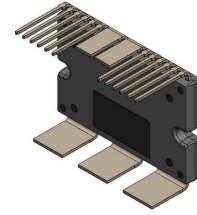


# Automotive Power MOSFET Module

## NXV08B800DT1



APM17-MDC  
CASE MODHH

### Features

- Back to Back Mosfet Load Switch Module
- Temp Sensing
- Electrically Isolated DBC Substrate for Low Rthjc
- 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

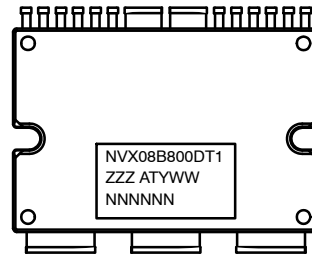
### Applications

- 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

### 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

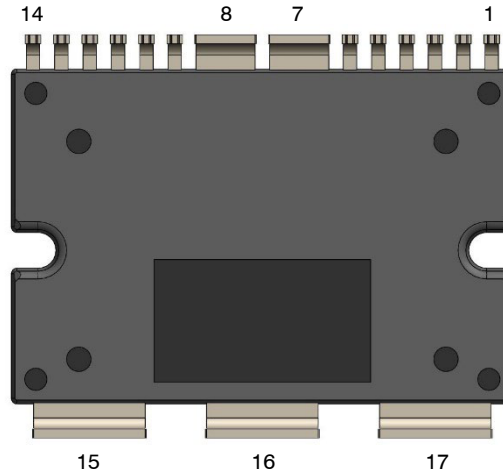


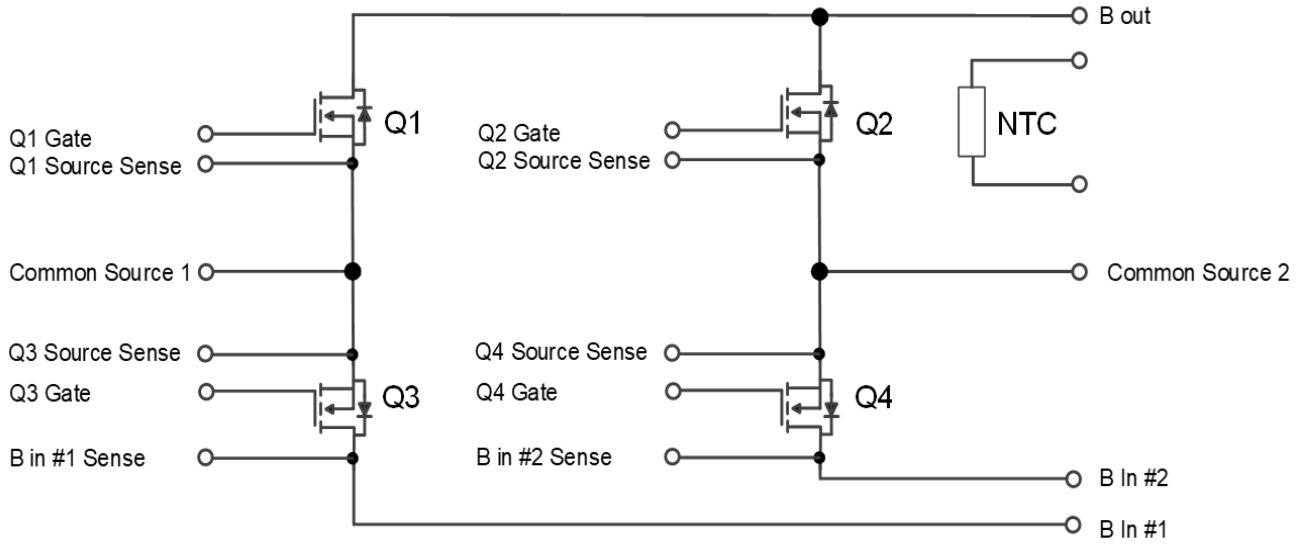
Figure 1. Pin Configuration

## 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<sub>J</sub> = 25°C unless otherwise noted)

| 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) | 2,445 | mJ   |
| T <sub>J</sub>   | Maximum Junction Temperature           | 175   | °C   |
| T <sub>STG</sub> | 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.

