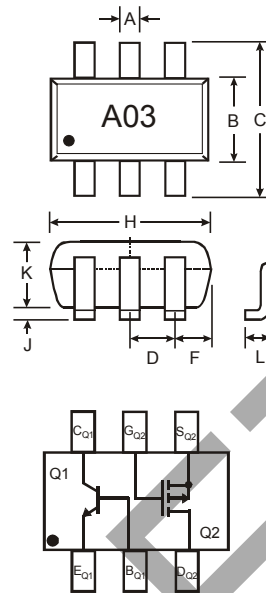


**Features**

- 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
α	0°	8°

All Dimensions in mm

**Maximum Ratings, Total Device** @<sub>T<sub>A</sub></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** @<sub>T<sub>A</sub></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 - Continuous	I <sub>C</sub>	600	mA

**Maximum Ratings, Q2, BSS84 P-Channel MOSFET Element** @<sub>T<sub>A</sub></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.

OBSOLETE - PART DISCONTINUED

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

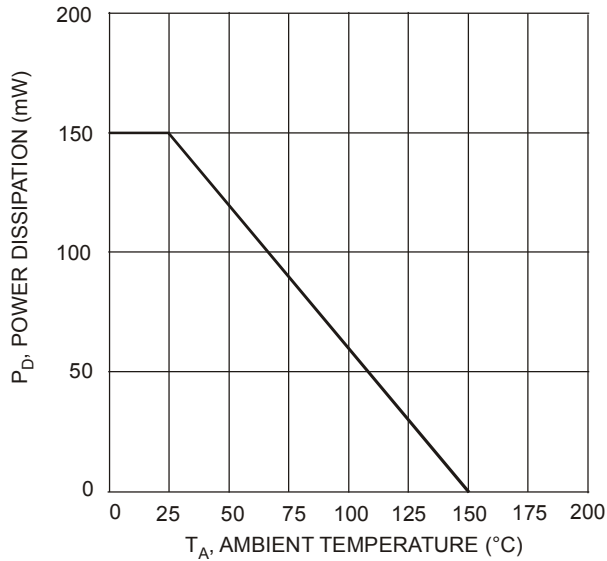
Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 5)</b>					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	$I_C = 100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$I_C = 1.0mA, I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	$I_E = 100\mu A, I_C = 0$
Collector Cutoff Current	$I_{CEX}$	—	100	nA	$V_{CE} = 35V, V_{EB(OFF)} = 0.4V$
Base Cutoff Current	$I_{BL}$	—	100	nA	$V_{CE} = 35V, V_{EB(OFF)} = 0.4V$
<b>ON CHARACTERISTICS (Note 5)</b>					
DC Current Gain	$h_{FE}$	20	—	—	$I_C = 100\mu A, V_{CE} = 1.0V$ $I_C = 1.0mA, V_{CE} = 1.0V$ $I_C = 10mA, V_{CE} = 1.0V$ $I_C = 150mA, V_{CE} = 1.0V$ $I_C = 500mA, V_{CE} = 2.0V$
		40	—		
		80	—		
		100	300		
		40	—		
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.40 0.75	V	$I_C = 150mA, I_B = 15mA$ $I_C = 500mA, I_B = 50mA$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.75	0.95 1.2	V	$I_C = 150mA, I_B = 15mA$ $I_C = 500mA, I_B = 50mA$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{cb}$	—	6.5	pF	$V_{CB} = 5.0V, f = 1.0MHz, I_E = 0$
Input Capacitance	$C_{eb}$	—	30	pF	$V_{EB} = 0.5V, f = 1.0MHz, I_C = 0$
Input Impedance	$h_{ie}$	1.0	15	k $\Omega$	$V_{CE} = 10V, I_C = 1.0mA,$ $f = 1.0kHz$
Voltage Feedback Ratio	$h_{re}$	0.1	8.0	$\times 10^{-4}$	
Small Signal Current Gain	$h_{fe}$	40	500	—	
Output Admittance	$h_{oe}$	1.0	30	$\mu S$	
Current Gain-Bandwidth Product	$f_T$	250	—	MHz	
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	$t_d$	—	15	ns	$V_{CC} = 30V, I_C = 150mA,$
Rise Time	$t_r$	—	20	ns	$V_{BE(off)} = 2.0V, I_{B1} = 15mA$
Storage Time	$t_s$	—	225	ns	$V_{CC} = 30V, I_C = 150mA,$
Fall Time	$t_f$	—	30	ns	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 5)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-50	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-15	$\mu A$	$V_{DS} = -50V, V_{GS} = 0V, T_J = 25^\circ C$
		—	—	-60	$\mu A$	$V_{DS} = -50V, V_{GS} = 0V, T_J = 125^\circ C$
		—	—	-100	nA	$V_{DS} = -25V, V_{GS} = 0V, T_J = 25^\circ C$
Gate-Body Leakage	$I_{GSS}$	—	—	$\pm 10$	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 5)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	-0.8	—	-2.0	V	$V_{DS} = V_{GS}, I_D = -1mA$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	10	$\Omega$	$V_{GS} = -5V, I_D = 0.100A$
Forward Transconductance	$g_{FS}$	.05	—	—	S	$V_{DS} = -25V, I_D = 0.1A$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{iss}$	—	—	45	pF	$V_{DS} = -25V, V_{GS} = 0V$ $f = 1.0MHz$
Output Capacitance	$C_{oss}$	—	—	25	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	—	12	pF	
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{D(ON)}$	—	10	—	ns	$V_{DD} = -30V, I_D = -0.27A,$
Turn-Off Delay Time	$t_{D(OFF)}$	—	18	—	ns	$R_{GEN} = 50\Omega, V_{GS} = -10V$

