

# Automotive Power MOSFET Module

## NXV08B800DT1

### Features

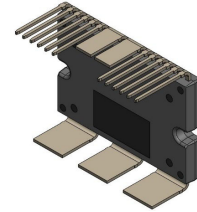
- Back to Back Mosfet Load Switch Module
- Temp Sensing
- Electrically Isolated DBC Substrate for Low R<sub>thjc</sub>
- Compact Design for Low Total Module Resistance
- Module Serialization for Full Traceability
- AQG324 Qualified
- UL 94 V-0
- ESD Tested for HBM and CDM per AEC Q101, JS-001, JS-002
- This Device is Pb-Free and is RoHS Compliant

### Applications

- 48 V Battery Switch (Back to Back Source Common)

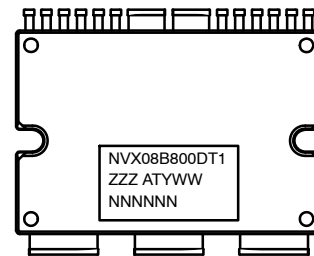
### Benefits

- Enable Design of Small, Efficient and Reliable System for Reduced Vehicle Fuel Consumption and CO<sub>2</sub> 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
- Low Inductance



APM17-MDC  
CASE MODHH

### MARKING DIAGRAM



NXV08B800DT1 = Specific Device Code  
 ZZZ = Lot ID  
 AT = Assembly & Test Location  
 Y = Year  
 W = Work Week  
 NNN = Serial Number

### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

# NXV08B800DT1

## Pin Configuration

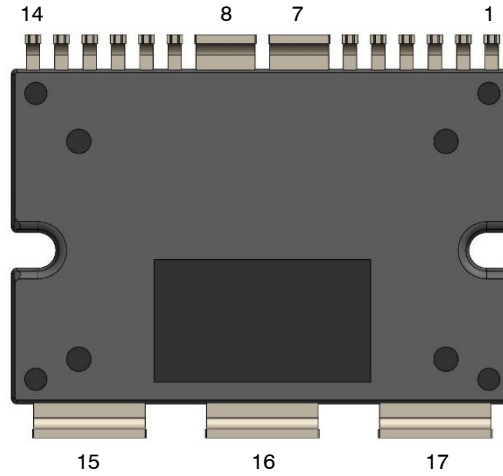


Figure 1. Pin Configuration

## PIN DESCRIPTION

Pin No.	Description	Remark
1	Q2 Gate	
2	Q2 Source Sense	
3	B In #2 Sense	
4	Q4 Gate	
5	Q4 Source Sense	
6	NTC1	
7	B In #2	Use as common or separately per the applications
8	B In #1	
9	NTC2	
10	Q3 Source Sense	
11	Q3 Gate	
12	B In #1 Sense	
13	Q1 Source Sense	
14	Q1 Gate	
15	Common Source 1	For electrical test purpose for module
16	B Out	
17	Common Source 2	For electrical test purpose for module

