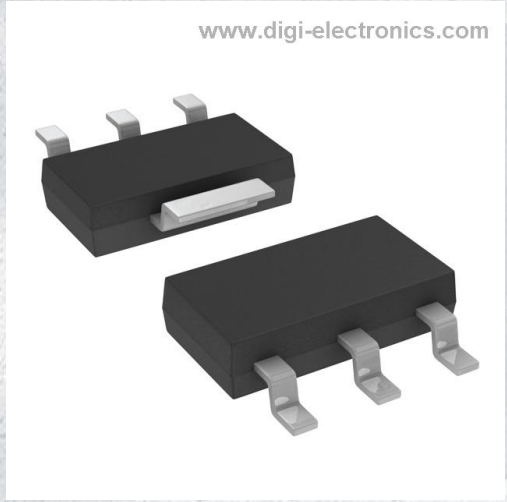
# NIF5002NT1G Datasheet




https://www.DiGi-Electronics.com

| | |
|---|---|
| DiGi Electronics Part Number | NIF5002NT1G-DG |
| Manufacturer | onsemi |
| Manufacturer Product Number | NIF5002NT1G |
| Description | IC PWR DRIVER N-CHAN 1:1 SOT223 |
| Detailed Description | Power Switch/Driver 1:1 N-Channel 2A SOT-223 (TO-261) |

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

## Purchase and inquiry

| Manufacturer Product Number: | Manufacturer: |
| --- | --- |
| NIF5002NT1G | onsemi |
| Series: | Product Status: |
| HDPlus™ | Obsolete |
| Switch Type: | Number of Outputs: |
| General Purpose | 1 |
| Ratio - Input:Output: | Output Configuration: |
| 1:1 | Low Side |
| Output Type: | Interface: |
| N-Channel | On/Off |
| Voltage - Load: | Voltage - Supply (Vcc/Vdd): |
| 42V (Max) | Not Required |
| Current - Output (Max): | Rds On (Typ): |
| 2A | 165mOhm |
| Input Type: | Features: |
| Non-Inverting | Auto Restart, Slew Rate Controlled |
| Fault Protection: | Operating Temperature: |
| Current Limiting (Fixed), Over Temperature, Over Voltage | -55°C ~ 150°C (TJ) |
| Mounting Type: | Supplier Device Package: |
| Surface Mount | SOT-223 (TO-261) |
| Package / Case: | Base Product Number: |
| TO-261-4, TO-261AA | NIF5002 |

## Environmental & Export classification

| Moisture Sensitivity Level (MSL): | REACH Status: |
| --- | --- |
| 3 (168 Hours) | REACH Unaffected |
| ECCN: | HTSUS: |
| EAR99 | 8541.29.0095 |

# NIF5002N

Preferred Device

# Self-Protected FET with Temperature and Current Limit

## 42 V, 2.0 A, Single N−Channel, SOT−223

HDPlus™ devices are an advanced series of power MOSFETs which utilize ON Semiconductors latest MOSFET technology process to achieve the lowest possible on−resistance per silicon area while incorporating smart features. Integrated thermal and current limits work together to provide short circuit protection. The devices feature an integrated Drain−to−Gate Clamp that enables them to withstand high energy in the avalanche mode. The Clamp also provides additional safety margin against unexpected voltage transients. Electrostatic Discharge (ESD) protection is provided by an integrated Gate−to−Source Clamp.

### Features

- Current Limitation
- Thermal Shutdown with Automatic Restart
- Short Circuit Protection
- $I_{DSS}$ Specified at Elevated Temperature
- Avalanche Energy Specified
- Slew Rate Control for Low Noise Switching
- Overvoltage Clamped Protection
- Pb−Free Packages are Available

