



**THE DATASHEET OF  
CTA2N1P-7-F**

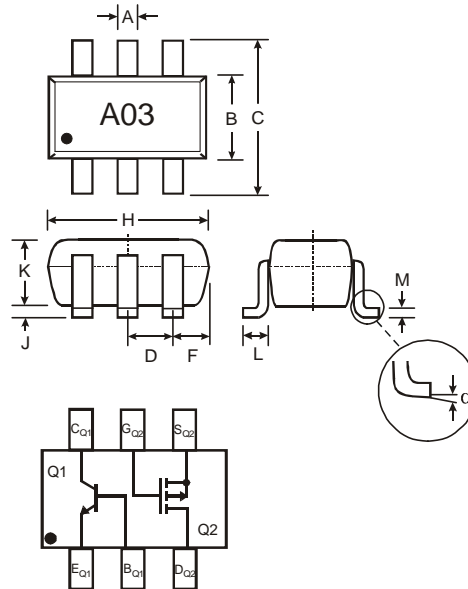


**Features**

- Combines MMBT4401 type transistor with BSS84 type MOSFET
- Small Surface Mount Package
- PNP/N-Channel Complement Available: CTA2P1N
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 3 and 4)**

**Mechanical Data**

- Case: SOT-363
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Terminal Connections: See Diagram
- Marking Information: A03, See Page 6
- Ordering Information: See Page 6
- Weight: 0.006 grams (approximate)



SOT-363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Nominal	
F	0.30	0.40
H	1.80	2.20
J	—	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.25
$\alpha$	0°	8°
All Dimensions in mm		

**Maximum Ratings, Total Device** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 1)	P <sub>d</sub>	150	mW
Thermal Resistance, Junction to Ambient (Note 1)	R <sub>θJA</sub>	833	°C/W
Operating and Storage Temperature Range	T <sub>j</sub> , T <sub>STG</sub>	-55 to +150	°C

**Maximum Ratings, Q1, MMBT4401 NPN Transistor Element** @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>CE0</sub>	40	V
Emitter-Base Voltage	V <sub>EB0</sub>	6.0	V
Collector Current - Continuous	I <sub>c</sub>	600	mA

**Maximum Ratings, Q2, BSS84 P-Channel MOSFET Element** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	-50	V
Drain-Gate Voltage R <sub>GS</sub> ≤ 1.0MΩ	V <sub>DGR</sub>	-50	V
Gate-Source Voltage Continuous	V <sub>GSS</sub>	±20	V
Drain Current Continuous	I <sub>D</sub>	-130	mA

- Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.
  2. No purposefully added lead.
  3. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).
  4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

