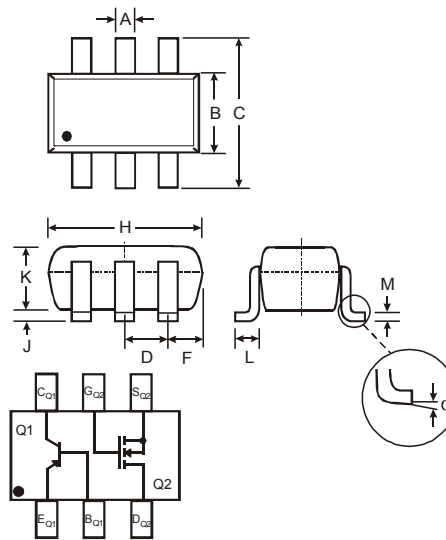


Features

- Combines MMBT4403 type transistor with 2N7002 type MOSFET
- Small Surface Mount Package
- NPN/P-Channel Complement Available: CTA2N1P
- **Lead Free/RoHS Compliant (Note 1)**
- **"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: A80, See Page 5
- Ordering Information: See Page 5
- 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 @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 2)	P_d	150	mW
Thermal Resistance, Junction to Ambient (Note 2)	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Operating and Storage Temperature Range	T_j, T_{STG}	-55 to +150	$^\circ\text{C}$

Maximum Ratings, Q1, MMBT4403 PNP Transistor Element @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CB0}	-40	V
Collector-Emitter Voltage	V_{CE0}	-40	V
Emitter-Base Voltage	V_{EB0}	-5.0	V
Collector Current - Continuous	I_C	-600	mA

Maximum Ratings, Q2, 2N7002 N-Channel MOSFET Element @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V_{DSS}	60	V
Drain-Gate Voltage $R_{GS} \leq 1.0M\Omega$	V_{DGR}	60	V
Gate-Source Voltage	V_{GSS}	± 20	V
		± 40	
Drain Current (Note 2)	I_D	115	mA
		73	
		800	

- Notes:
1. No purposefully added lead.
 2. Device mounted on FR-4 PCB; 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>.
 3. Diodes Inc.'s "Green" policy can be found on our website at 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, MMBT4403 PNP Transistor Element

@T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 5)					
Collector-Base Breakdown Voltage	V _{(BR)CBO}	-40	—	V	I _C = -100μA, 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}	-5.0	—	V	I _E = -100μA, 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
ON CHARACTERISTICS (Note 5)					
DC Current Gain	h _{FE}	30 60 100 100 20	— — — 300 —	—	I _C = -100μA, V _{CE} = -1.0V I _C = -1.0mA, V _{CE} = -1.0V I _C = -10mA, V _{CE} = -1.0V I _C = -150mA, V _{CE} = -2.0V I _C = -500mA, V _{CE} = -2.0V
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 -1.30	V	I _C = -150mA, I _B = -15mA I _C = -500mA, I _B = -50mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C _{cb}	—	8.5	pF	V _{CB} = -10V, 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}	1.5	15	kΩ	V _{CE} = -10V, I _C = -1.0mA, f = 1.0kHz
Voltage Feedback Ratio	h _{re}	0.1	8.0	x 10 ⁻⁴	
Small Signal Current Gain	h _{fe}	60	500	—	
Output Admittance	h _{oe}	1.0	100	μS	
Current Gain-Bandwidth Product	f _T	200	—	MHz	V _{CE} = -10V, I _C = -20mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Delay Time	t _d	—	15	ns	V _{CC} = -30V, I _C = -150mA, V _{BE(off)} = -2.0V, I _{B1} = -15mA
Rise Time	t _r	—	20	ns	
Storage Time	t _s	—	225	ns	V _{CC} = -30V, I _C = -150mA, I _{B1} = I _{B2} = -15mA
Fall Time	t _f	—	30	ns	