# NXV08B800DT1

## Block Diagram

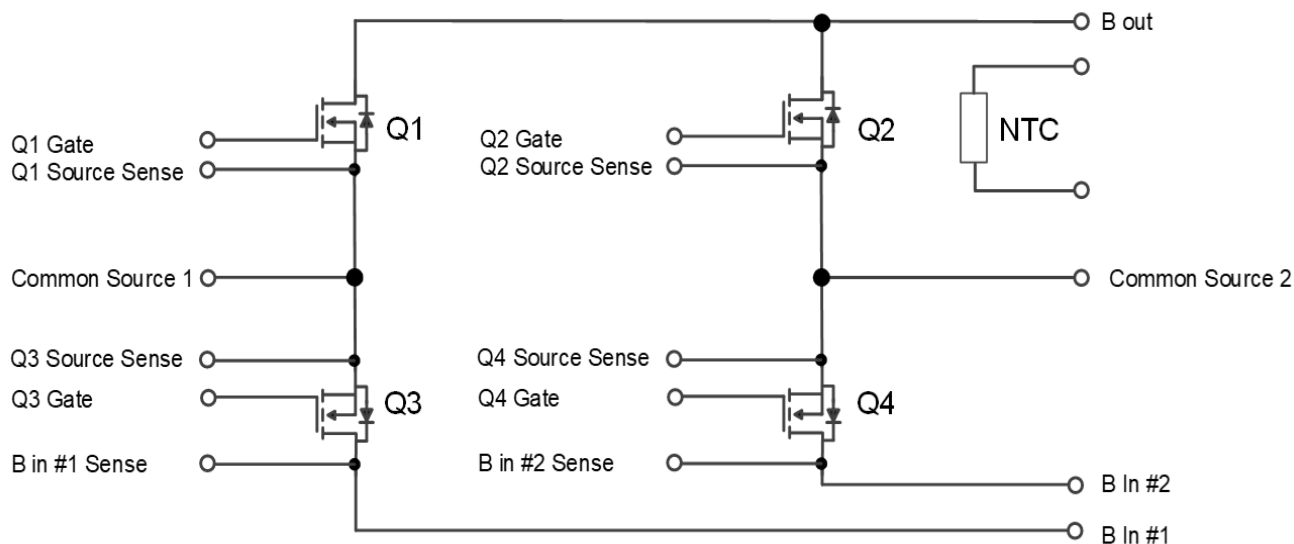


Figure 2. Block Diagram

### Flammability Information Solder

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 ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Max	Unit
VDS(Q1~Q4)	Drain to Source Voltage	80	V
VGS(Q1~Q4)	Gate to Source Voltage	$\pm 20$	V
EAS(Q1~Q4)	Single Pulse Avalanche Energy (Note 1)	2,445	mJ
$T_J$	Maximum Junction Temperature	175	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	125	$^\circ\text{C}$

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  $T_J = 25^\circ\text{C}$ ,  $L = 0.47\text{ mH}$ ,  $I_{AS} = 102\text{ A}$ ,  $V_{DD} = 72\text{ V}$  during inductor charging and  $V_{DD} = 0\text{ V}$  during time in avalanche.

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
BVDSS	Drain-to-Source Breakdown Voltage	I <sub>D</sub> = 1 mA, V <sub>GS</sub> = 0 V	80	–	–	
VGS(th)	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 1 mA	2	–	4.6	V
VSD	Source-to-Drain Diode Voltage	I <sub>SD</sub> = 160 A, V <sub>GS</sub> = 0 V	–	0.79	1.1	V
Measured RDS(ON) Q1, Q2	Single Q1, Q2 MOSFET (Note 2)	V <sub>GS</sub> = 12 V, I <sub>D</sub> = 160 A, T <sub>J</sub> = 25°C	–	0.71	0.81	mΩ
Measured RDS(ON) Q3, Q4	Single Q3, Q4 MOSFET (Note 2)	V <sub>GS</sub> = 12 V, I <sub>D</sub> = 160 A, T <sub>J</sub> = 25°C	–	0.50	0.595	mΩ
Pure FET RDS(ON) Q1, Q2, Q3, Q4	Rdson Measurement with Kelvin Pin with Min Impact of Measurement Path (Note 2)	V <sub>GS</sub> = 12 V, I <sub>D</sub> = 160 A, T <sub>J</sub> = 25°C	–	0.46	–	mΩ
IGSS	Gate-to-Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V, T <sub>J</sub> = 25°C	–100	–	+100	nA
IDSS	Drain-to-Source Leakage Current	V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25°C	–	–	2	μA

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.