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

**MMBT4401 Section**



$T_A$ , AMBIENT TEMPERATURE (°C)  
Fig. 1 Max Power Dissipation vs. Ambient Temperature (Total Device)

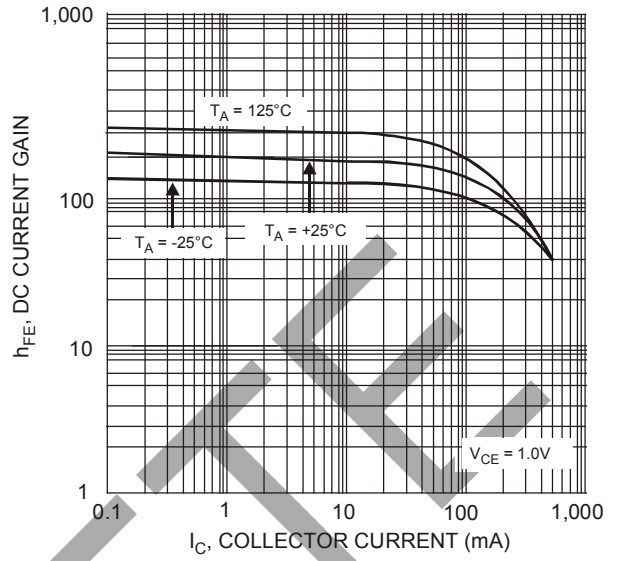


Fig. 2 Typical DC Current Gain vs. Collector Current

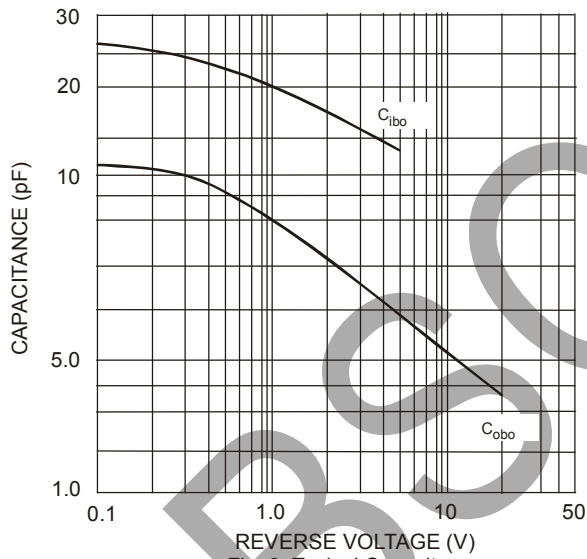


Fig. 3 Typical Capacitance

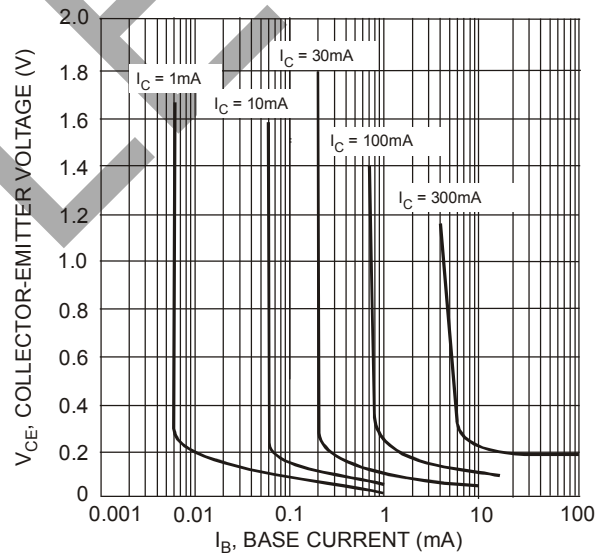


Fig. 4 Typical Collector Saturation Region