### Applications

- Lighting
- Solenoids
- Small Motors

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain−to−Source Voltage Internally Clamped | $V_{DSS}$ | 42 | V |
| Drain−to−Gate Voltage Internally Clamped ($R_G$ = 1.0 MΩ) | $V_{DGR}$ | 42 | V |
| Gate−to−Source Voltage | $V_{GS}$ | ±14 | V |
| Continuous Drain Current | $I_D$ | Internally Limited | |
| Power Dissipation @ $T_A$ = 25°C (Note 1)<br>@ $T_A$ = 25°C (Note 2)<br>@ $T_T$ = 25°C (Note 3) | $P_D$ | 1.1<br>1.7<br>8.9 | W |
| Operating Junction and Storage Temperature | $T_J$, $T_{stg}$ | −55 to 150 | °C |
| Single Pulse Drain−to−Source Avalanche Energy ($V_{DD}$ = 32 V, $V_G$ = 5.0 V, $I_{PK}$ = 1.0 A, L = 300 mH, $R_{G(ext)}$ = 25 Ω) | $E_{AS}$ | 150 | mJ |

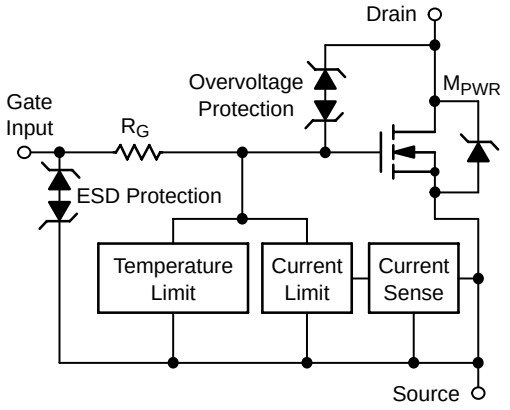
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

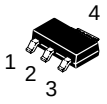
**ON Semiconductor®**

**http://onsemi.com**

| $V_{(BR)DSS}$ (Clamped) | $R_{DS(ON)}$ TYP | $I_D$ MAX |
|---|---|---|
| 42 V | 165 mΩ @ 10 V | 2.0 A* |

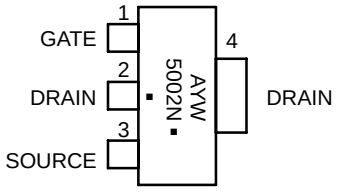
*Max current limit value is dependent on input condition.




**SOT−223**
**CASE 318E**
**STYLE 3**

**MARKING DIAGRAM**




A = Assembly Location
Y = Year
W = Work Week
5002N = Specific Device Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

**Preferred** devices are recommended choices for future use and best overall value.

## THERMAL CHARACTERISTICS

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Junction−to−Ambient − Steady State (Note 1)<br>Junction−to−Ambient − Steady State (Note 2)<br>Junction−to−Tab − Steady State (Note 3) | $R_{\theta JA}$<br>$R_{\theta JA}$<br>$R_{\theta JT}$ | 114<br>72<br>14 | °C/W |

1. Surface−mounted onto min pad FR4 PCB, (2 oz. Cu, 0.06″ thick).
2. Surface−mounted onto 2″ sq. FR4 board (1″ sq., 1 oz. Cu, 0.06″ thick).
3. Surface−mounted onto min pad FR4 PCB, (2 oz. Cu, 0.06″ thick).