- Starting T<sub>J</sub> = 25°C, L = 0.47 mH, I<sub>AS</sub> = 102 A, V<sub>DD</sub> = 72 V during inductor charging and V<sub>DD</sub> = 0 V during time in avalanche.

# NXV08B800DT1

## 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)<br>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)<br>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)<br>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 |      |      |
|---|---------------------------------------|-----|-----|------|------|------|
| Rthjc: 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   |

# NXV08B800DT1

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

| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|--------|-----------|-----------|-----|-----|-----|------|
|--------|-----------|-----------|-----|-----|-----|------|

### 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<br>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<br>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<br>@ 25/50°C : 3380K<br>@ 25/85°C : 3434K<br>@ 25/100°C : 3455K |

TYPICAL CHARACTERISTICS

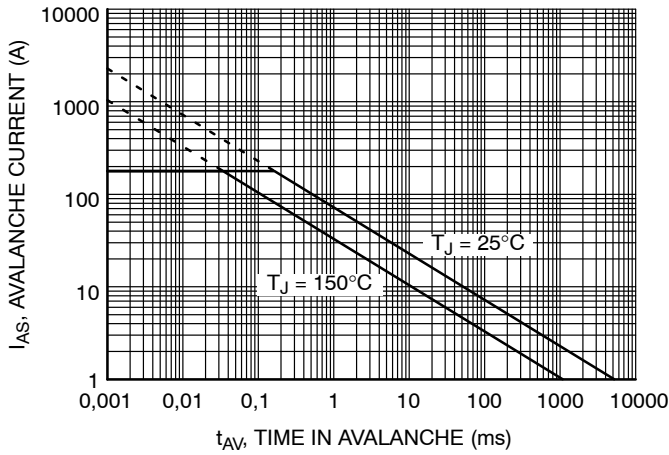


Figure 3. Unclamped Inductive Switching Capability

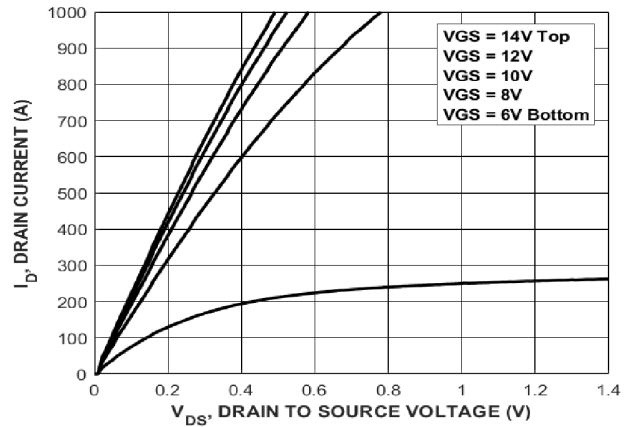


Figure 4. Saturation Characteristics

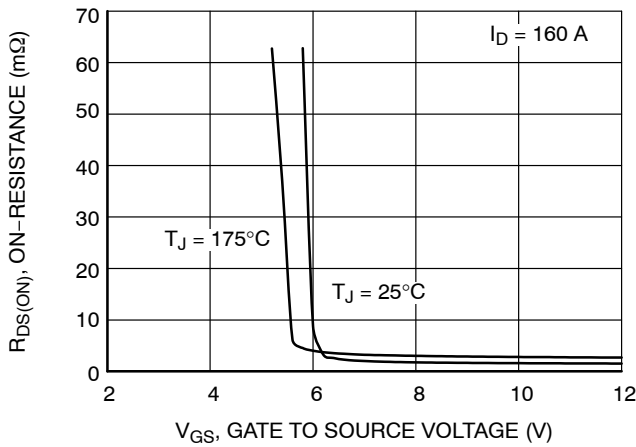


Figure 5.  $R_{DS(on)}$  vs. Gate Voltage

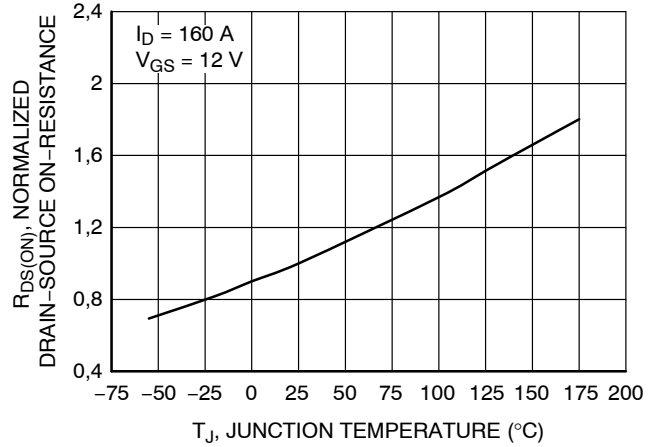


Figure 6.  $R_{DS(on)}$  vs. Temperature