- 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. In this reason, the actual FET RDS(ON) is not able to be measured. For the Pure FET Rdson for power loss calculation, the Rdson measurement with Kelvin pin from NXV08H400XT1 can be used. Each Rdson measurement paths are as below table, "Resistance Measurement Methods"

## RESISTANCE MEASUREMENTS METHODS

	+ Force Pin#	– Force Pin#	+ Sense Pin#	– Sense Pin#
FET Rdson Q1	16	15	16	13
FET Rdson Q2	16	17	16	2
FET Rdson Q3	8	15	12	10
FET Rdson Q4	7	17	3	5

## TEMPERATURE SENSE (NTC THERMISTOR)

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

## THERMAL RESISTOR

Parameter		Min	Typ	Max	Unit
<i>R<sub>thjc</sub></i> : Thermal Resistance Junction to Case, Single Inverter FET	Q1, Q2, Q3, Q4 Thermal Resistance J–C	–	–	0.46	°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	μA

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## DYNAMIC AND SWITCHING CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
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### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, f = 750 kHz	–	30,150	–	pF
C <sub>oss</sub>	Output Capacitance		–	4,505	–	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	77	–	pF
R <sub>g</sub>	Gate Resistance	f = 750 kHz	–	4.3	–	Ω
Q <sub>g(tot)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 to 12 V, I <sub>D</sub> = 160 A	–	502	–	nC
Q <sub>gs</sub>	Gate to Source Gate Charge		–	193	–	nC
Q <sub>gd</sub>	Gate to Drain “Miller” Charge		–	89	–	nC

### SWITCHING CHARACTERISTICS

t <sub>on</sub>	Turn-On Time	V <sub>DD</sub> = 48 V, I <sub>D</sub> = 400 A V <sub>GS</sub> = 12 V, R <sub>G(on/off)</sub> = 15/15	–	710	–	ns
t <sub>d(on)</sub>	Turn-On Delay Time		–	235	–	ns
t <sub>r</sub>	Turn-On Rise Time		–	475	–	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		–	608	–	ns
t <sub>f</sub>	Turn-Off Fall Time		–	290	–	ns
t <sub>off</sub>	Turn-Off Time		–	898	–	ns

### DRAIN-SOURCE DIODE CHARACTERISTICS

t <sub>RR</sub>	Reverse Recovery Time	V <sub>DD</sub> = 48 V, I <sub>D</sub> = 400 A V <sub>GS</sub> = 12 V, R <sub>G(on/off)</sub> = 15/15	–	59	–	ns
Q <sub>RR</sub>	Reverse Recovery Charge		–	1433	–	nC

3. Dynamic & Switching characteristics data is by characterization test result and guaranteed by design factors.

### COMPONENTS

Component	Description	Type	Qty.	Specification
MOSFET	Bare Die	Bare Die	4	80 V 0.55 m
NTC	10 k ±1% 1,600 x 800 μm	Discrete	1	B-Constant @ 25/50°C : 3380K @ 25/85°C : 3434K @ 25/100°C : 3455K

