

## Description

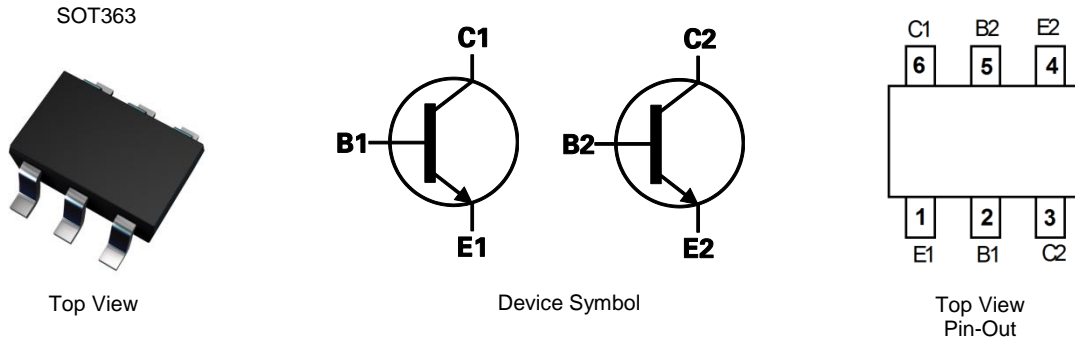
This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of Automotive Applications.

## Features

- $BV_{CEO} > 40V$
- $I_C = 600mA$  High Collector Current
- 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 208③
- Weight: 0.006 grams (Approximate)

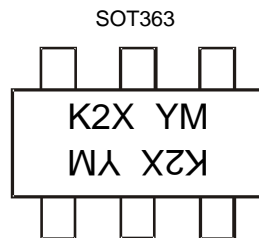


## Ordering Information (Note 5)

Product	Compliance	Marking	Reel Size (inch)	Tape Width (mm)	Quantity per Reel
MMDT4401Q-7-F	Automotive	K2X	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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



K2X = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: E = 2017)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

Year	2017	2018	2019	2020	2021	2022	2023	2024
Code	E	F	G	H	I	J	K	L

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>CB0</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>	600	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 and 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

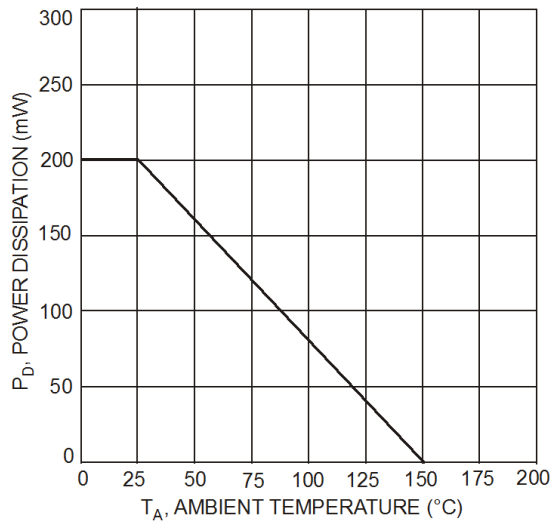


Fig. 1 Max Power Dissipation vs. Ambient Temperature

**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-Emitter Cut-Off Current	I <sub>CEX</sub>	—	100	nA	V <sub>CE</sub> = 35V, V <sub>EB(OFF)</sub> = 0.4V
Base Cut-Off Current	I <sub>BL</sub>	—	100	nA	V <sub>CE</sub> = 35V, V <sub>EB(OFF)</sub> = 0.4V
<b>ON CHARACTERISTICS (Note 8)</b>					
DC Current Gain	h <sub>FE</sub>	20	—	—	I <sub>C</sub> = 100μA, V <sub>CE</sub> = 1.0V
		40	—		I <sub>C</sub> = 1.0mA, V <sub>CE</sub> = 1.0V
		80	—		I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1.0V
		100	300		I <sub>C</sub> = 150mA, V <sub>CE</sub> = 1.0V
		40	—		I <sub>C</sub> = 500mA, V <sub>CE</sub> = 2.0V
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	—	0.40 0.75	V	I <sub>C</sub> = 150mA, I <sub>B</sub> = 15mA I <sub>C</sub> = 500mA, I <sub>B</sub> = 50mA
Base-Emitter Saturation Voltage	V <sub>BE(SAT)</sub>	0.75 —	0.95 1.2	V	I <sub>C</sub> = 150mA, I <sub>B</sub> = 15mA I <sub>C</sub> = 500mA, I <sub>B</sub> = 50mA
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	C <sub>obo</sub>	—	6.5	pF	V <sub>CB</sub> = 5.0V, f = 1.0MHz, I <sub>E</sub> = 0
Input Capacitance	C <sub>ibo</sub>	—	30	pF	V <sub>EB</sub> = 0.5V, f = 1.0MHz, I <sub>C</sub> = 0
Input Impedance	h <sub>ie</sub>	1.0	15	kΩ	V <sub>CE</sub> = 10V, I <sub>C</sub> = 1.0mA, f = 1.0kHz
Voltage Feedback Ratio	h <sub>re</sub>	0.1	8.0	x 10 <sup>-4</sup>	
Small Signal Current Gain	h <sub>fe</sub>	40	500	—	
Output Admittance	h <sub>oe</sub>	1.0	30	μs	
Current Gain-Bandwidth Product	f <sub>T</sub>	250	—	MHz	V <sub>CE</sub> = 30V, I <sub>C</sub> = 150mA, f = 100MHz
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	t <sub>D</sub>	—	15	ns	V <sub>CC</sub> = 30V, I <sub>C</sub> = 150mA, V <sub>BE(OFF)</sub> = 2.0V, I <sub>B1</sub> = 15mA
Rise Time	t <sub>R</sub>	—	20	ns	
Storage Time	t <sub>S</sub>	—	225	ns	V <sub>CC</sub> = 30V, I <sub>C</sub> = 150mA, I <sub>B1</sub> = - I <sub>B2</sub> = 15mA
Fall Time	t <sub>F</sub>	—	30	ns	