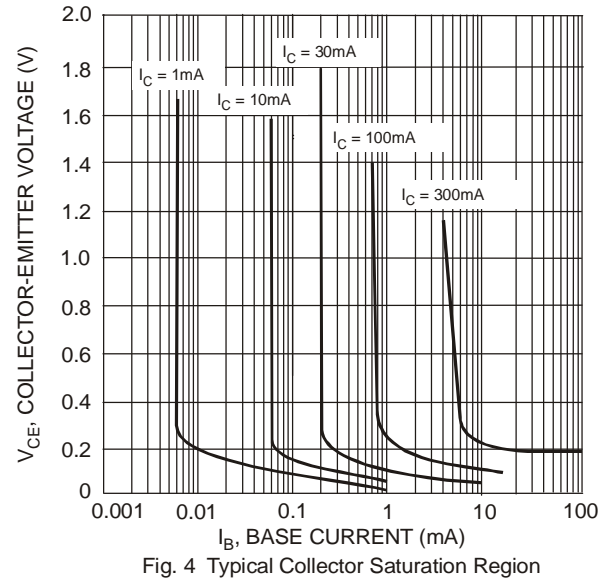
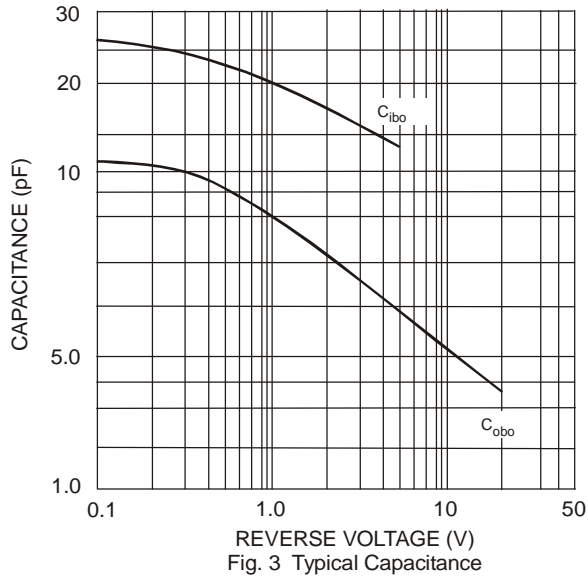
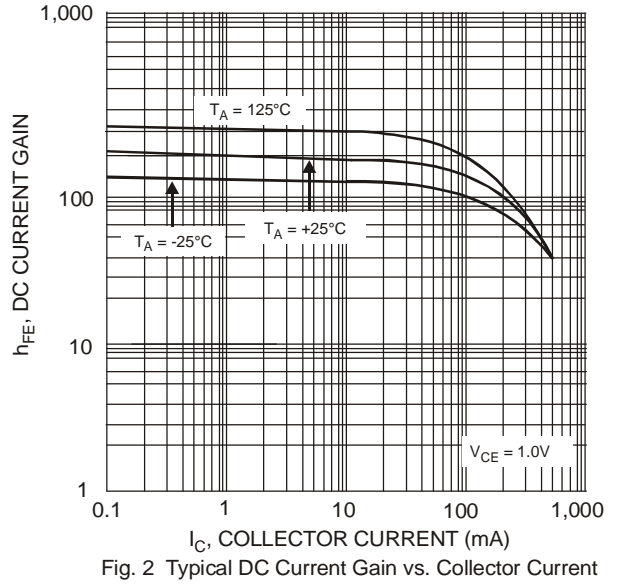
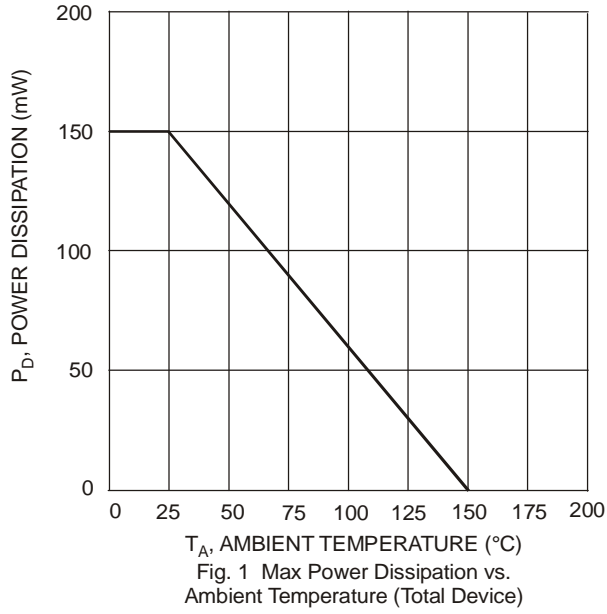
**Electrical Characteristics, Q1, MMBT4401 NPN Transistor Element** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition	
<b>OFF CHARACTERISTICS (Note 5)</b>						
Collector-Base Breakdown Voltage	V <sub>(BR)CBO</sub>	60	—	V	I <sub>C</sub> = 100μA, I <sub>E</sub> = 0	
Collector-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	40	—	V	I <sub>C</sub> = 1.0mA, I <sub>B</sub> = 0	
Emitter-Base Breakdown Voltage	V <sub>(BR)EBO</sub>	6.0	—	V	I <sub>E</sub> = 100μA, I <sub>C</sub> = 0	
Collector Cutoff Current	I <sub>CEX</sub>	—	100	nA	V <sub>CE</sub> = 35V, V <sub>EB(OFF)</sub> = 0.4V	
Base Cutoff Current	I <sub>BL</sub>	—	100	nA	V <sub>CE</sub> = 35V, V <sub>EB(OFF)</sub> = 0.4V	
<b>ON CHARACTERISTICS (Note 5)</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>cb</sub>	—	6.5	pF	V <sub>CB</sub> = 5.0V, f = 1.0MHz, I <sub>E</sub> = 0	
Input Capacitance	C <sub>eb</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		
<b>SWITCHING CHARACTERISTICS</b>						
Delay Time	t <sub>d</sub>	—	15	ns	V <sub>CC</sub> = 30V, I <sub>C</sub> = 150mA,	
Rise Time	t <sub>r</sub>	—	20	ns	V <sub>BE(off)</sub> = 2.0V, I <sub>B1</sub> = 15mA	
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		

