

Complementary Power Transistors

DPAK for Surface Mount Applications

MJD44H11 (NPN), MJD45H11 (PNP)

Designed for general purpose power and switching such as output or driver stages in applications such as switching regulators, converters, and power amplifiers.

Features

- Lead Formed for Surface Mount Application in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves (“-1” Suffix)
- Electrically Similar to Popular D44H/D45H Series
- Low Collector Emitter Saturation Voltage
- Fast Switching Speeds
- Complementary Pairs Simplifies Designs
- Epoxy Meets UL 94 V-0 @ 0.125 in
- NJV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, common for NPN and PNP, minus sign, “-”, for PNP omitted, unless otherwise noted)

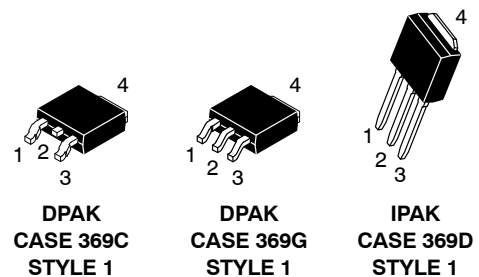
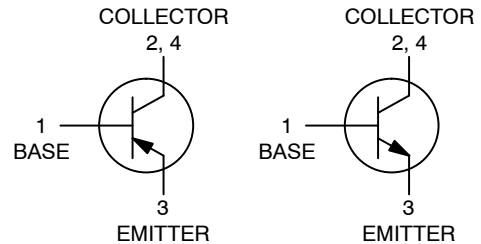
| Rating | Symbol | Max | Unit |
|---|----------------|---------------|--------------------------|
| Collector-Emitter Voltage | V_{CEO} | 80 | Vdc |
| Emitter-Base Voltage | V_{EB} | 5 | Vdc |
| Collector Current - Continuous | I_C | 8 | Adc |
| Collector Current - Peak | I_{CM} | 16 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 20 0.16 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.75 0.014 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| ESD - Human Body Model | HBM | 3B | V |
| ESD - Machine Model | MM | C | V |

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.

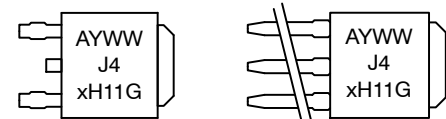
1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

SILICON POWER TRANSISTORS 8 AMPERES 80 VOLTS, 20 WATTS

COMPLEMENTARY



MARKING DIAGRAMS



- DPAK IPAK
- A = Assembly Location
 - Y = Year
 - WW = Work Week
 - J4xH11 = Device Code
x = 4 or 5
 - G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

MJD44H11 (NPN), MJD45H11 (PNP)

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|------|---------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 6.25 | $^{\circ}C/W$ |
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 71.4 | $^{\circ}C/W$ |
| Lead Temperature for Soldering | T_L | 260 | $^{\circ}C$ |

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

ELECTRICAL CHARACTERISTICS

($T_A = 25^{\circ}C$, common for NPN and PNP, minus sign, “-”, for PNP omitted, unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|----|---|-----|---------|
| Collector-Emitter Sustaining Voltage ($I_C = 30\text{ mA}$, $I_B = 0$) | $V_{CE(sus)}$ | 80 | - | - | Vdc |
| Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CE0}$, $V_{BE} = 0$) | I_{CES} | - | - | 1.0 | μA |
| Emitter Cutoff Current ($V_{EB} = 5\text{ Vdc}$) | I_{EBO} | - | - | 1.0 | μA |

ON CHARACTERISTICS

| | | | | | |
|---|---------------|----------|--------|--------|-----|
| Collector-Emitter Saturation Voltage ($I_C = 8\text{ Adc}$, $I_B = 0.4\text{ Adc}$) | $V_{CE(sat)}$ | - | - | 1 | Vdc |
| Base-Emitter Saturation Voltage ($I_C = 8\text{ Adc}$, $I_B = 0.8\text{ Adc}$) | $V_{BE(sat)}$ | - | - | 1.5 | Vdc |
| DC Current Gain ($V_{CE} = 1\text{ Vdc}$, $I_C = 2\text{ Adc}$) ($V_{CE} = 1\text{ Vdc}$, $I_C = 4\text{ Adc}$) | h_{FE} | 60 40 | - - | - - | - |

