

## Features

- Epitaxial Planar Die Construction
- Ideal for Medium Power Amplification and Switching
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

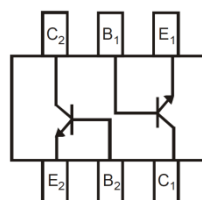
## Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Finish; Solderable per MIL-STD-202, Method 208 
- Weight: 0.006 grams (Approximate)

SOT363



Top View



Device Schematic  
Top View

## Ordering Information (Note 5)

| Product       | Status | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|---------------|--------|------------|---------|--------------------|-----------------|-------------------|
| MMDT3904Q-7-F | Active | Automotive | K6N     | 7                  | 8               | 3,000             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information

SOT363



K6N = Product Type Marking Code  
YM = Date Code Marking  
Y or  $\bar{Y}$  = Year (ex: D = 2016)  
M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

| Year | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|------|------|------|------|------|------|------|------|------|
| Code | D    | E    | F    | G    | H    | I    | J    | K    |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic            | Symbol           | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage    | V <sub>CBO</sub> | 60    | V    |
| Collector-Emitter Voltage | V <sub>CEO</sub> | 40    | V    |
| Emitter-Base Voltage      | V <sub>EBO</sub> | 6.0   | V    |
| Collector Current         | I <sub>C</sub>   | 200   | mA   |

**Thermal Characteristics**

| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 6)                       | P <sub>D</sub>                    | 200         | mW   |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 625         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 7)

| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--------------------------------------------|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

Notes: 6. For the device mounted on minimum recommended pad layout FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.  
 7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

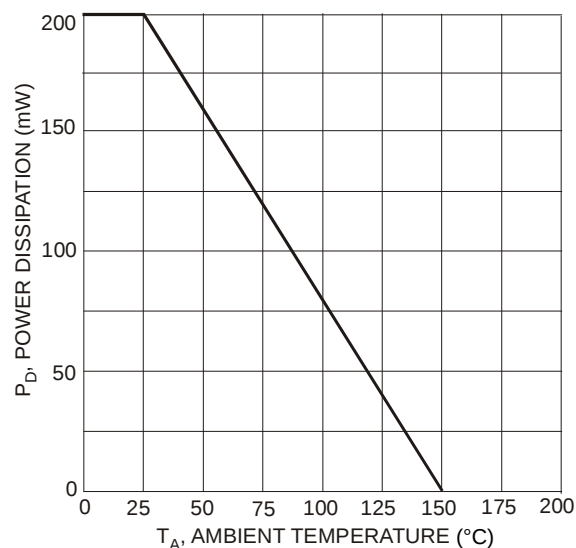
**Thermal Characteristic and Derating Information**


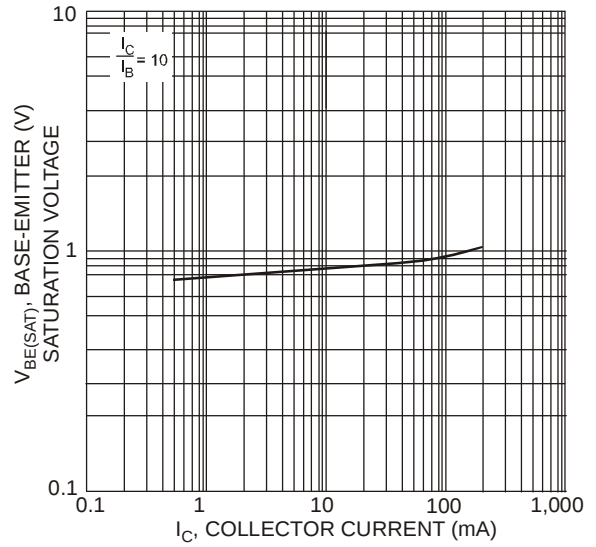
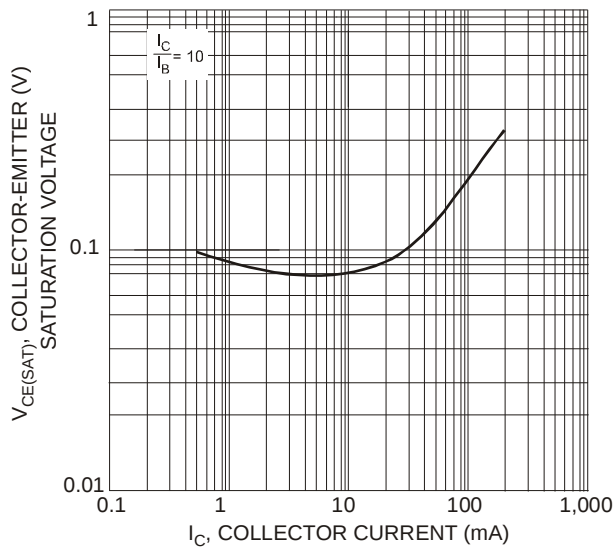
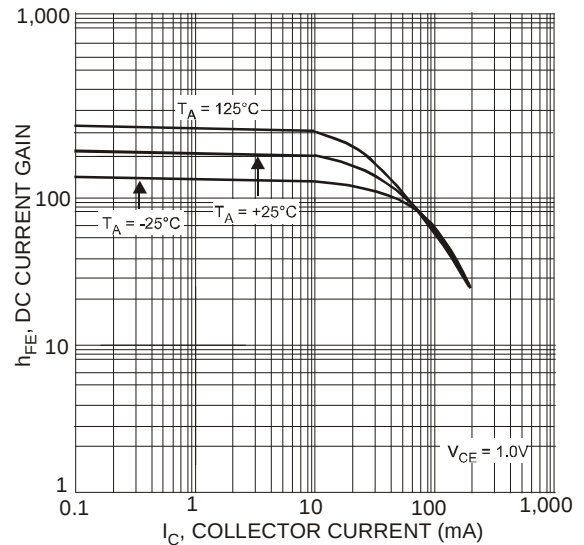
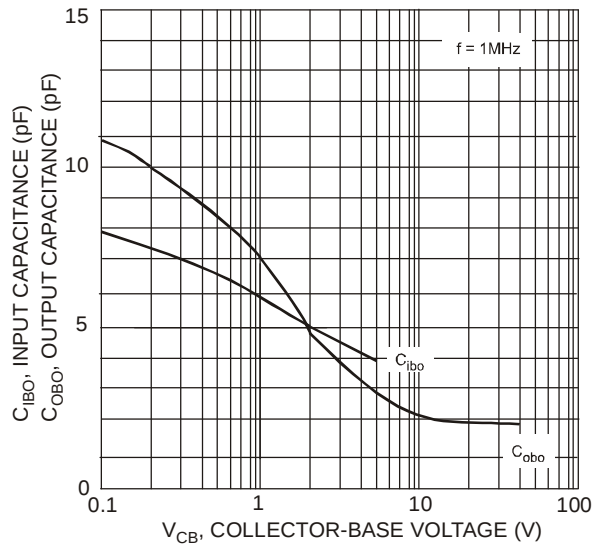
Fig. 1, Power Dissipation vs. Ambient Temperature (Total Device)