**Electrical Characteristics, Q2, BSS84 P-Channel MOSFET Element** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 5)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-50	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-15	μA	V <sub>DS</sub> = -50V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C
		—	—	-60	μA	V <sub>DS</sub> = -50V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
		—	—	-100	nA	V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C
Gate-Body Leakage	I <sub>GSS</sub>	—	—	±10	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 5)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.8	—	-2.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -1mA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	—	10	Ω	V <sub>GS</sub> = -5V, I <sub>D</sub> = 0.100A
Forward Transconductance	g <sub>FS</sub>	.05	—	—	S	V <sub>DS</sub> = -25V, I <sub>D</sub> = 0.1A
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>iSS</sub>	—	—	45	pF	V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	—	25	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	—	12	pF	
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	—	10	—	ns	V <sub>DD</sub> = -30V, I <sub>D</sub> = -0.27A,
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	18	—	ns	R <sub>GEN</sub> = 50Ω, V <sub>GS</sub> = -10V

Notes: 5. Short duration pulse test used to minimize self-heating effect.



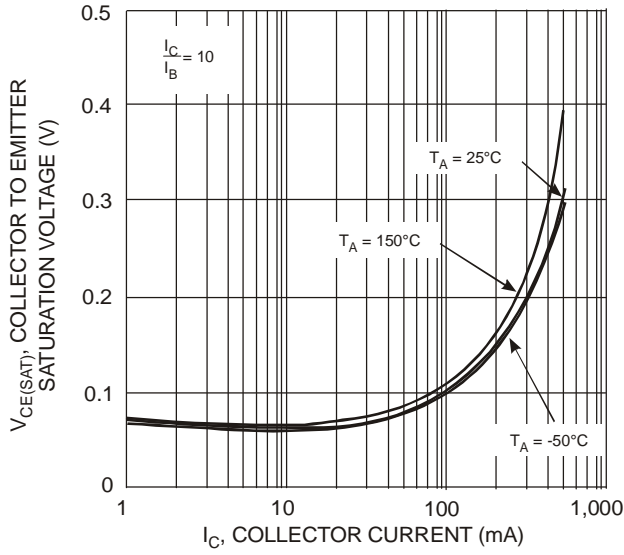


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

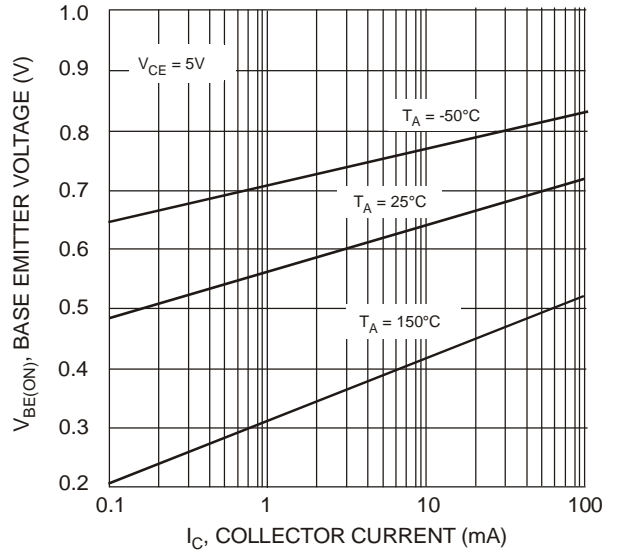


Fig. 6 Base Emitter Voltage vs. Collector Current

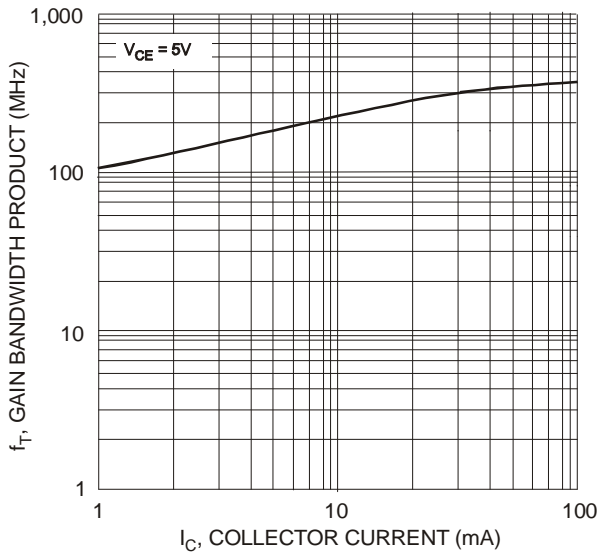


Fig. 7 Gain Bandwidth Product vs. Collector Current

NEW PRODUCT

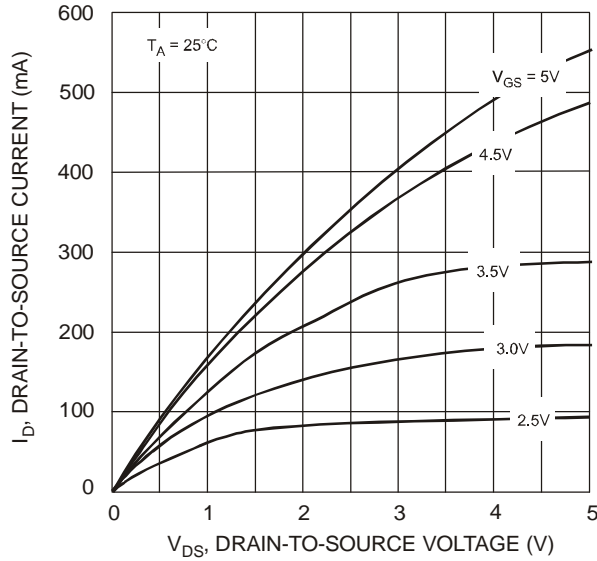


Fig. 8 Drain-Source Current vs. Drain-Source Voltage