DYNAMIC CHARACTERISTICS

| | | | | | |
|---|----------|--------|-----------|--------|-----|
| Collector Capacitance ($V_{CB} = 10\text{ Vdc}$, $f_{test} = 1\text{ Mhz}$) MJD44H11 MJD45H11 | C_{cb} | - - | 45 130 | - - | pF |
| Gain Bandwidth Product ($I_C = 0.5\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 20\text{ Mhz}$) MJD44H11 MJD45H11 | f_T | - - | 85 90 | - - | MHz |

SWITCHING TIMES

| | | | | | |
|---|-------------|--------|------------|--------|----|
| Delay and Rise Times ($I_C = 5\text{ Adc}$, $I_{B1} = 0.5\text{ Adc}$) MJD44H11 MJD45H11 | $t_d + t_r$ | - - | 300 135 | - - | ns |
| Storage Time ($I_C = 5\text{ Adc}$, $I_{B1} = I_{B2} = 0.5\text{ Adc}$) MJD44H11 MJD45H11 | t_s | - - | 500 500 | - - | ns |
| Fall Time ($I_C = 5\text{ Adc}$, $I_{B1} = I_{B2} = 0.5\text{ Adc}$) MJD44H11 MJD45H11 | t_f | - - | 140 100 | - - | ns |

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.

MJD44H11 (NPN), MJD45H11 (PNP)