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain−to−Source Breakdown Voltage (Note 4) | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 10 mA | $T_J$ = 25°C | 42 | 46 | 55 | V |
| | | | $T_J$ = 150°C | 40 | 45 | 55 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 32 V | $T_J$ = 25°C | | 0.25 | 4.0 | μA |
| | | | $T_J$ = 150°C | | 1.1 | 20 | |
| Gate Input Current | $I_{GSSF}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 5.0 V | | | 50 | 100 | μA |
| **ON CHARACTERISTICS** (Note 4) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 150 μA | | 1.3 | 1.8 | 2.2 | V |
| Gate Threshold Temperature Coefficient | $V_{GS(th)}/T_J$ | | | | 4.0 | 6.0 | −mV/°C |
| Static Drain−to−Source On−Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 1.7 A | $T_J$ = 25°C | | 165 | 200 | mΩ |
| | | | $T_J$ = 150°C | | 305 | 400 | |
| | | $V_{GS}$ = 5.0 V, $I_D$ = 1.7 A | $T_J$ = 25°C | | 195 | 230 | |
| | | | $T_J$ = 150°C | | 360 | 460 | |
| | | $V_{GS}$ = 5.0 V, $I_D$ = 0.5 A | $T_J$ = 25°C | | 190 | 230 | |
| | | | $T_J$ = 150°C | | 350 | 460 | |
| Source−Drain Forward On Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 7.0 A | | | 1.0 | | V |
| **SWITCHING CHARACTERISTICS** | | | | | | | |
| Turn−on Time | $t_{d(on)}$ | $V_{GS}$ = 10 V, $V_{DD}$ = 12 V, $I_D$ = 2.5 A, $R_L$ = 4.7 Ω, (10% $V_{in}$ to 90% $I_D$) | | | 20 | 30 | μs |
| Turn−off Time | $t_{d(off)}$ | | | | 65 | 100 | |
| Slew Rate On | $dV_{DS}/dt_{on}$ | $R_L$ = 4.7 Ω, $V_{in}$ = 0 to 10 V, $V_{DD}$ = 12 V, 70% to 50% | | | 1.2 | | V/μs |
| Slew−Rate Off | $dV_{DS}/dt_{off}$ | $R_L$ = 4.7 Ω, $V_{in}$ = 0 to 10 V, $V_{DD}$ = 12 V, 50% to 70% | | | 0.5 | | |
| **SELF PROTECTION CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted) (Note 5) | | | | | | | |
| Current Limit | $I_{LIM}$ | $V_{DS}$ = 10 V, $V_{GS}$ = 5.0 V | $T_J$ = 25°C | 3.1 | 4.7 | 6.3 | A |
| | | | $T_J$ = 150°C | 2.0 | 3.2 | 4.3 | |
| | | $V_{DS}$ = 10 V, $V_{GS}$ = 10 V | $T_J$ = 25°C | 3.8 | 5.7 | 7.6 | |
| | | | $T_J$ = 150°C | 2.8 | 4.3 | 5.7 | |
| Temperature Limit (Turn−off) | $T_{LIM(off)}$ | $V_{GS}$ = 5.0 V | | 150 | 175 | 200 | °C |
| Temperature Limit (Circuit Reset) | $T_{LIM(on)}$ | $V_{GS}$ = 5.0 V | | 135 | 160 | 185 | |
| Temperature Limit (Turn−off) | $T_{LIM(off)}$ | $V_{GS}$ = 10 V | | 150 | 165 | 185 | |
| Temperature Limit (Circuit Reset) | $T_{LIM(on)}$ | $V_{GS}$ = 10 V | | 135 | 150 | 170 | |
| **ESD ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted) | | | | | | | |
| Electro−Static Discharge Capability | ESD | Human Body Model (HBM) | | 4000 | | | V |
| | | Machine Model (MM) | | 400 | | | |

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
5. Fault conditions are viewed as beyond the normal operating range of the part.