**MMBT4401 Section**

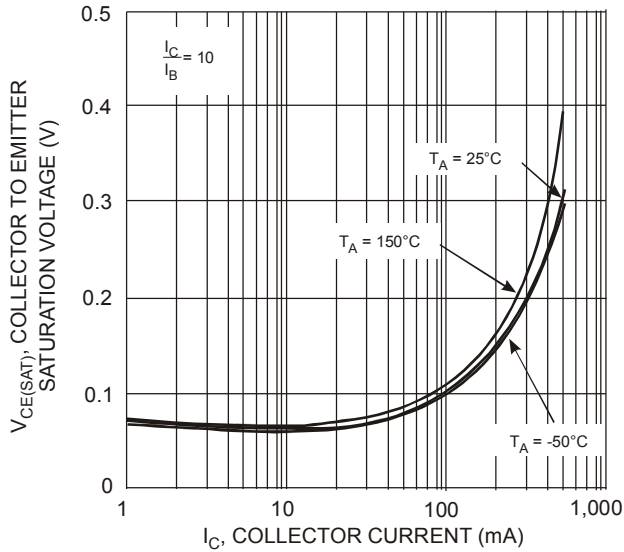


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

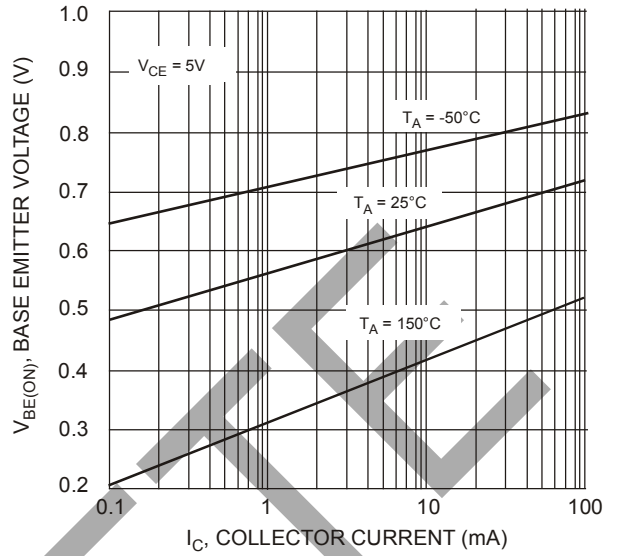


Fig. 6 Base Emitter Voltage vs. Collector Current

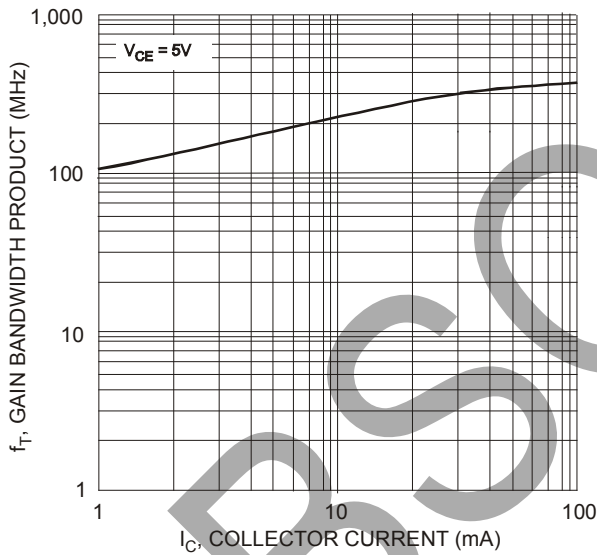


Fig. 7 Gain Bandwidth Product vs. Collector Current

**BSS84 Section**

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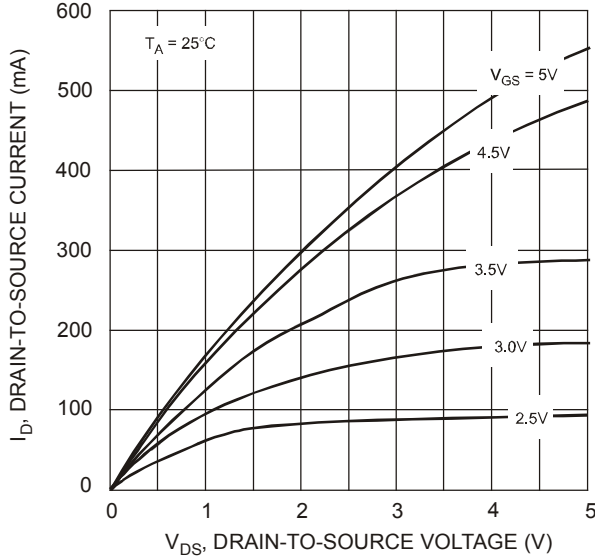