Electrical Characteristics, Q2, 2N7002 N-Channel MOSFET Element

@T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 5)						
Drain-Source Breakdown Voltage	BV _{DSS}	60	70	—	V	V _{GS} = 0V, I _D = 10μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1.0 500	μA	@ T _C = 25°C @ T _C = 125°C V _{DS} = 60V, V _{GS} = 0V
Gate-Body Leakage	I _{GSS}	—	—	±10	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 5)						
Gate Threshold Voltage	V _{GS(th)}	1.0	—	2.0	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	3.2 4.4	7.5 13.5	Ω	@ T _J = 25°C @ T _J = 125°C V _{GS} = 5.0V, I _D = 0.05A V _{GS} = 10V, I _D = 0.5A
On-State Drain Current	I _{D(ON)}	0.5	1.0	—	A	V _{GS} = 10V, V _{DS} = 7.5V
Forward Transconductance	g _{FS}	80	—	—	mS	V _{DS} = 10V, I _D = 0.2A
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{iss}	—	22	50	pF	V _{DS} = 25V, V _{GS} = 0V f = 1.0MHz
Output Capacitance	C _{oss}	—	11	25	pF	
Reverse Transfer Capacitance	C _{rss}	—	2.0	5.0	pF	
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	—	7.0	20	ns	V _{DD} = 30V, I _D = 0.2A, R _L = 150Ω, V _{GEN} = 10V, R _{GEN} = 25Ω
Turn-Off Delay Time	t _{D(OFF)}	—	11	20	ns	