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

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

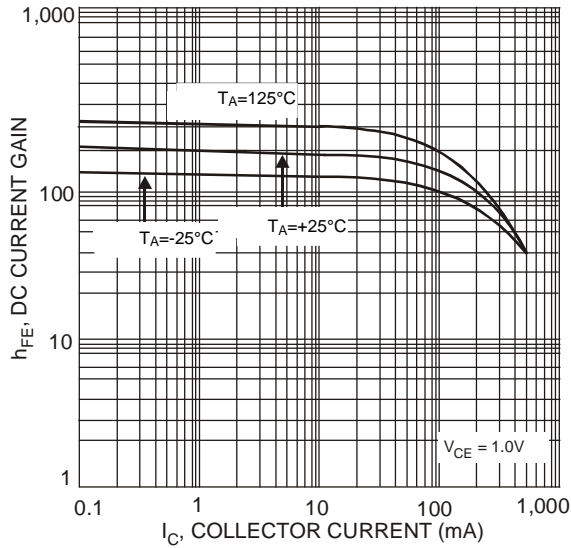


Fig. 2 Typical DC Current Gain vs. Collector Current

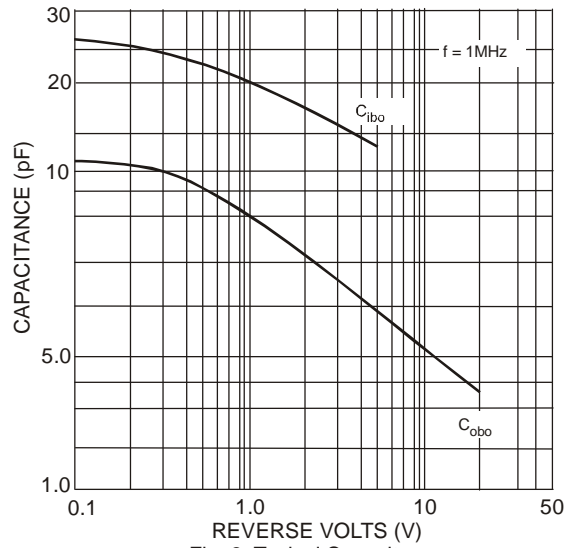


Fig. 3 Typical Capacitance

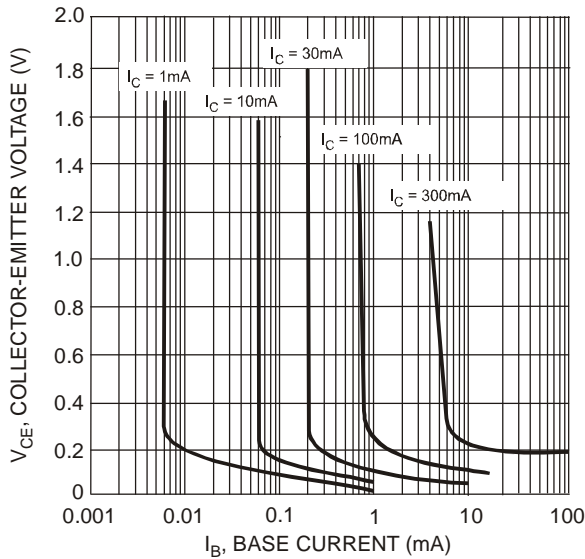


Fig. 4 Typical Collector Saturation Region

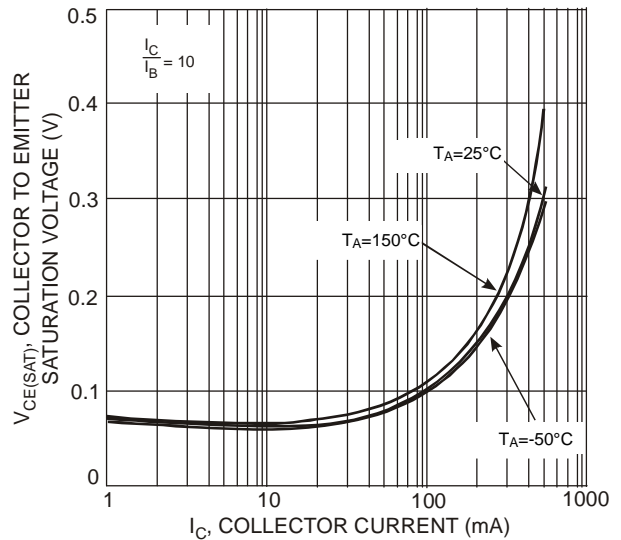


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

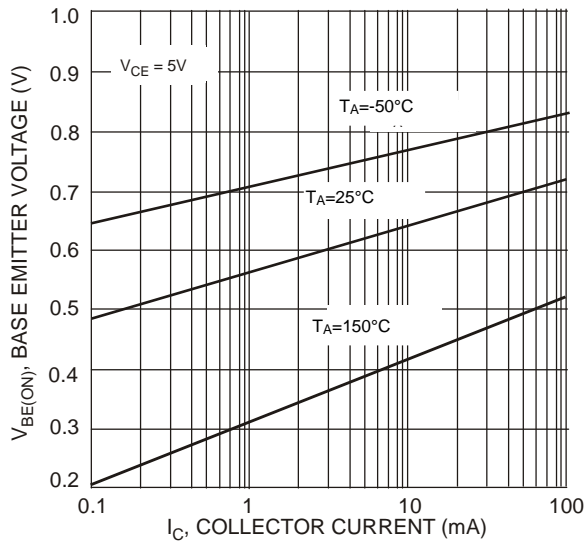