TYPICAL CHARACTERISTICS

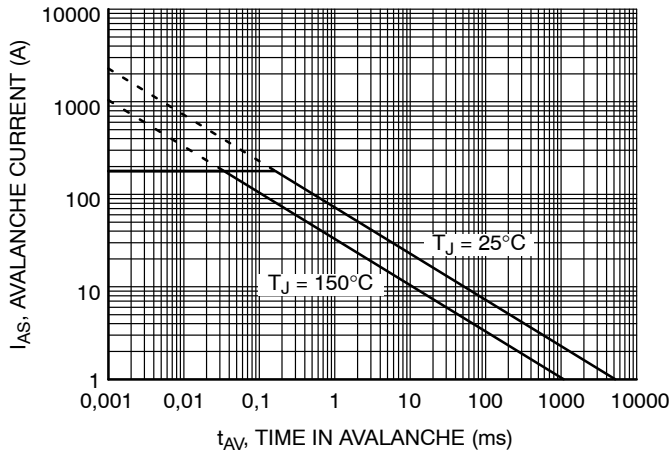


Figure 3. Unclamped Inductive Switching Capability

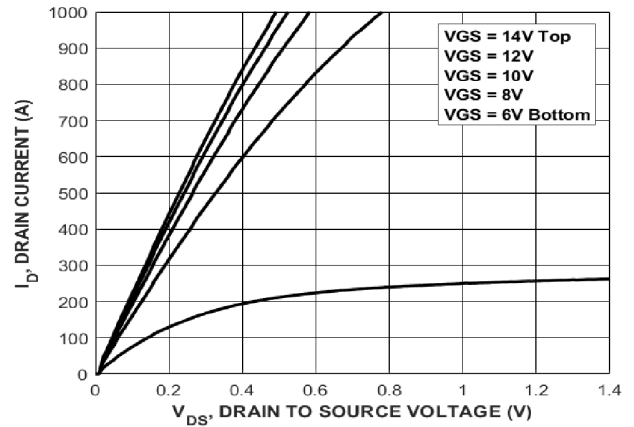


Figure 4. Saturation Characteristics

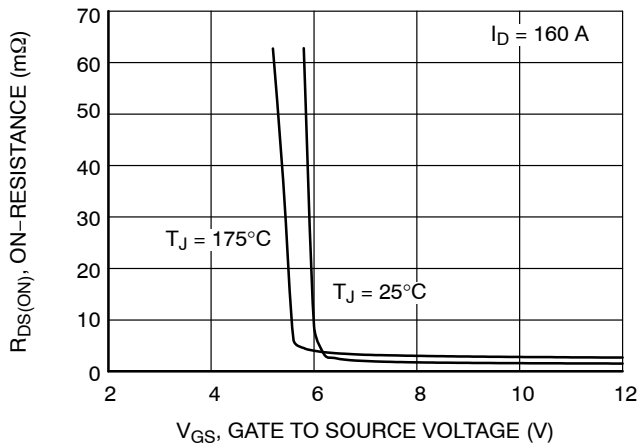


Figure 5.  $R_{DS(on)}$  vs. Gate Voltage

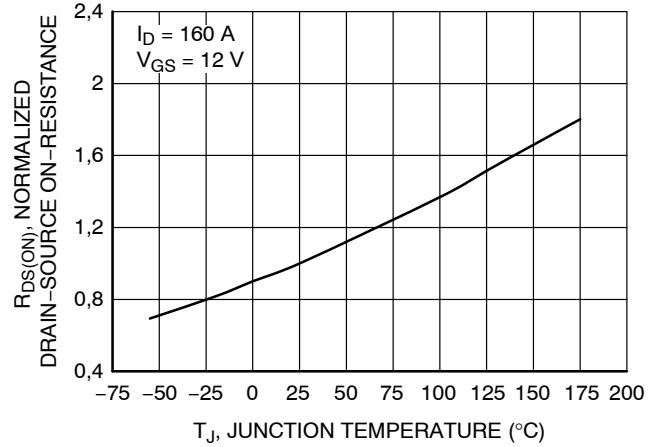


Figure 6.  $R_{DS(on)}$  vs. Temperature

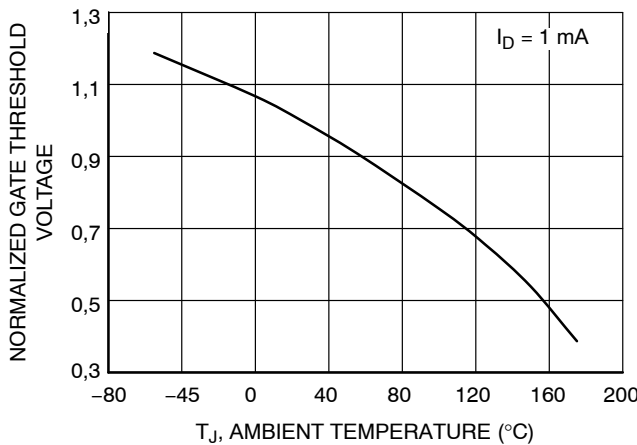


Figure 7. Normalized Gate Threshold Voltage vs. Temperature

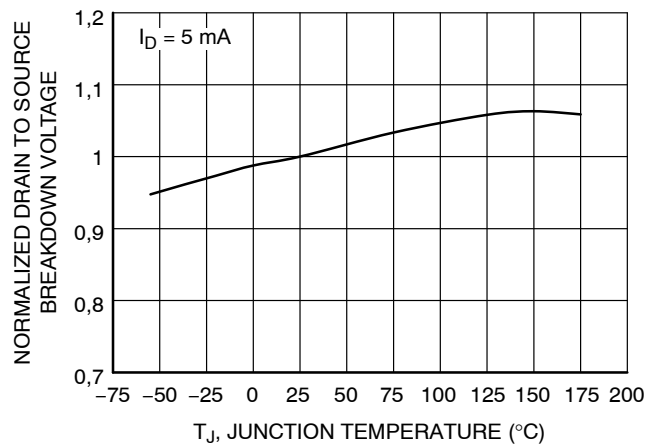


Figure 8. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS (continued)