Fig. 8 Drain-Source Current vs. Drain-Source Voltage

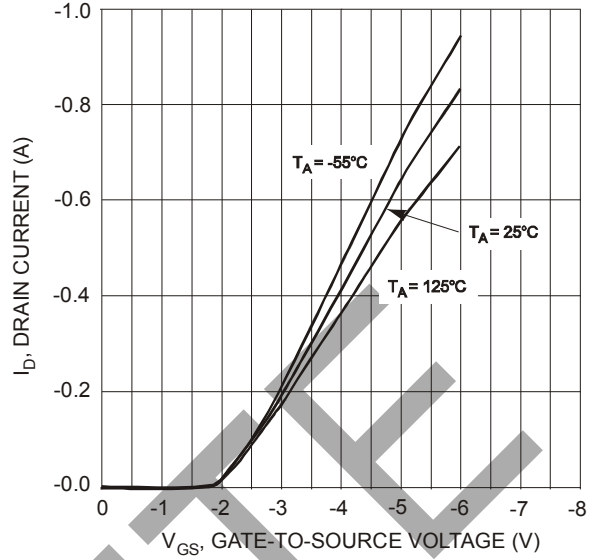


Fig. 9 Drain Current vs. Gate Source Voltage

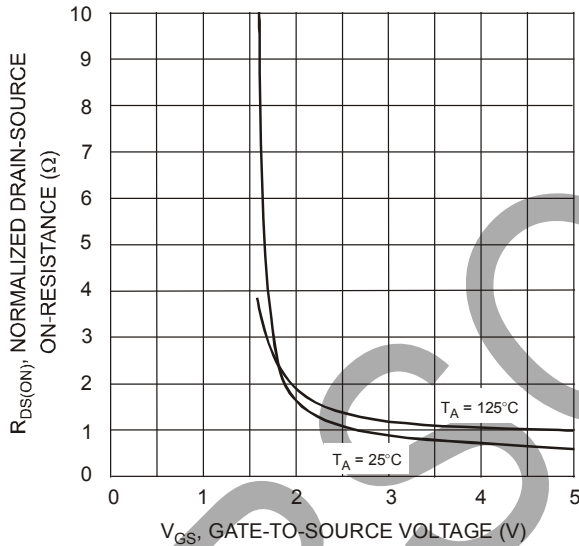


Fig. 10 On-Resistance vs. Gate-Source Voltage

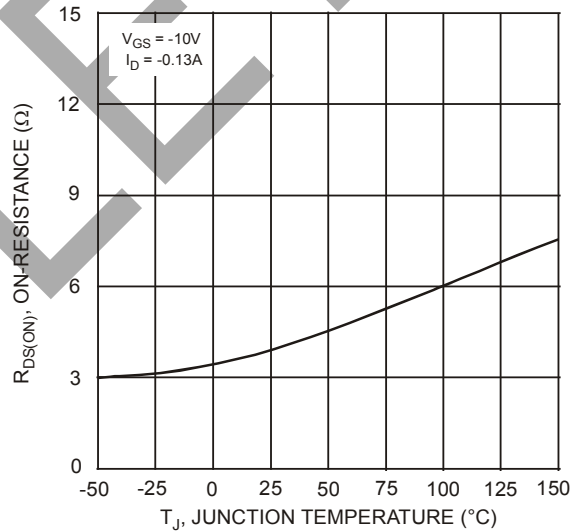


Fig. 11 On-Resistance vs. Junction Temperature

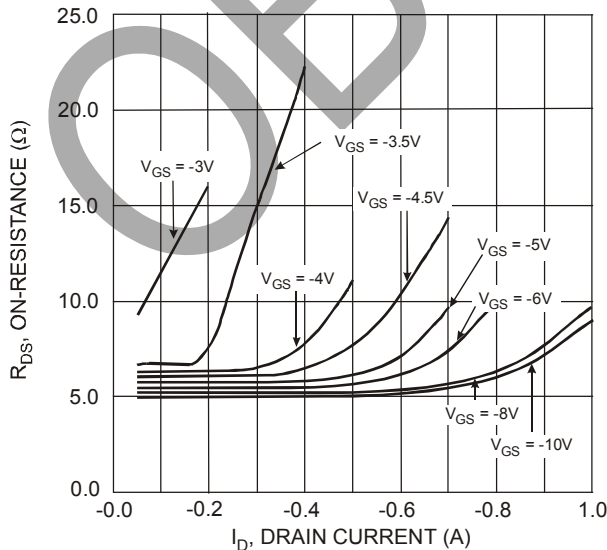


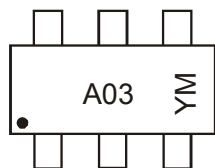
Fig. 12, On-Resistance vs. Drain Current