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

MMBT4403 Section

NEW PRODUCT

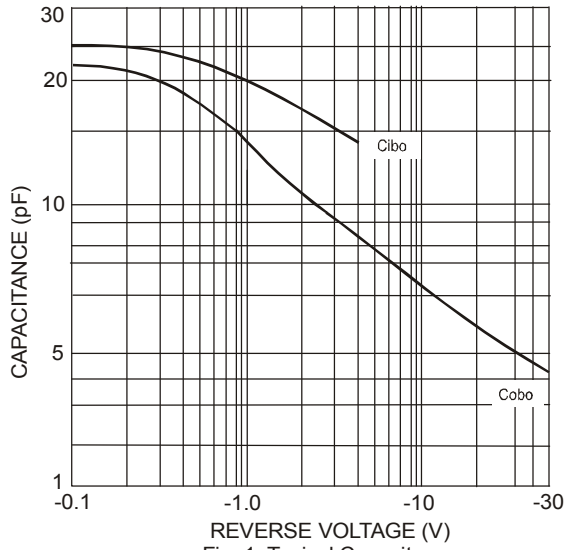


Fig. 1 Typical Capacitance

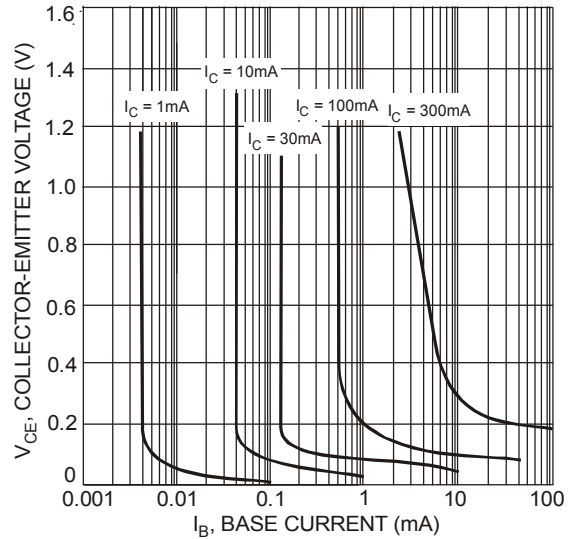


Fig. 2 Typical Collector Saturation Region

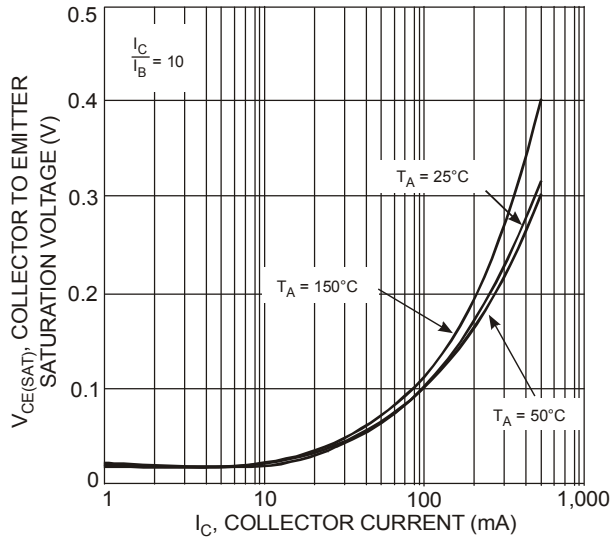


Fig. 3 Collector Emitter Saturation Voltage vs. Collector Current

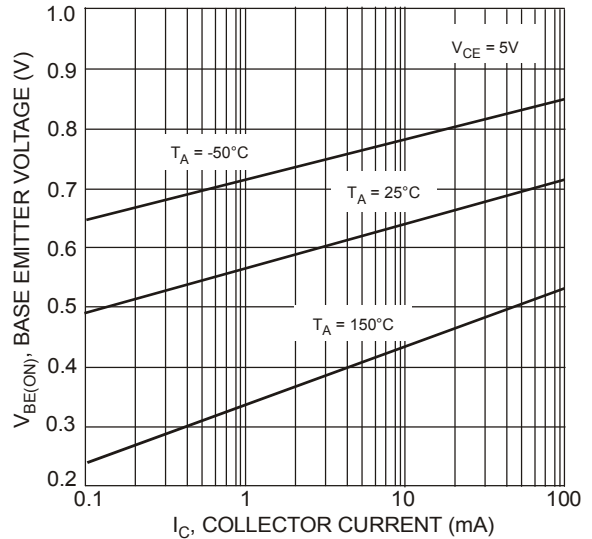


Fig. 4 Base-Emitter Voltage vs. Collector Current

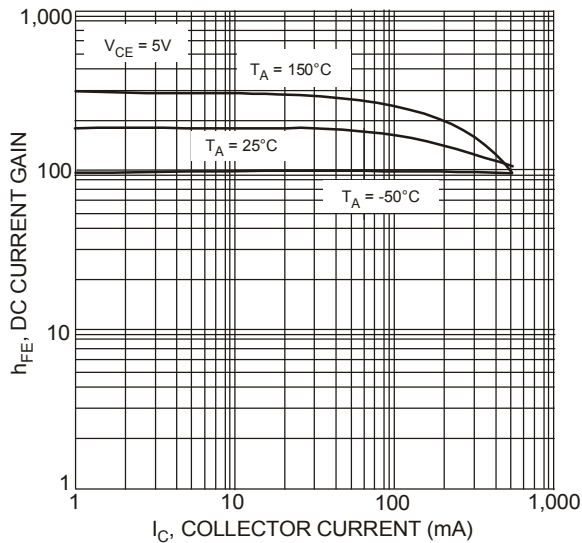


Fig. 5 DC Current Gain vs. Collector Current

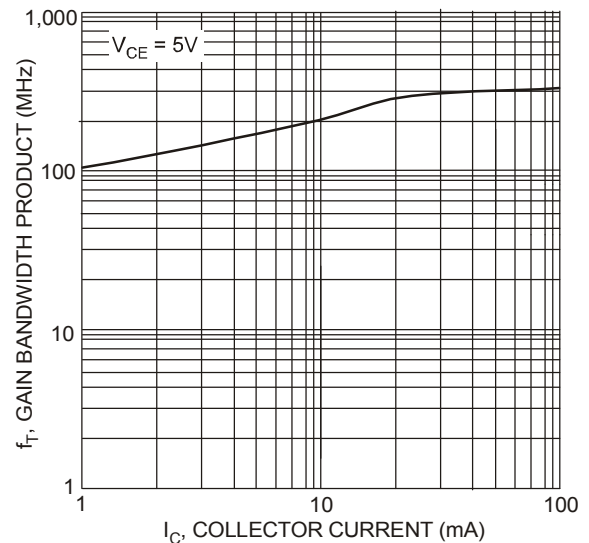


Fig. 6 Gain Bandwidth Product vs. Collector Current

MMBT4403 Section (Continued)

