Rthjc: Thermal Resistance Junction-to-case, Single Inverter FET	Q1, Q2, Q3, Q4 Thermal Resistance J-C	1	1	0.54	°C/W

ISOLATION VOLTAGE (Isolation voltage between the Base plate and to control pins or power terminals.)

Test	Test Condition	Test Time	Min	Max	Unit
Leakage @ Isolation Voltage (Hi-Pot)	VAC = 3 kV	Time = 1 s	-	250	μΑ

DYNAMIC AND SWITCHING CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Condition	Min	Тур	Max	Unit
NAMIC C	CHARACTERISTICS					
C _{iss}	Input Capacitance	V _{DS} = 40 V, V _{GS} = 0 V, f = 750 kHz	-	24350	-	pF
C _{oss}	Output Capacitance		-	3415	-	pF
C _{rss}	Reverse Transfer Capacitance		-	53	-	pF
Rg	Gate Resistance	f = 750 kHz, Vac = 1 Vrms	-	3.6	-	Ω
Q _{g(tot)}	Total Gate Charge	V _{GS} = 0 to 10 V, I _D =160 A	-	320	-	nC
Q _{gs}	Gate-to-Source Gate Charge		-	150	-	nC
Q _{gd}	Gate-to-Drain "Miller" Charge		-	54	-	nC
VITCHING	CHARACTERISTICS	•				
t _{on}	Turn-On Time	V _{DD} = 48 V, I _D = 400 A	-	462	-	ns
t _{d(on)}	Turn-On Delay Time	$V_{GS} = 12 \text{ V}, R_{G}(\text{on/off}) = 15/15 \Omega$	-	164	-	ns
t _r	Turn-On Rise Time		-	298	-	ns
t _{d(off)}	Turn-Off Delay Time		-	476	-	ns
t _f	Turn-Off Fall Time		-	196	-	ns
t _{off}	Turn-Off Time		_	672	-	ns
RAIN-SOL	JRCE DIODE CHARACTERISTICS					
t _{RR}	Reverse Recovery Time	$V_{DD} = 48 \text{ V}, I_D = 400 \text{ A}$	-	55	-	ns
Q _{RR}	Reverse Recovery Charge	$V_{GS} = 14 \text{ V, } R_{G}(\text{on/off}) = 3.9/8.2 \Omega$	_	2005	_	nC

COMPONENTS

COMM CITETION				
Component	Description	Туре	Qty.	Specification
MOSFET	Bare Die, 7,874 x 5,588 μm	Bare Die	4	80 V
NTC	10 kΩ ±1% 1,600 x 800 μm	Discrete	1	$\begin{array}{c} \text{B-Constant} \\ \text{B}_{25/50} = 3380\text{K} \\ \text{B}_{25/85} = 3435\text{K} \\ \text{B}_{25/100} = 3455\text{K} \end{array}$
Capacitor (Snubber)	1,600 x 800 μm	Discrete	2	15 nF
Resistor (Snubber)	2,000 x 1,250 μm	Discrete	2	1 Ω

TYPICAL CHARACTERISTICS

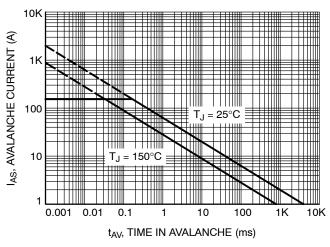


Figure 3. Unclamped Inductive Switching Capability

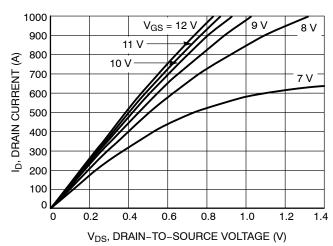


Figure 4. Saturation Characteristics

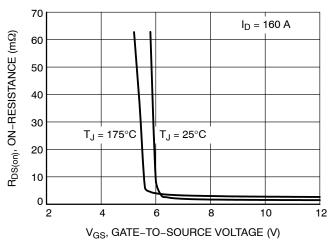


Figure 5. R_{DSON} vs. Gate Voltage

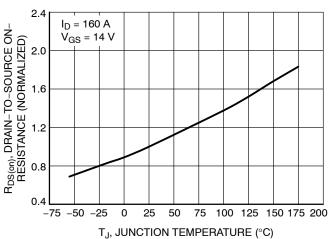


Figure 6. R_{DSON} vs. Temperature

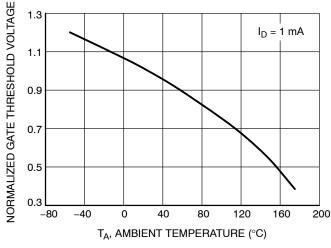


Figure 7. Normalized Gate Threshold Voltage vs. Temperature

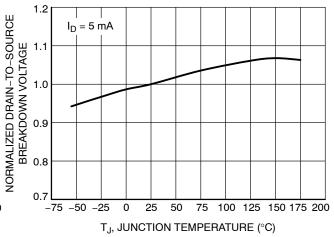


Figure 8. Normalized Drain-to-Source Breakdown Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS

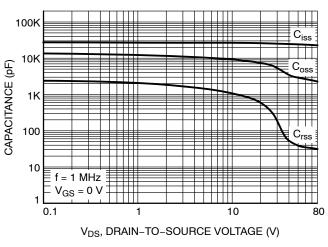


Figure 9. Capacitance vs. Drain-to-Source Voltage

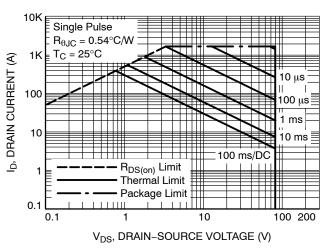


Figure 11. Safe Operating Area

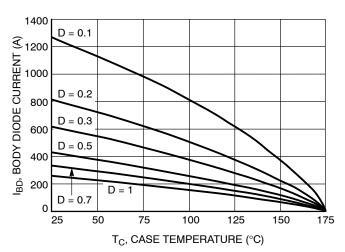


Figure 13. Body Diode Current

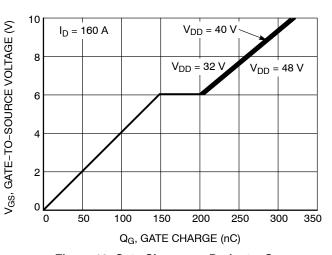


Figure 10. Gate Charge vs. Drain-to-Source Voltage

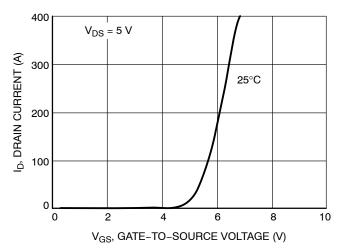
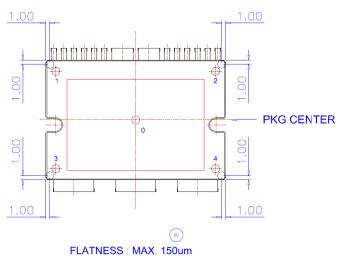


Figure 12. Transfer Characteristics



- MEASURING AT INDICATING POINTS 1, 2, 3, AND 4 (BASED ON "0")

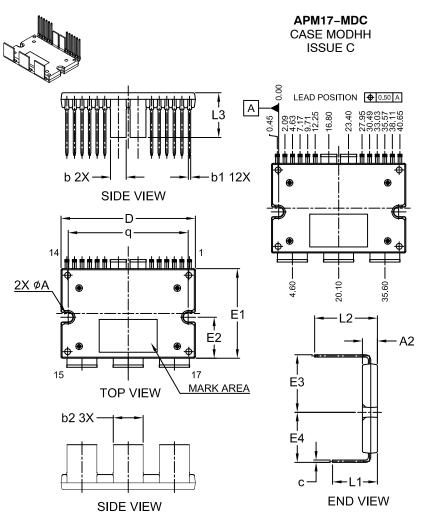
Figure 14. Flatness Measurement Position

MECHANICAL CHARACTERISTICS AND RATINGS

Parameter	Test Conditions	Min	Тур	Max	Units
Device Flatness	Refer to the package dimensions	0	_	150	um
Mounting Torque	Mounting screw: M3, recommended 0.7 N∙m	0.4	-	1.4 (Note 5)	N∙m
Weight		-	23.6	-	g

^{5.} Max Torque rating can be different by the type of screw, such as the screw head diameter, use or without use of Washer. In case of special screw mounting method is applied, contact **onsemi** for the proper information of mounting condition.



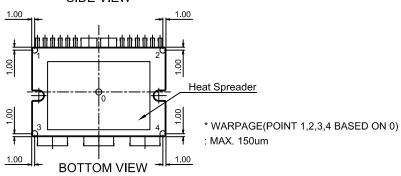


DATE 08 DEC 2021

NOTES:

- DIMENSIONING AND TOLERANCING PER. ASME Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.

	MILLIMETERS				
DIM	MIN.	NOM.	MAX.		
A2	4.90	5.00	5.10		
р	5.20	5.30	5.40		
b1	0.70	0.80	0.90		
b2	9.90	10.00	10.10		
O	0.75	0.80	0.90		
D	44.90	45.00	45.10		
E1	29.90	30.00	30.10		
E2	13.65	13.75	13.85		
E3	19.00	19.30	19.60		
E4	16.50	16.80	17.10		
L1	14.70	15.00	15.30		
L2	20.70	21.00	21.30		
L3	14.70	15.00	15.30		
q	40.10	40.20	40.30		
ØΑ	3.10	3.20	3.30		



GENERIC MARKING DIAGRAM*

XXXXXXXXXXXXXXX

ZZZ ATYWW

NNNNNNN

XXXX = Specific Device Code

ZZZ = Lot ID

AT = Assembly & Test Location

Y = Year W = Work Week NNN = Serial Number *This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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