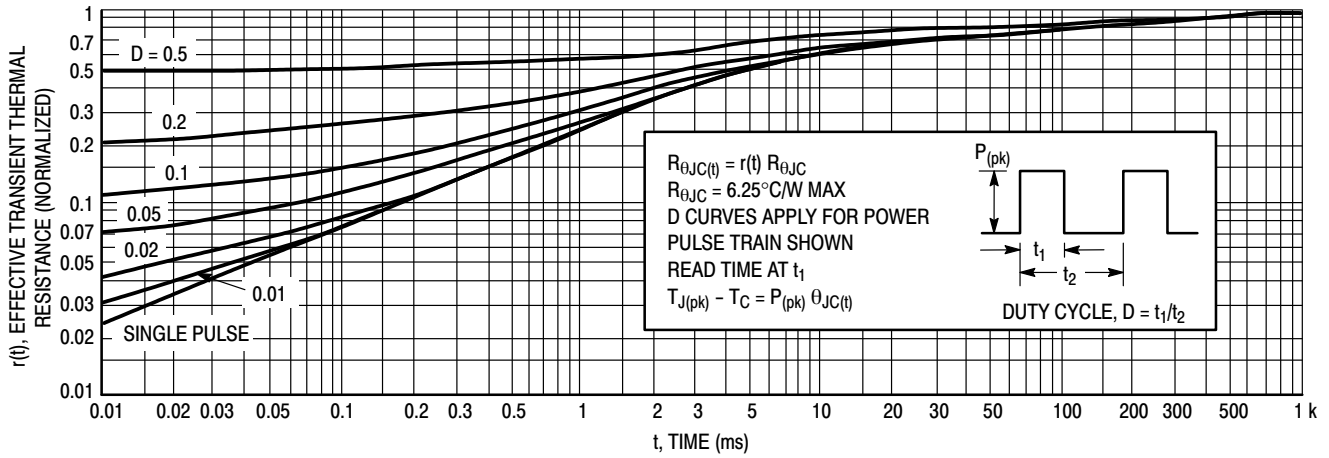


Figure 1. Thermal Response

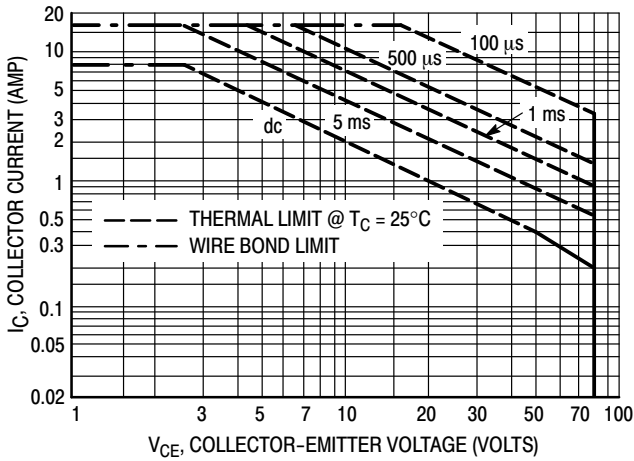


Figure 2. Maximum Forward Bias Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 2 is based on $T_{J(pk)} = 150^{\circ}\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^{\circ}\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 1. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

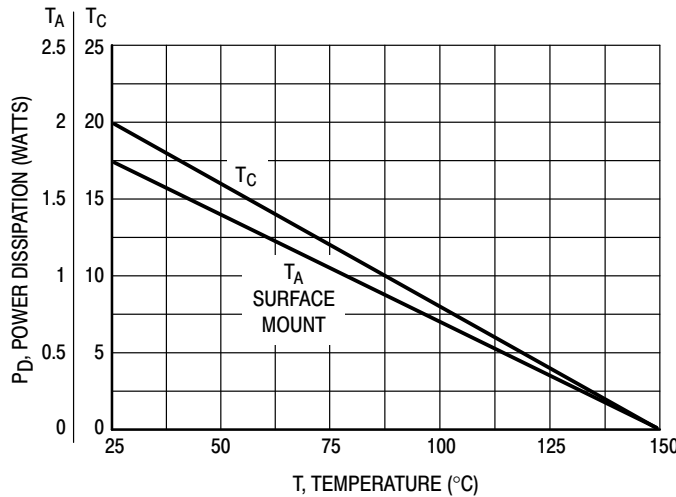


Figure 3. Power Derating

MJD44H11 (NPN), MJD45H11 (PNP)