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                               | Symbol               | Min       | Max          | Unit               | Test Condition                                                                                 |
|----------------------------------------------|----------------------|-----------|--------------|--------------------|------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS</b>                   |                      |           |              |                    |                                                                                                |
| Collector-Base Breakdown Voltage             | BV <sub>CBO</sub>    | 60        | —            | V                  | I <sub>C</sub> = 100μA, I <sub>E</sub> = 0                                                     |
| Collector-Emitter Breakdown Voltage (Note 8) | BV <sub>CEO</sub>    | 40        | —            | V                  | I <sub>C</sub> = 10.0mA, I <sub>B</sub> = 0                                                    |
| Emitter-Base Breakdown Voltage               | BV <sub>EBO</sub>    | 6.0       | —            | V                  | I <sub>E</sub> = 100μA, I <sub>C</sub> = 0                                                     |
| Collector-Base Cut-Off Current               | I <sub>CBO</sub>     | —         | 50           | nA                 | V <sub>CB</sub> = 50V                                                                          |
| Collector-Emitter Cut-Off Current            | I <sub>CEV</sub>     | —         | 50           | nA                 | V <sub>CE</sub> = 40V, V <sub>BE(OFF)</sub> = 3.0V                                             |
|                                              |                      |           | 50           |                    | V <sub>CE</sub> = 40V, V <sub>BE(ON)</sub> = 0.25V                                             |
| Emitter-Base Cut-Off Current                 | I <sub>EBO</sub>     | —         | 50           | nA                 | V <sub>EB</sub> = 5V                                                                           |
| <b>ON CHARACTERISTICS</b> (Note 8)           |                      |           |              |                    |                                                                                                |
| DC Current Gain                              | h <sub>FE</sub>      | 40        | —            | —                  | I <sub>C</sub> = 100μA, V <sub>CE</sub> = 1.0V                                                 |
|                                              |                      | 70        | —            |                    | I <sub>C</sub> = 1.0mA, V <sub>CE</sub> = 1.0V                                                 |
|                                              |                      | 100       | 300          |                    | I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1.0V                                                  |
|                                              |                      | 60        | —            |                    | I <sub>C</sub> = 50mA, V <sub>CE</sub> = 1.0V                                                  |
|                                              |                      | 30        | —            |                    | I <sub>C</sub> = 100mA, V <sub>CE</sub> = 1.0V                                                 |
| Collector-Emitter Saturation Voltage         | V <sub>CE(SAT)</sub> | —         | 0.20<br>0.30 | V                  | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA<br>I <sub>C</sub> = 50mA, I <sub>B</sub> = 5.0mA |
| Base-Emitter Saturation Voltage              | V <sub>BE(SAT)</sub> | 0.65<br>— | 0.85<br>0.95 | V                  | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA<br>I <sub>C</sub> = 50mA, I <sub>B</sub> = 5.0mA |
| <b>SMALL SIGNAL CHARACTERISTICS</b>          |                      |           |              |                    |                                                                                                |
| Output Capacitance                           | C <sub>obo</sub>     | —         | 4.0          | pF                 | V <sub>CB</sub> = 5.0V, f = 1.0MHz, I <sub>E</sub> = 0                                         |
| Input Capacitance                            | C <sub>ibo</sub>     | —         | 8.0          | pF                 | V <sub>EB</sub> = 0.5V, f = 1.0MHz, I <sub>C</sub> = 0                                         |
| Input Impedance                              | h <sub>ie</sub>      | 1.0       | 10           | kΩ                 | V <sub>CE</sub> = 10V, I <sub>C</sub> = 1.0mA,<br>f = 1.0kHz                                   |
| Voltage Feedback Ratio                       | h <sub>re</sub>      | 0.5       | 8.0          | × 10 <sup>-4</sup> |                                                                                                |
| Small Signal Current Gain                    | h <sub>fe</sub>      | 100       | 400          | —                  |                                                                                                |
| Output Admittance                            | h <sub>oe</sub>      | 1.0       | 40           | μS                 |                                                                                                |
| Current Gain-Bandwidth Product               | f <sub>T</sub>       | 300       | —            | MHz                | V <sub>CE</sub> = 20V, I <sub>C</sub> = 10mA,<br>f = 100MHz                                    |
| Noise Figure                                 | NF                   | —         | 5.0          | dB                 | V <sub>CE</sub> = 5.0V, I <sub>C</sub> = 100μA,<br>R <sub>S</sub> = 1.0kΩ, f = 1.0kHz          |
| <b>SWITCHING CHARACTERISTICS</b>             |                      |           |              |                    |                                                                                                |
| Delay Time                                   | t <sub>D</sub>       | —         | 35           | ns                 | V <sub>CC</sub> = 3.0V, I <sub>C</sub> = 10mA,                                                 |
| Rise Time                                    | t <sub>R</sub>       | —         | 35           | ns                 | V <sub>BE(OFF)</sub> = -0.5V, I <sub>B1</sub> = 1.0mA                                          |
| Storage Time                                 | t <sub>S</sub>       | —         | 200          | ns                 | V <sub>CC</sub> = 3.0V, I <sub>C</sub> = 10mA,                                                 |
| Fall Time                                    | t <sub>F</sub>       | —         | 50           | ns                 | I <sub>B1</sub> = -I <sub>B2</sub> = 1.0mA                                                     |