**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**



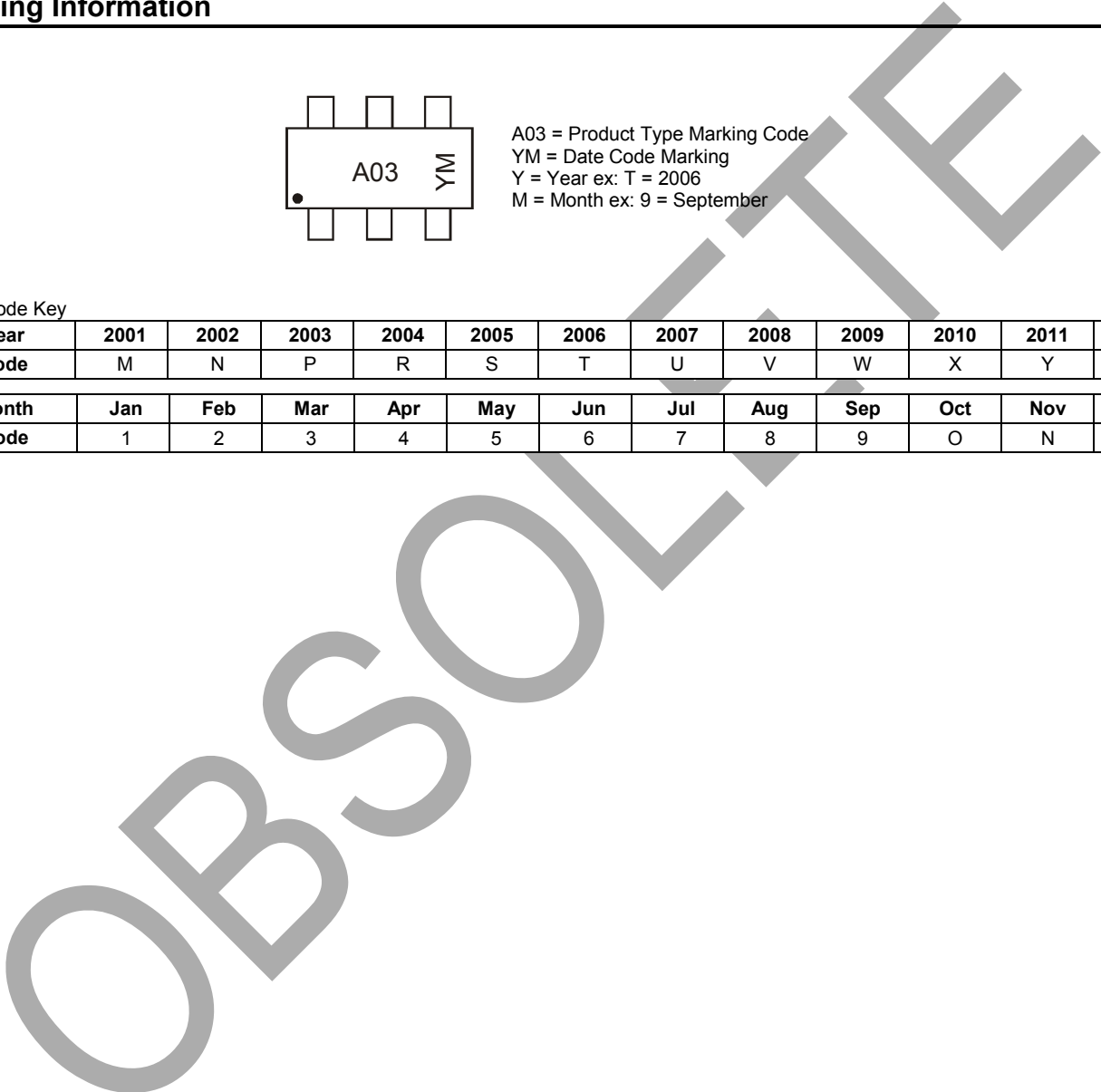
A03 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: T = 2006  
 M = Month ex: 9 = September

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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