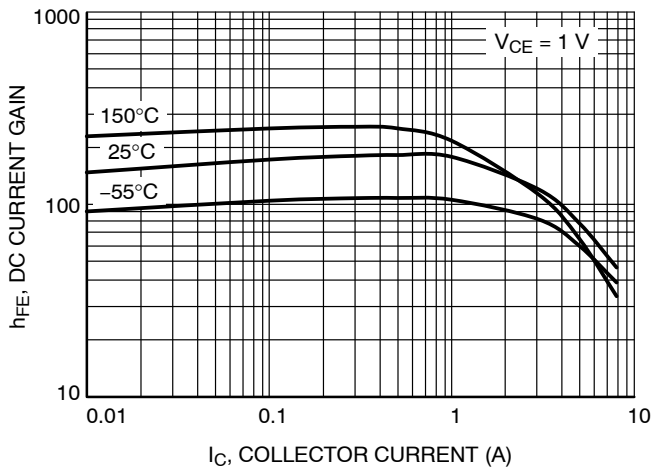


Figure 4. MJD44H11 DC Current Gain



Figure 5. MJD45H11 DC Current Gain

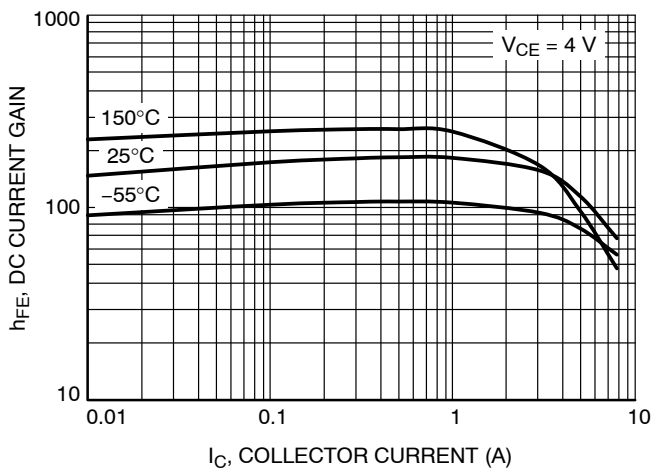


Figure 6. MJD44H11 DC Current Gain



Figure 7. MJD45H11 DC Current Gain

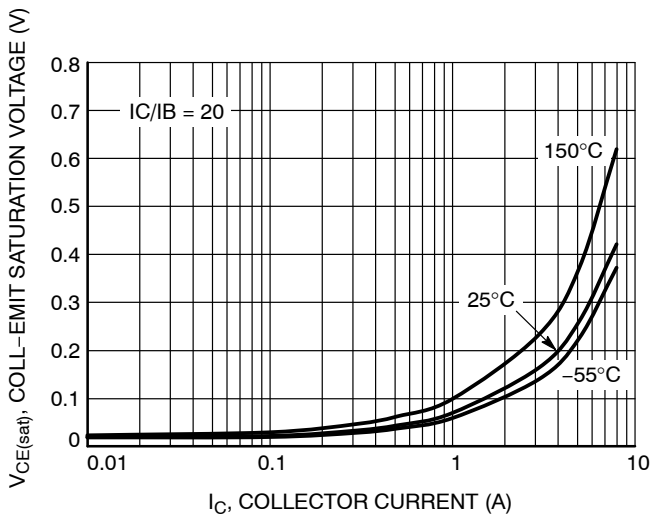


Figure 8. MJD44H11 Saturation Voltage
 $V_{CE(sat)}$



Figure 9. MJD45H11 Saturation Voltage
 $V_{CE(sat)}$

MJD44H11 (NPN), MJD45H11 (PNP)