## TYPICAL PERFORMANCE CURVES

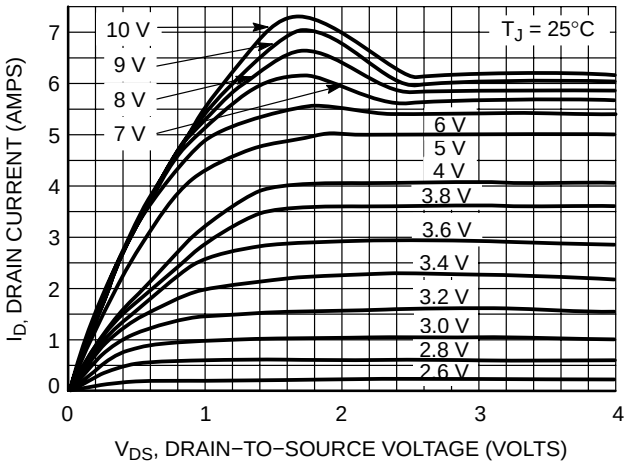



**Figure 1. On−Region Characteristics**

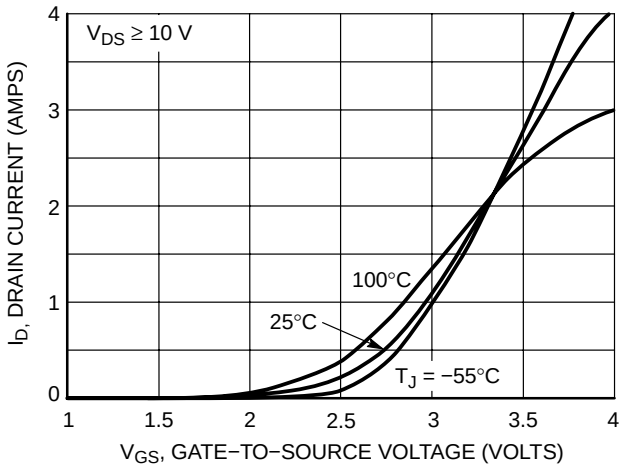



**Figure 2. Transfer Characteristics**

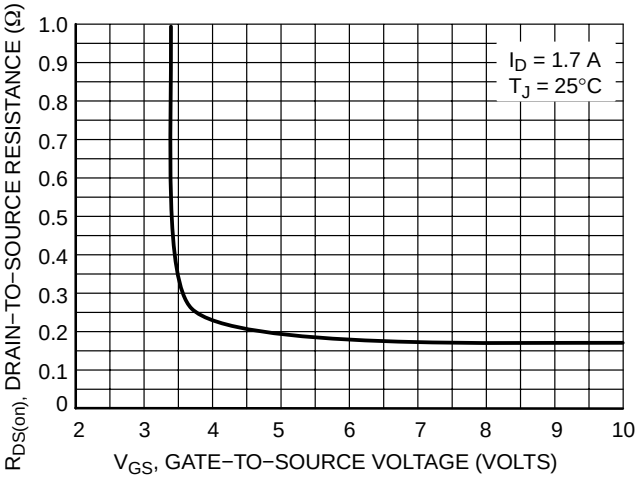



**Figure 3. On−Resistance vs. Gate−to−Source Voltage**

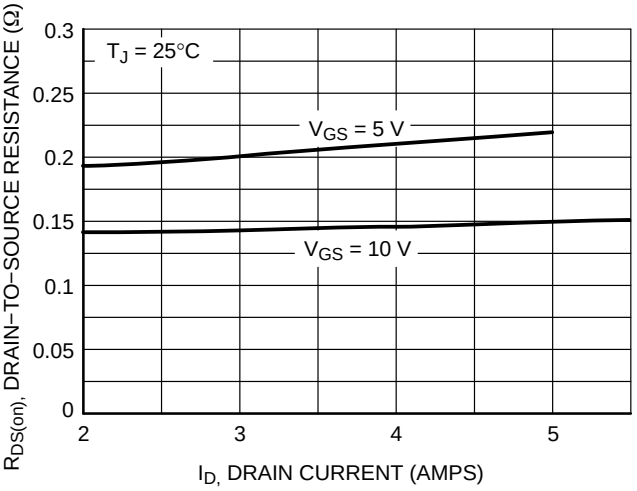



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

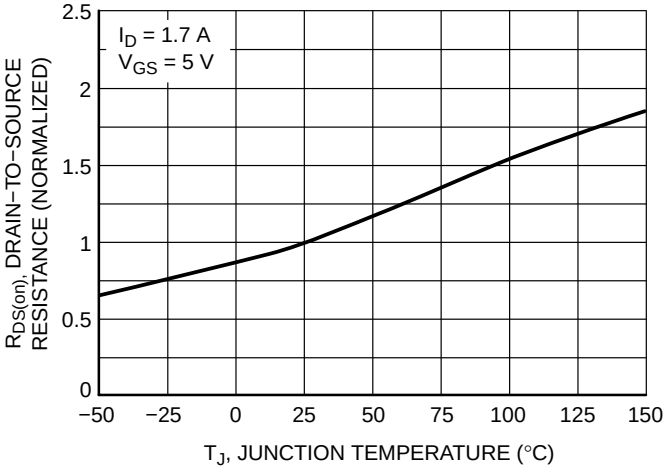



**Figure 5. On−Resistance Variation with Temperature**

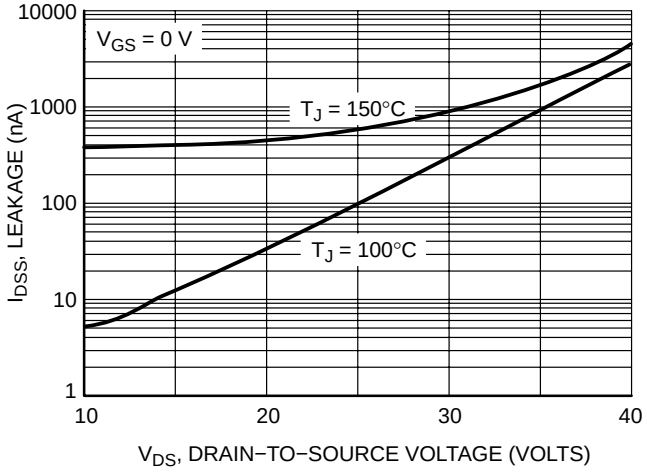



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

## TYPICAL PERFORMANCE CURVES

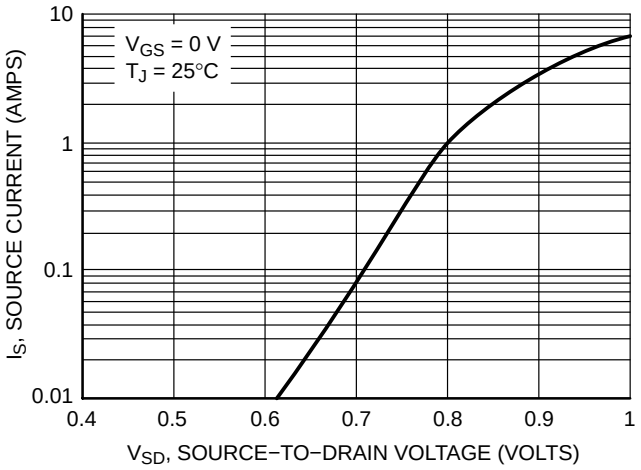