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

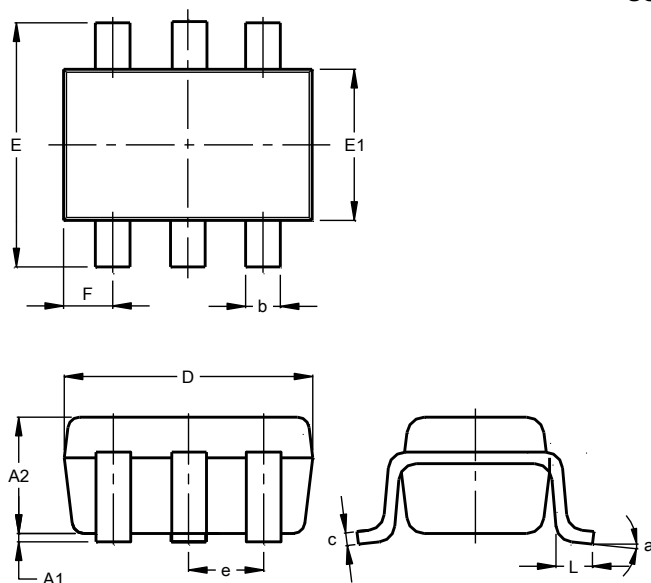
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT363

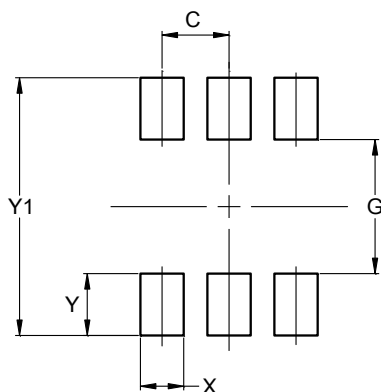


| SOT363               |           |      |       |
|----------------------|-----------|------|-------|
| Dim                  | Min       | Max  | Typ   |
| A1                   | 0.00      | 0.10 | 0.05  |
| A2                   | 0.90      | 1.00 | 1.00  |
| b                    | 0.10      | 0.30 | 0.25  |
| c                    | 0.10      | 0.22 | 0.11  |
| D                    | 1.80      | 2.20 | 2.15  |
| E                    | 2.00      | 2.20 | 2.10  |
| E1                   | 1.15      | 1.35 | 1.30  |
| e                    | 0.650 BSC |      |       |
| F                    | 0.40      | 0.45 | 0.425 |
| L                    | 0.25      | 0.40 | 0.30  |
| a                    | 0°        | 8°   | --    |
| All Dimensions in mm |           |      |       |

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT363



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.420         |
| Y          | 0.600         |
| Y1         | 2.500         |

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