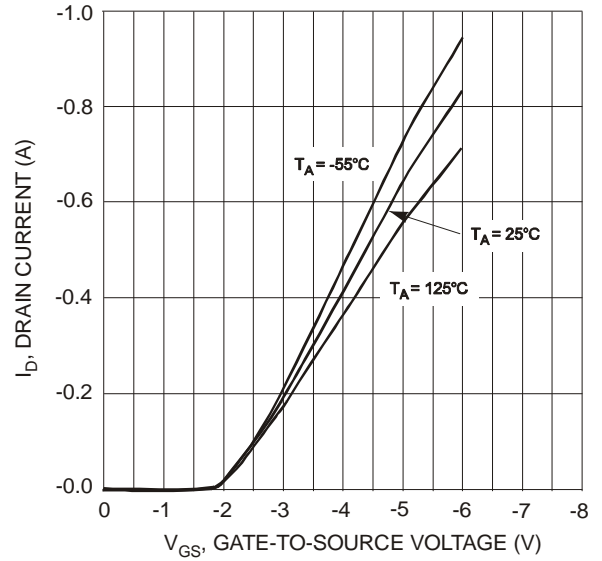


Fig. 9 Drain Current vs. Gate Source Voltage

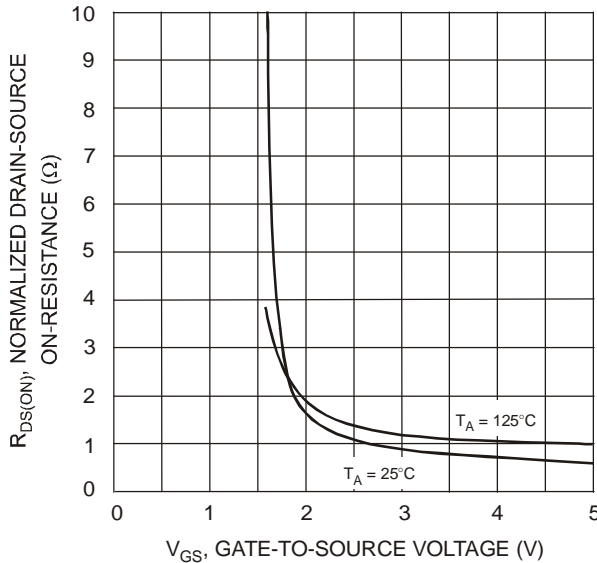


Fig. 10 On-Resistance vs. Gate-Source Voltage

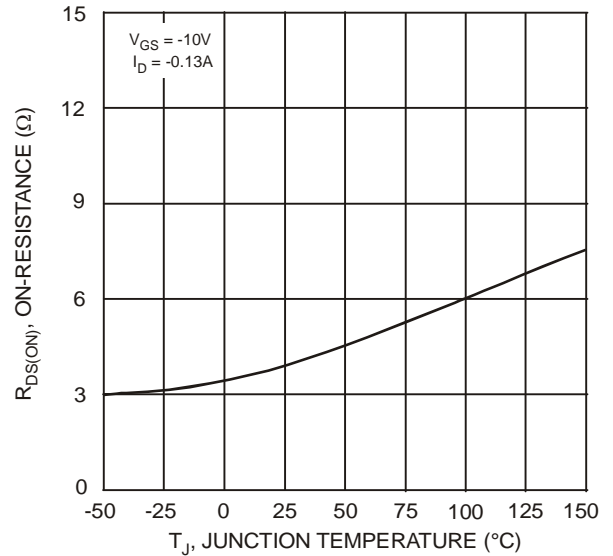


Fig. 11 On-Resistance vs. Junction Temperature

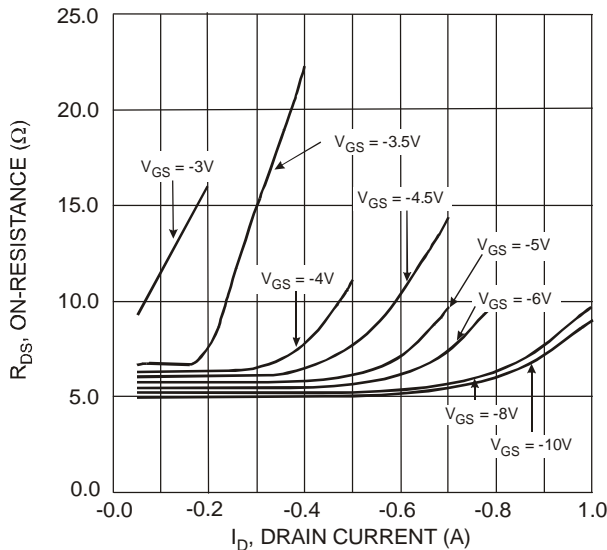


Fig. 12, On-Resistance vs. Drain Current

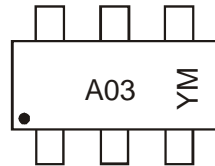
NEW PRODUCT

## Ordering Information (Note 6)

Device	Packaging	Shipping
CTA2N1P-7-F	SOT-363	3000/Tape & Reel

Notes: 6. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



A03 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: T = 2006  
 M = Month ex: 9 = September

### Date Code Key

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Code	M	N	P	R	S	T	U	V	W	X	Y	Z

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

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