Fig. 6 Base Emitter Voltage vs. Collector Current

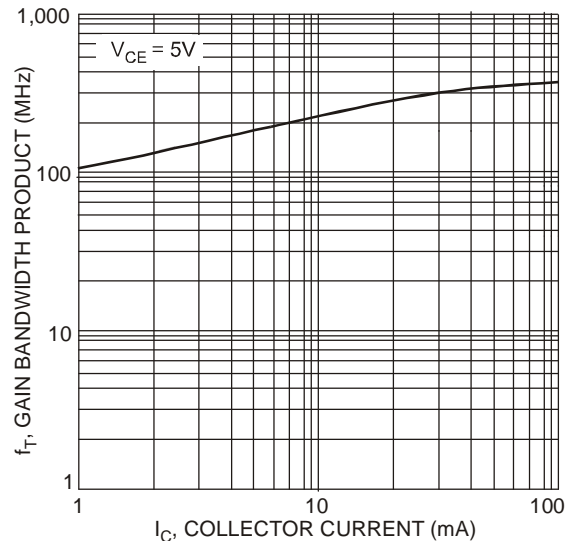
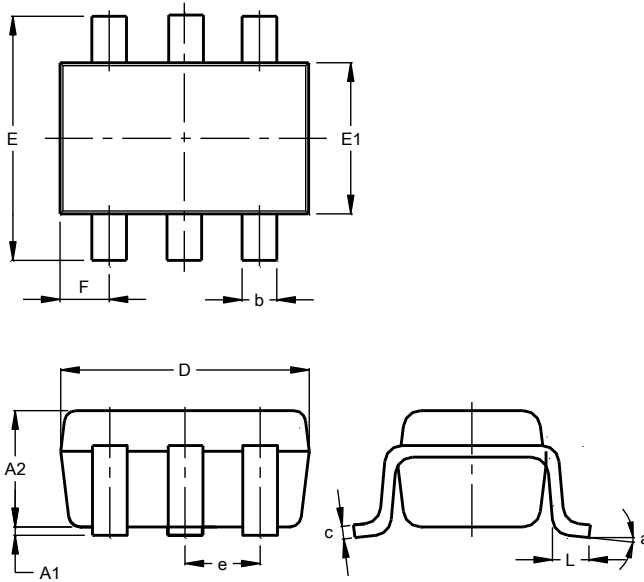


Fig. 7 Gain Bandwidth Product vs. Collector Current

**Package Outline Dimensions**

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

**SOT363**

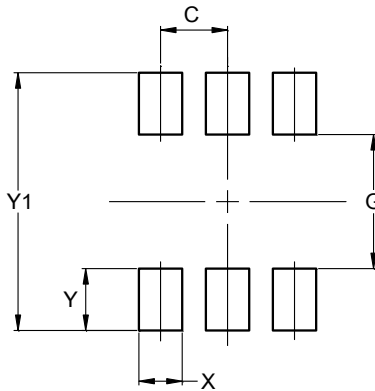


SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	1.00
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

**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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