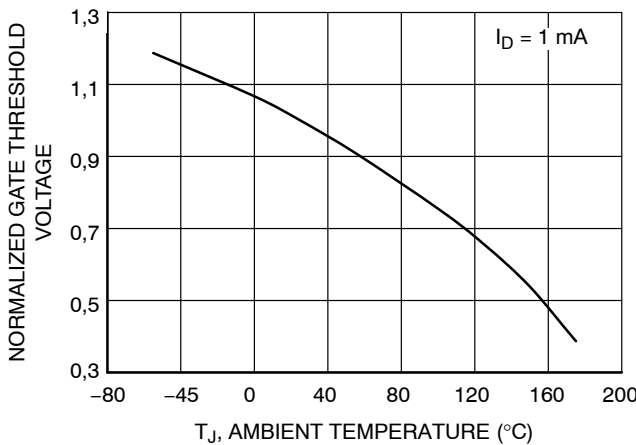


Figure 7. Normalized Gate Threshold Voltage vs. Temperature

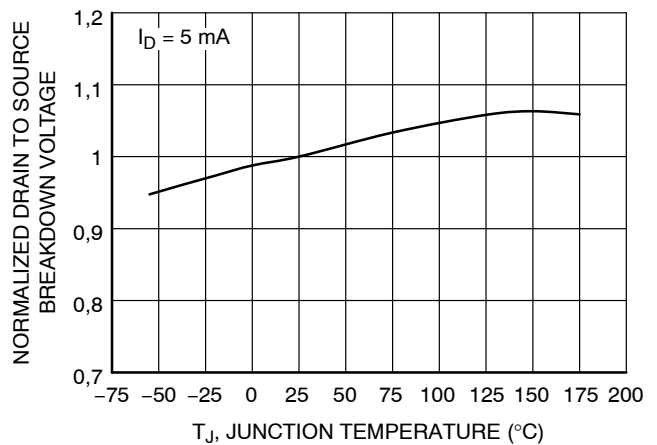


Figure 8. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

# NXV08B800DT1

## TYPICAL CHARACTERISTICS (continued)

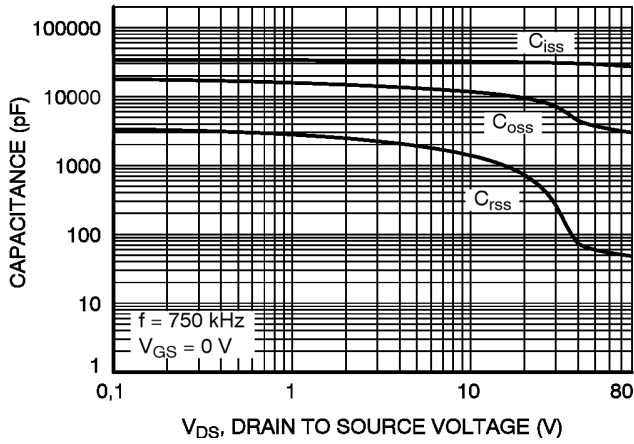


Figure 9. Capacitance vs. Drain to Source Voltage

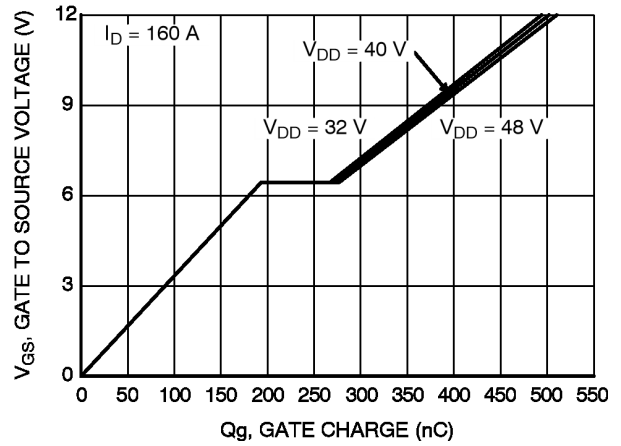


Figure 10. Gate Charge vs. Drain to Source Voltage

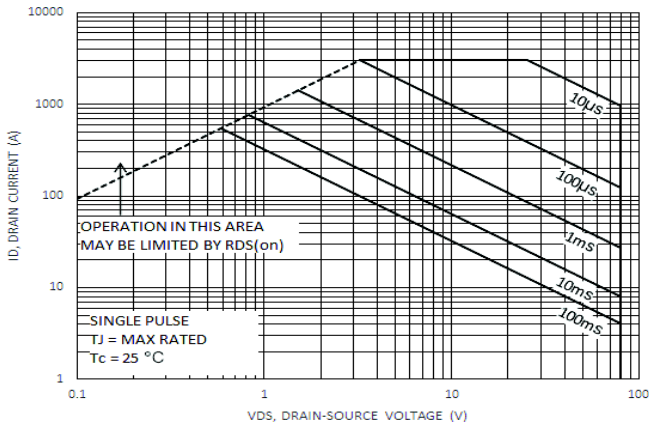


Figure 11. Safe Operating Area

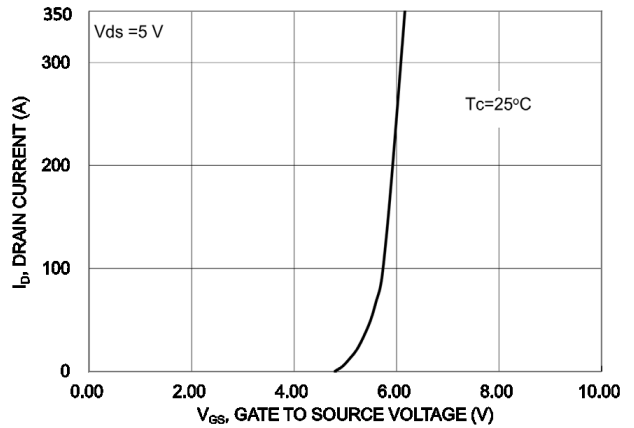


Figure 12. Transfer Characteristics

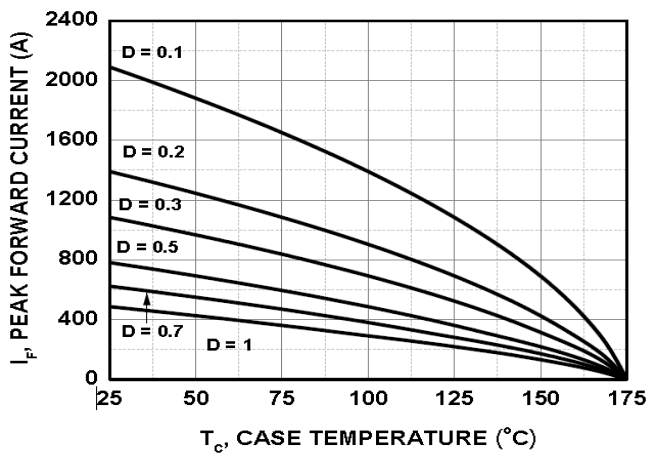
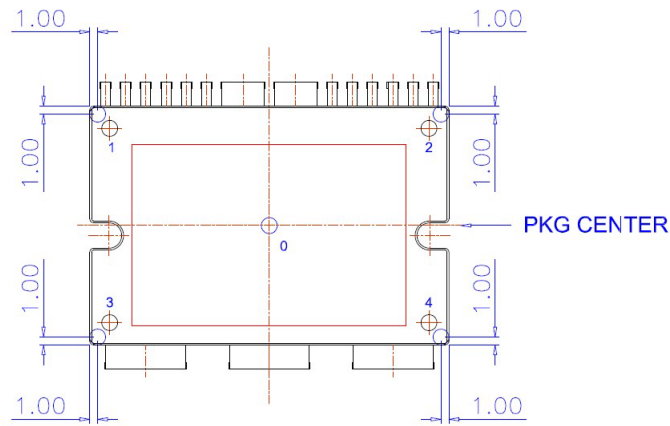