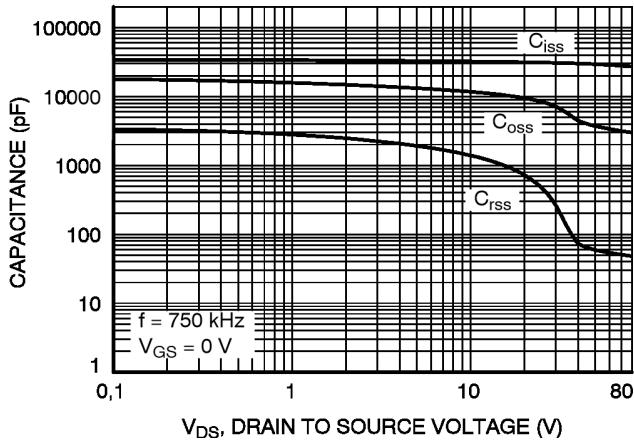


Figure 9. Capacitance vs. Drain to Source Voltage

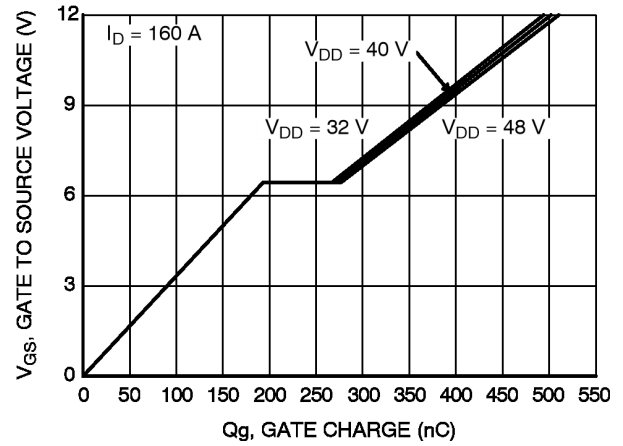


Figure 10. Gate Charge vs. Drain to Source Voltage

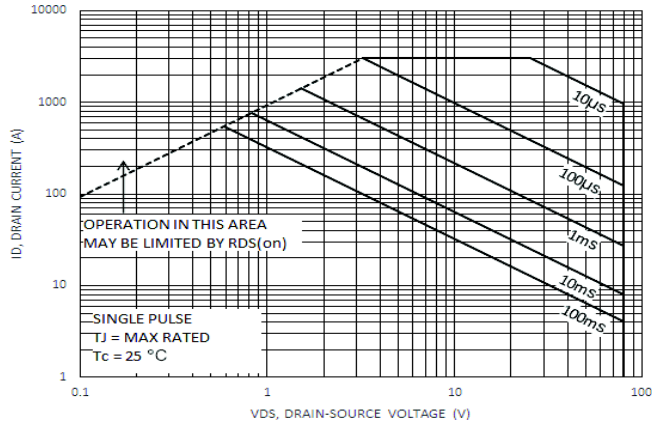


Figure 11. Safe Operating Area

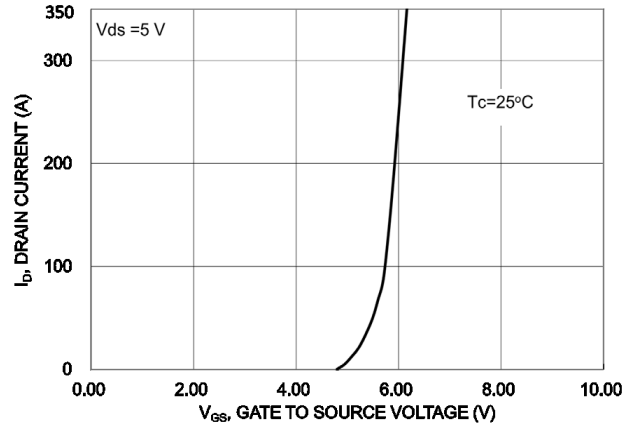


Figure 12. Transfer Characteristics

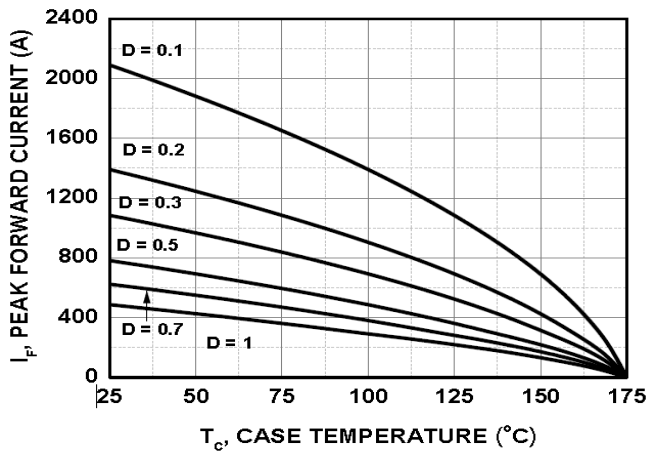
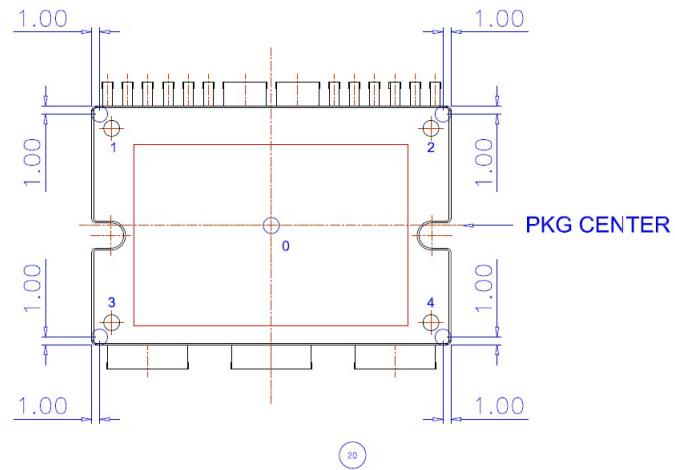


Figure 13. Body Diode Current

## NXV08B800DT1



FLATNESS : MAX. 150 $\mu$ m  
 -, MEASURING AT INDICATING POINTS  
 1, 2, 3, AND 4 (BASED ON "0")

**Figure 14. Flatness Measurement Position**

### MECHANICAL CHARACTERISTICS AND RATINGS

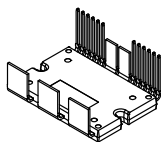
Parameter	Test Conditions	Min	Typ	Max	Units
Device Flatness	Refer to the package dimensions	0	–	150	$\mu$ m
Mounting Torque	Mounting screw: M3, recommended 0.7 N·m	0.4	–	1.4 (Note 4)	N·m
Weight		–	23.7	–	g

4. 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 to **onsemi** for the proper information of mounding condition.