**Figure 7. Diode Forward Voltage vs. Current**

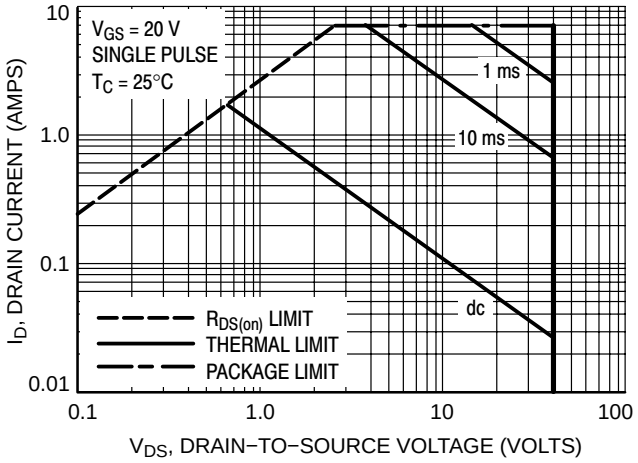



**Figure 8. Maximum Rated Forward Biased Safe Operating Area**

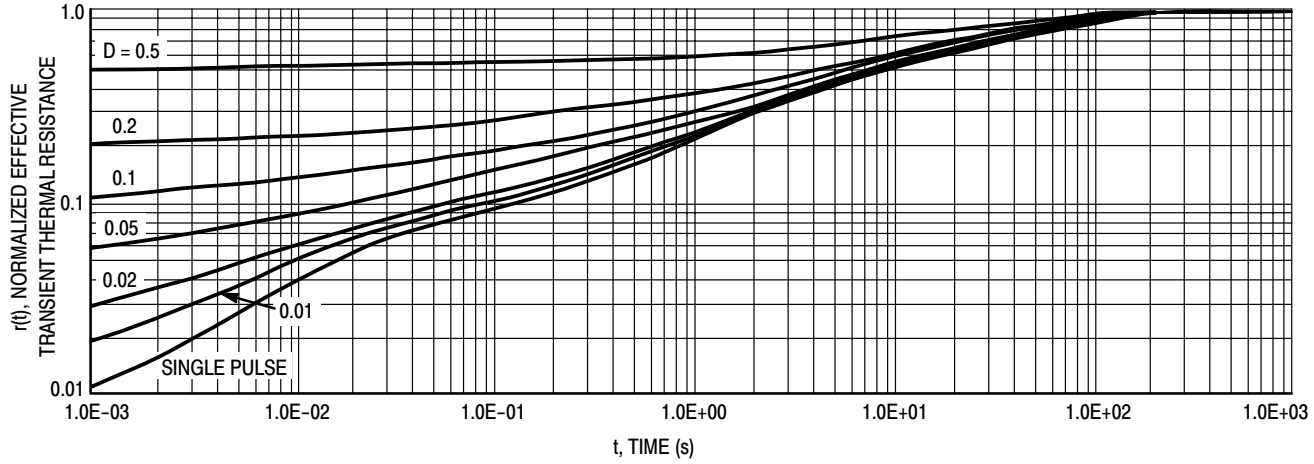



**Figure 9. Thermal Response**

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| NIF5002NT1 | SOT−223 | 1000 / Tape & Reel |
| NIF5002NT1G | SOT−223 (Pb−Free) | 1000 / Tape & Reel |
| NIF5002NT3 | SOT−223 | 4000 / Tape & Reel |
| NIF5002NT3G | SOT−223 (Pb−Free) | 4000 / Tape & Reel |

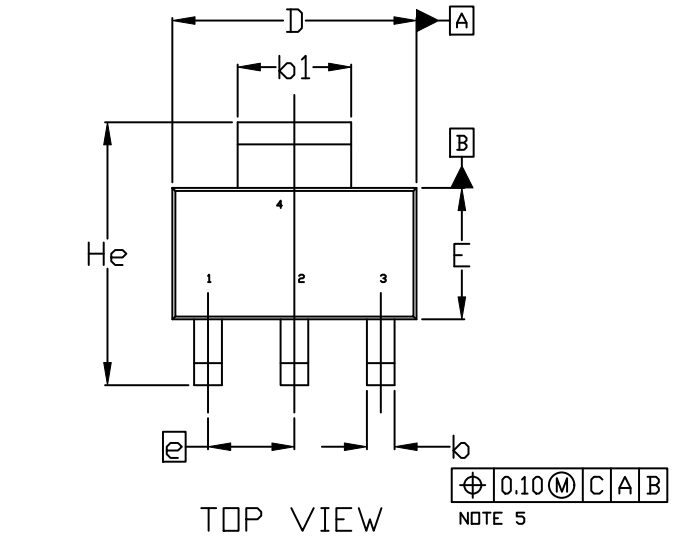
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

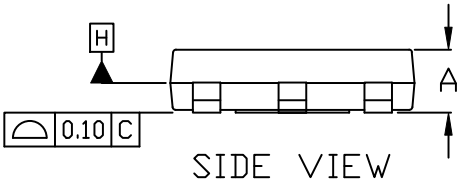
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

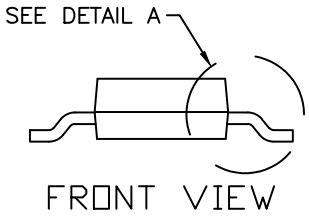
**SOT−223 (TO−261)**
CASE 318E−04