Figure 13. Body Diode Current

# NXV08B800DT1



20  
 FLATNESS : MAX. 150um  
 - 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          | μm    |
| Mounting Torque | Mounting screw: M3, recommended 0.7 N·m | 0.4 | -    | 1.4 (Note 4) | N·m   |
| Weight          |   | -   | 23.7 | -            | g     |

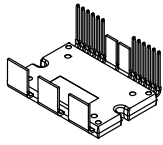
4. Max Torque rating can be different by the type of screw, such as the screw head diameter, use or without use of Washer. In case of special screw mounting method is applied, contact to **onsemi** for the proper information of mounding condition.

## ORDERING INFORMATION

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

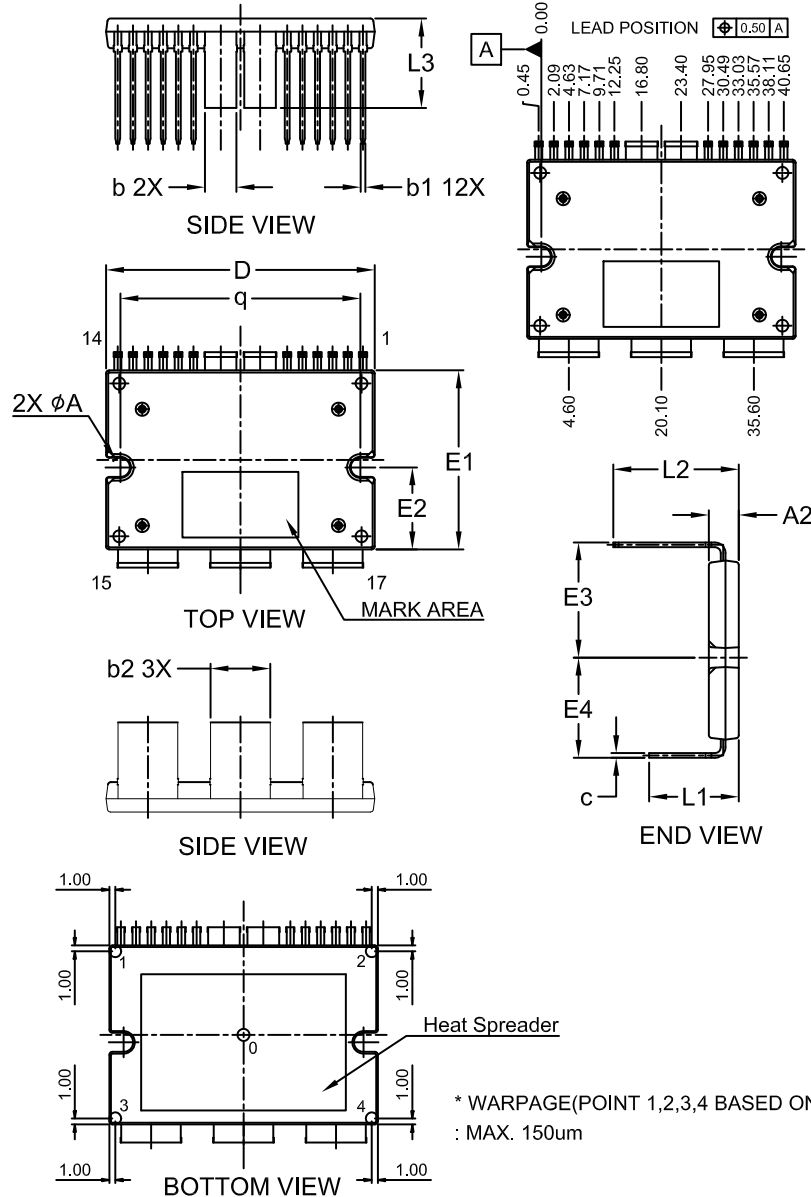


# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



## APM17-MDC CASE MODHH ISSUE C

DATE 08 DEC 2021

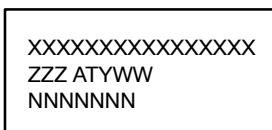


NOTES:

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 |
| $\phi A$ | 3.10        | 3.20  | 3.30  |

### GENERIC MARKING DIAGRAM\*



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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