NEW PRODUCT

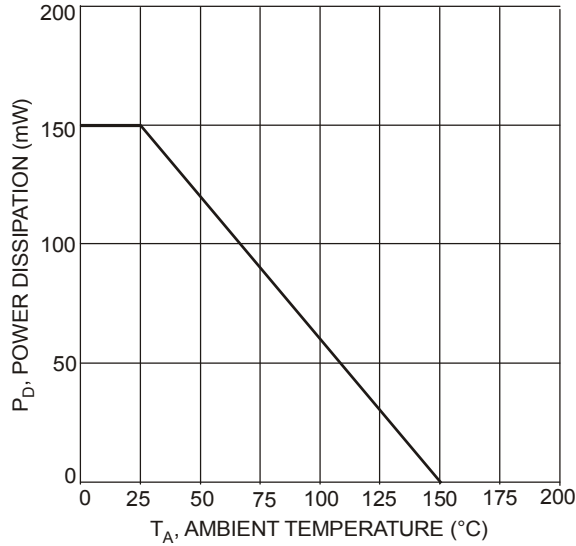


Fig. 7 Max Power Dissipation vs. Ambient Temperature (Total Device)

2N7002 Section

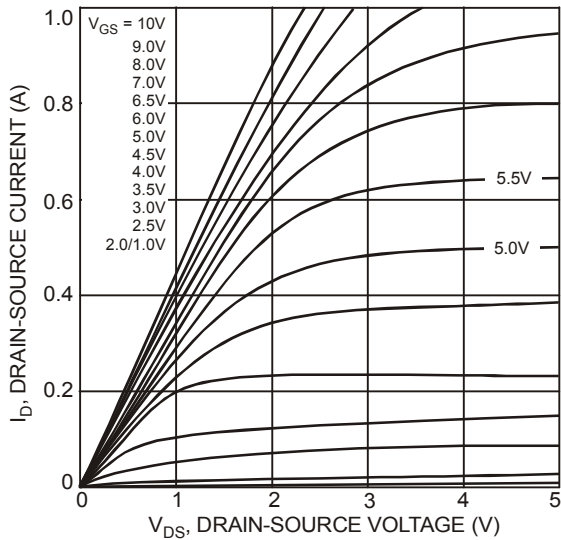


Fig. 8 On-Region Characteristics (2N7002)

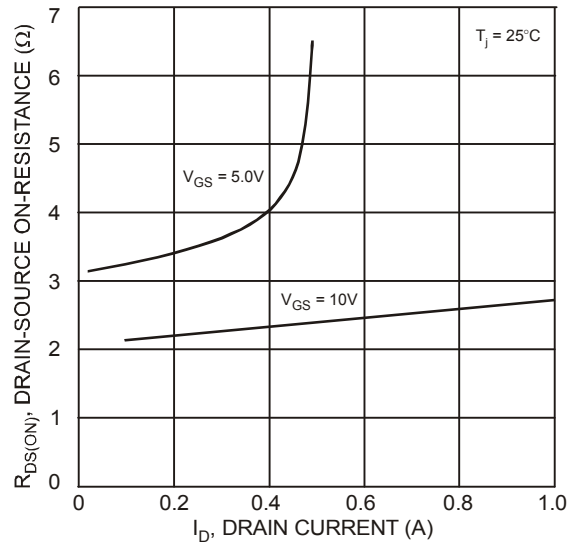


Fig. 9 On-Resistance vs. Drain Current (2N7002)