ISSUE R

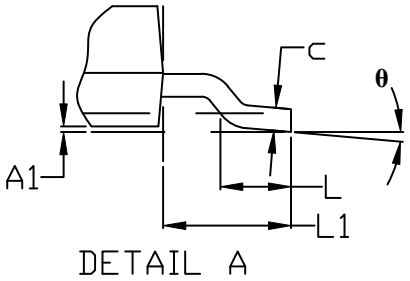
DATE 02 OCT 2018

**SCALE 1:1**



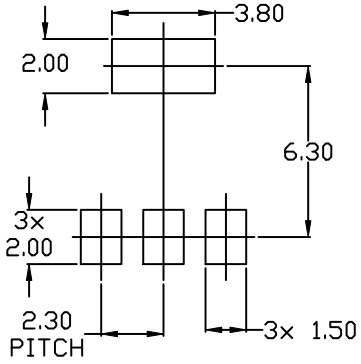




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.200MM PER SIDE.
4. DATUMS A AND B ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
6. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

| | MILLIMETERS | | |
|---|---|---|---|
| DIM | MIN. | NOM. | MAX. |
| A | 1.50 | 1.63 | 1.75 |
| A1 | 0.02 | 0.06 | 0.10 |
| b | 0.60 | 0.75 | 0.89 |
| b1 | 2.90 | 3.06 | 3.20 |
| c | 0.24 | 0.29 | 0.35 |
| D | 6.30 | 6.50 | 6.70 |
| E | 3.30 | 3.50 | 3.70 |
| e | 2.30 BSC | | |
| L | 0.20 | --- | --- |
| L1 | 1.50 | 1.75 | 2.00 |
| He | 6.70 | 7.00 | 7.30 |
| θ | 0° | --- | 10° |