Figure 10. MJD44H11 Saturation Voltage
 $V_{BE(sat)}$



Figure 11. MJD45H11 Saturation Voltage
 $V_{BE(sat)}$

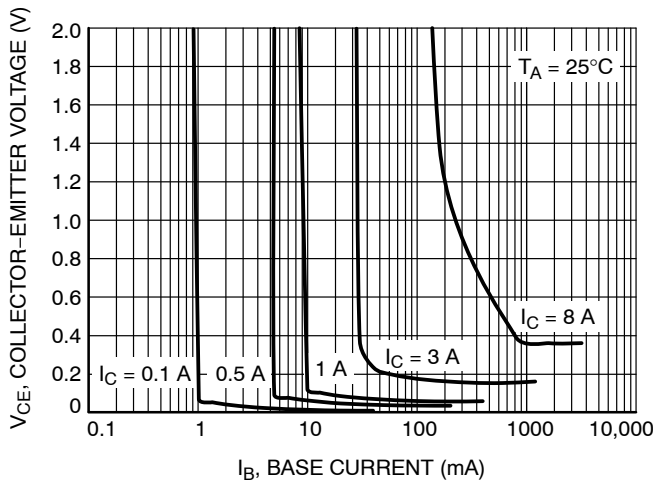


Figure 12. MJD44H11 Collector Saturation Region

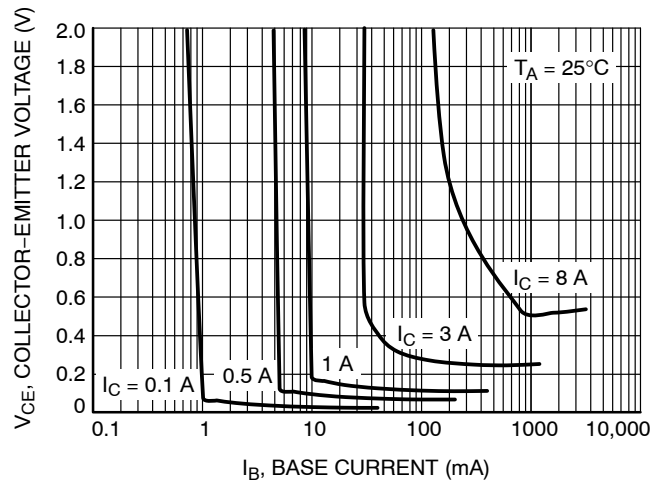


Figure 13. MJD45H11 Collector Saturation Region



Figure 14. MJD44H11 Capacitance

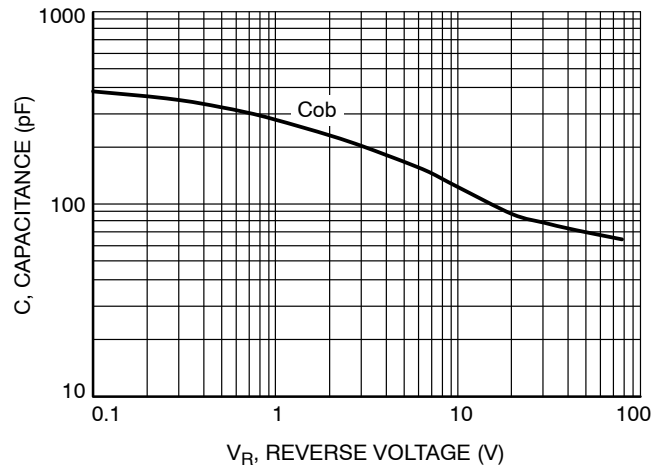
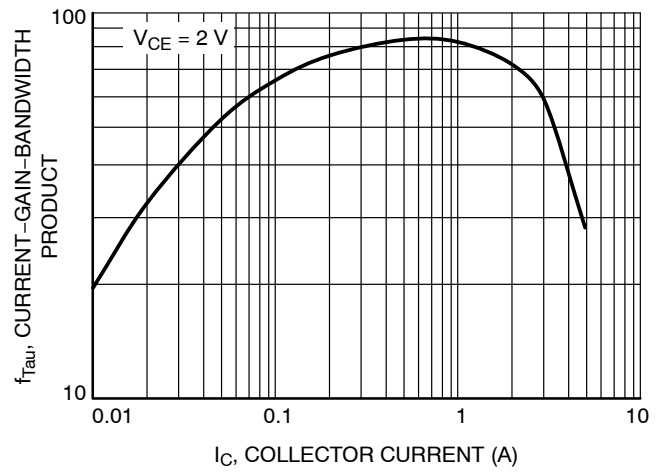


Figure 15. MJD45H11 Capacitance

MJD44H11 (NPN), MJD45H11 (PNP)



**Figure 16. MJD44H11
Current-Gain-Bandwidth Product**



**Figure 17. MJD45H11
Current-Gain-Bandwidth Product**

MJD44H11 (NPN), MJD45H11 (PNP)

ORDERING INFORMATION

| Device | Package Type | Package | Shipping† |
|-------------------|---------------------|---------|---------------------|
| MJD44H11G | DPAK (Pb-Free) | 369C | 75 Units / Rail |
| NJVMJD44H11G | DPAK (Pb-Free) | 369C | 75 Units / Rail |
| MJD44H11-1G | DPAK-3 (Pb-Free) | 369D | 75 Units / Rail |
| MJD44H11RLG | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| NJVMJD44H11RLG* | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| MJD44H11T4G | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD44H11T4G* | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| MJD44H11T5G | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| MJD45H11G | DPAK (Pb-Free) | 369C | 75 Units / Rail |
| NJVMJD45H11G* | DPAK (Pb-Free) | 369C | 75 Units / Rail |
| MJD45H11-1G | DPAK-3 (Pb-Free) | 369D | 75 Units / Rail |
| MJD45H11RLG | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| NJVMJD45H11RLG* | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| MJD45H11T4G | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD45H11T4G* | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD44H11D3T4G* | DPAK (Pb-Free) | 369G | 2,500 / Tape & Reel |
| NJVMJD45H11D3T4G* | DPAK (Pb-Free) | 369G | 2,500 / 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.