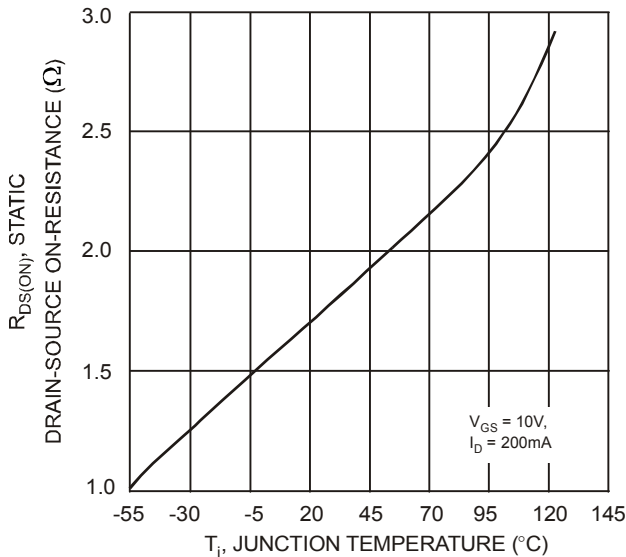


Fig. 10 On-Resistance vs. Junction Temperature (2N7002)

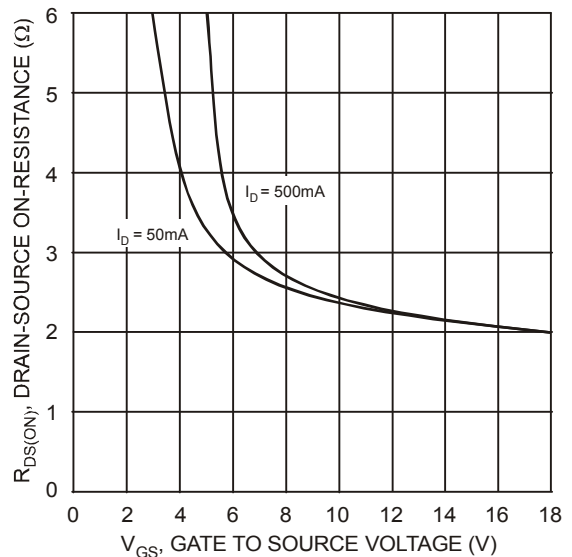


Fig. 11 On-Resistance vs. Gate-Source Voltage (2N7002)

2N7002 Section (Continued)

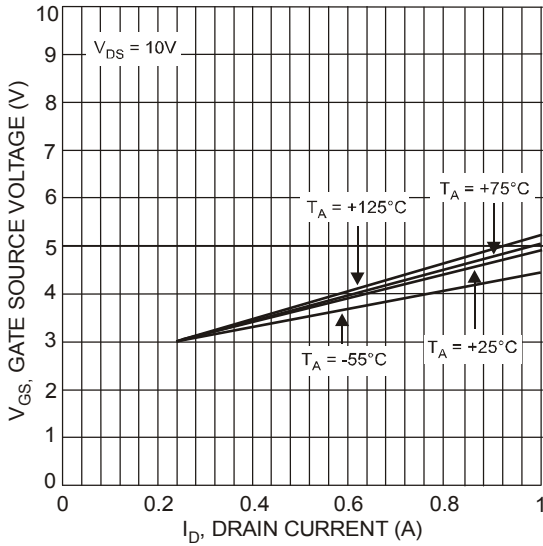


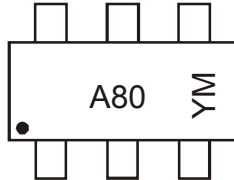
Fig. 12 Typical Transfer Characteristics (2N7002)

Ordering Information (Note 6)

Device	Packaging	Shipping
CTA2P1N-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



A80 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year ex: T = 2006
 M = Month ex: 9 = September

Date Code Key

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Code	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

IMPORTANT NOTICE

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to any product herein. Diodes Incorporated does not assume any liability arising out of the application or use of any product described herein; neither does it convey any license under its patent rights, nor the rights of others. The user of products in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on our website, harmless against all damages.

LIFE SUPPORT

Diodes Incorporated products are not authorized for use as critical components in life support devices or systems without the expressed written approval of the President of Diodes Incorporated.