RECOMMENDED MOUNTING FOOTPRINT

| | | | |
|---|---|---|---|
| **DOCUMENT NUMBER:** | **98ASB42680B** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. | |
| **DESCRIPTION:** | **SOT−223 (TO−261)** | | **PAGE 1 OF 2** |

**SOT−223 (TO−261)**
CASE 318E−04
ISSUE R

DATE 02 OCT 2018

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. CATHODE
3. NC
4. CATHODE

STYLE 3:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 4:
PIN 1. SOURCE
2. DRAIN
3. GATE
4. DRAIN

STYLE 5:
PIN 1. DRAIN
2. GATE
3. SOURCE
4. GATE

STYLE 6:
PIN 1. RETURN
2. INPUT
3. OUTPUT
4. INPUT

STYLE 7:
PIN 1. ANODE 1
2. CATHODE
3. ANODE 2
4. CATHODE

STYLE 8:
CANCELLED

STYLE 9:
PIN 1. INPUT
2. GROUND
3. LOGIC
4. GROUND

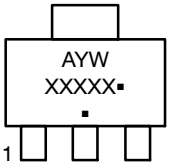
STYLE 10:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 11:
PIN 1. MT 1
2. MT 2
3. GATE
4. MT 2

STYLE 12:
PIN 1. INPUT
2. OUTPUT
3. NC
4. OUTPUT

STYLE 13:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

## GENERIC MARKING DIAGRAM*




A = Assembly Location
Y = Year
W = Work Week
XXXXX = Specific Device Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*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.

| | | | |
|---|---|---|---|
| **DOCUMENT NUMBER:** | **98ASB42680B** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red. | |
| **DESCRIPTION:** | **SOT−223 (TO−261)** | | **PAGE 2 OF 2** |

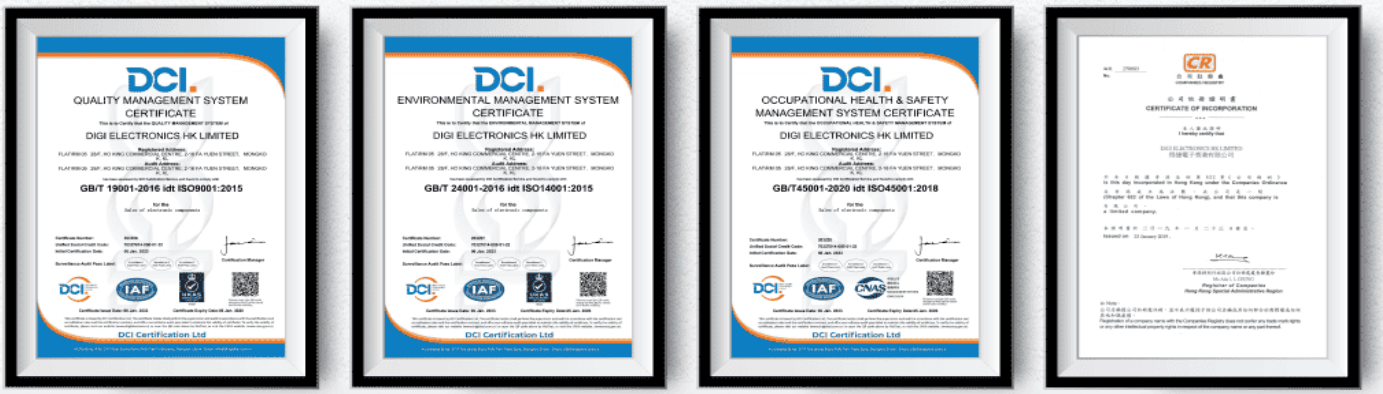
## ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT**: www.onsemi.com/support
**For additional information, please contact your local Sales Representative at** www.onsemi.com/support/sales

# OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement.  DiGi through third-party certification, we striciy control the quality of products and services. Welcome your RFQ to Email: Info@DiGi-Electronics.com





Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.