*NJV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

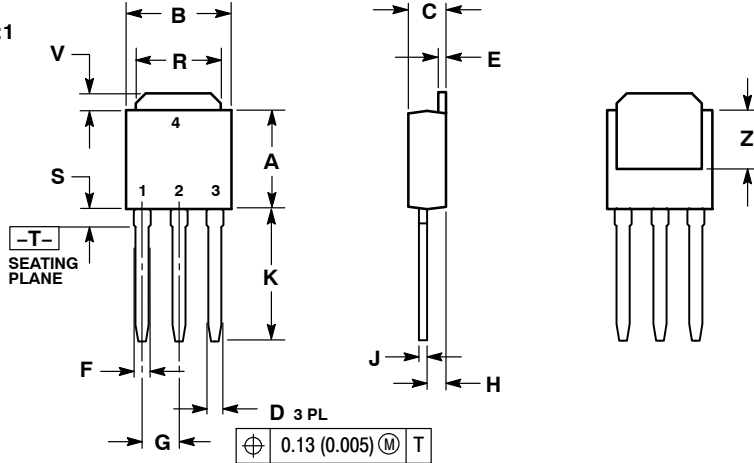
ON Semiconductor®



IPAK CASE 369D-01 ISSUE C

DATE 15 DEC 2010

SCALE 1:1

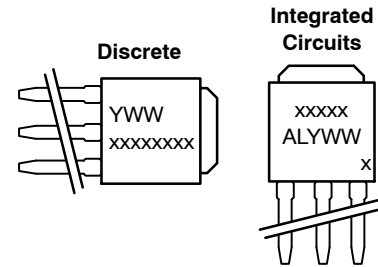


- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.245 | 5.97 | 6.35 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 0.045 | 0.94 | 1.14 |
| G | 0.090 | BSC | 2.29 | BSC |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.350 | 0.380 | 8.89 | 9.65 |
| R | 0.180 | 0.215 | 4.45 | 5.45 |
| S | 0.025 | 0.040 | 0.63 | 1.01 |
| V | 0.035 | 0.050 | 0.89 | 1.27 |
| Z | 0.155 | --- | 3.93 | --- |

- | | | | |
|--|---|--|--|
| <p>STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | <p>STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN</p> | <p>STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE</p> | <p>STYLE 4: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE</p> |
| <p>STYLE 5: PIN 1. GATE 2. ANODE 3. CATHODE 4. ANODE</p> | <p>STYLE 6: PIN 1. MT1 2. MT2 3. GATE 4. MT2</p> | <p>STYLE 7: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | |

MARKING DIAGRAMS



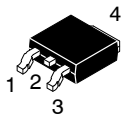
- xxxxxxxx = Device Code
A = Assembly Location
IL = Wafer Lot
Y = Year
WW = Work Week

| | | |
|-------------------------|------------------------------------|--|
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| DESCRIPTION: | IPAK (DPAK INSERTION MOUNT) | PAGE 1 OF 1 |

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 1:1

DPAK (SINGLE GAUGE) CASE 369C ISSUE F

DATE 21 JUL 2015

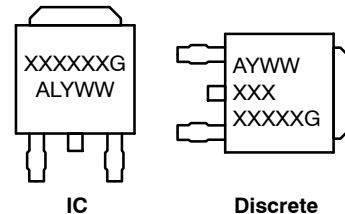


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.086 | 0.094 | 2.18 | 2.38 |
| A1 | 0.000 | 0.005 | 0.00 | 0.13 |
| b | 0.025 | 0.035 | 0.63 | 0.89 |
| b2 | 0.028 | 0.045 | 0.72 | 1.14 |
| b3 | 0.180 | 0.215 | 4.57 | 5.46 |
| c | 0.018 | 0.024 | 0.46 | 0.61 |
| c2 | 0.018 | 0.024 | 0.46 | 0.61 |
| D | 0.235 | 0.245 | 5.97 | 6.22 |
| E | 0.250 | 0.265 | 6.35 | 6.73 |
| e | 0.090 BSC | | 2.29 BSC | |
| H | 0.370 | 0.410 | 9.40 | 10.41 |
| L | 0.055 | 0.070 | 1.40 | 1.78 |
| L1 | 0.114 REF | | 2.90 REF | |
| L2 | 0.020 BSC | | 0.51 BSC | |
| L3 | 0.035 | 0.050 | 0.89 | 1.27 |
| L4 | --- | 0.040 | --- | 1.01 |
| Z | 0.155 | --- | 3.93 | --- |

GENERIC MARKING DIAGRAM*

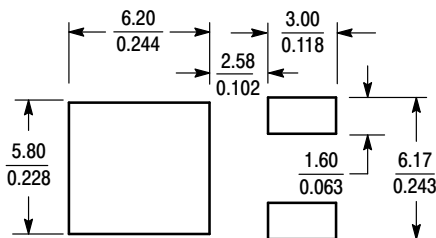


- XXXXXX = Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking.