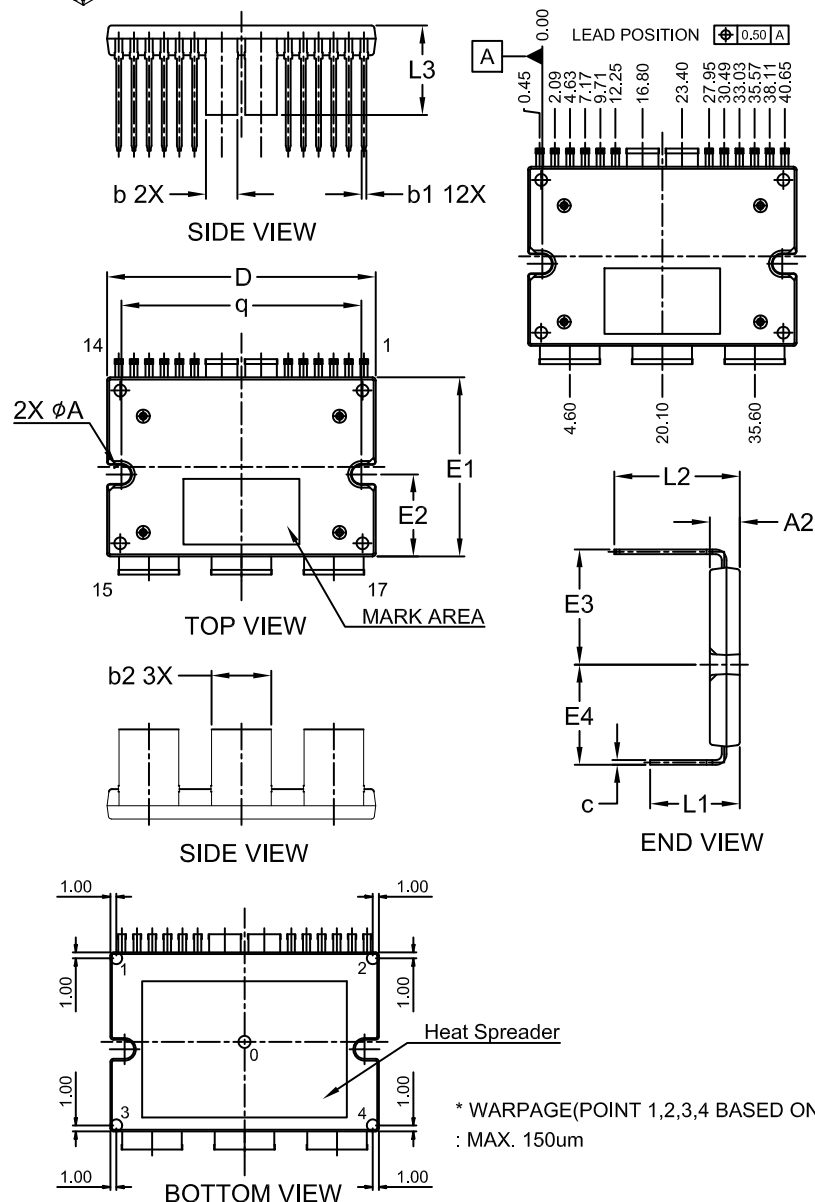
### ORDERING INFORMATION

Part Number	Package	Pb-Free and RoHS Compliant	Operating Ambient Temperature Range	Packing Method
NXV08B800DT1	APM17-MDC	yes	–40~125°C	Tube



onsemi<sup>™</sup>

## DATE 08 DEC 2021



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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A2	4.90	5.00	5.10
b	5.20	5.30	5.40
b1	0.70	0.80	0.90
b2	9.90	10.00	10.10
c	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
φA	3.10	3.20	3.30

### GENERIC MARKING DIAGRAM\*

XXXXXXXXXXXXXXXXXX  
ZZZ ATYWW  
NNNNNNNN

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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