- | | | | | |
|--|--|---|---|--|
| <p>STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | <p>STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN</p> | <p>STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE</p> | <p>STYLE 4: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE</p> | <p>STYLE 5: PIN 1. GATE 2. ANODE 3. CATHODE 4. ANODE</p> |
| <p>STYLE 6: PIN 1. MT1 2. MT2 3. GATE 4. MT2</p> | <p>STYLE 7: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | <p>STYLE 8: PIN 1. N/C 2. CATHODE 3. ANODE 4. CATHODE</p> | <p>STYLE 9: PIN 1. ANODE 2. CATHODE 3. RESISTOR ADJUST 4. CATHODE</p> | <p>STYLE 10: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. ANODE</p> |

SOLDERING FOOTPRINT*



SCALE 3:1 (mm / inches)

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

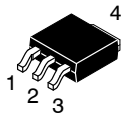
| | | |
|------------------|---------------------|--|
| DOCUMENT NUMBER: | 98AON10527D | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | DPAK (SINGLE GAUGE) | PAGE 1 OF 1 |

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®

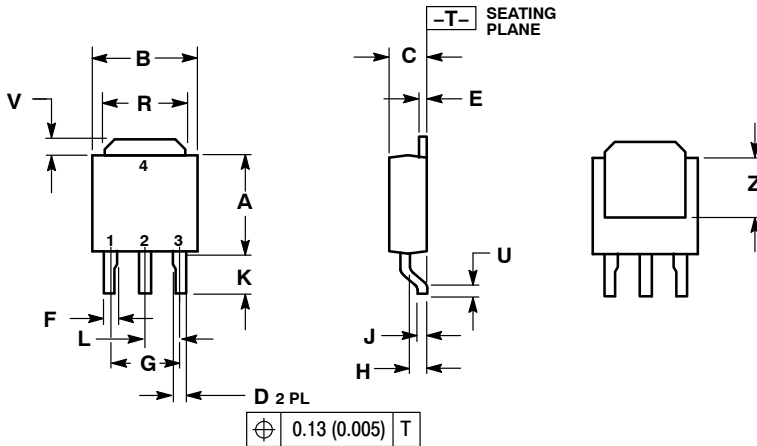


SCALE 1:1

DPAK-3, SURFACE MOUNT

CASE 369G-01
ISSUE O

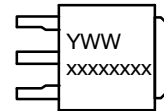
DATE 23 DEC 2003



- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.245 | 5.97 | 6.22 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 0.045 | 0.94 | 1.14 |
| G | 0.180 | BSC | 4.58 | BSC |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.102 | 0.114 | 2.60 | 2.89 |
| L | 0.090 | BSC | 2.29 | BSC |
| R | 0.180 | 0.215 | 4.57 | 5.45 |
| U | 0.020 | --- | 0.51 | --- |
| V | 0.035 | 0.050 | 0.89 | 1.27 |
| Z | 0.155 | --- | 3.93 | --- |

GENERIC MARKING DIAGRAM*



xxxxxxx = Device Code
Y = Year
WW = Work Week

- | | | | |
|--|---|--|--|
| <p>STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR</p> | <p>STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN</p> | <p>STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE</p> | <p>STYLE 4: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE</p> |
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*This information is generic. Please refer to device data sheet for actual part marking.

| | | |
|-------------------------|------------------------------|--|
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| DESCRIPTION: | DPAK-3, SURFACE MOUNT | PAGE 1 OF 1 |

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