

**40V MATCHED PAIR NPN SMALL SIGNAL TRANSISTOR IN SOT363**
**Features**

- $BV_{ce0} > 40V$
- $I_C = 200mA$  high Collector Current
- Pair of NPN transistors that are intrinsically matched (Note 1)
- 2% Matching on Current Gain ( $h_{FE}$ )
- 2mV Matching on Base-Emitter Voltage ( $V_{BE}$ )
- Fully internally isolated in a small surface mount package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 2 & 3)**
- **Halogen and Antimony Free. "Green" Device (Note 4)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 5)**

**Mechanical Data**

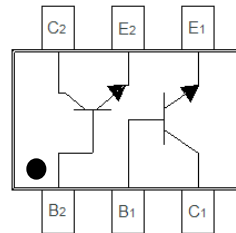
- Case: SOT363
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Finish. Solderable per MIL-STD-202, Method 208 <sup>Ⓔ3</sup>
- Weight: 0.006 grams (approximate)

**Applications**

- Current mirrors
- Differential and instrumentation amplifiers
- Comparators



Top View

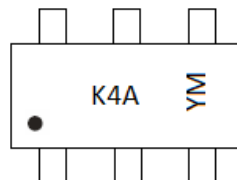


Device Schematic and Pin-Out Top View

**Ordering Information** (Note 4 & 5)

Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
DMMT3904W-7-F	AEC-Q101	K4A	7	8	3,000
DMMT3904WQ-7-F	Automotive	K4A	7	8	3,000

- Notes:
1. Intrinsically matched pair as this is built with adjacent die from the same wafer.
  2. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  3. 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.
  4. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  5. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  6. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**


K4A = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: B = 2014)  
 M = Month (ex: 2 = February)

## Date Code Key

Year	2010	2011	2012	2013	2014	2015	2016	2017				
Code	X	Y	Z	A	B	C	D	E				
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** (@ $T_A = +25^\circ\text{C}$  unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6.0	V
Collector Current	$I_C$	200	mA

**Thermal Characteristics – Total Device** (@ $T_A = +25^\circ\text{C}$  unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 7) Total Device	$P_D$	200	mW
Thermal Resistance, Junction to Ambient (Note 7)	$R_{\theta JA}$	625	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-65 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 8)

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

- Note: 7. For a device mounted on minimum recommended pad layout with 1oz copper that is on a single-sided 1.6mm FR4 PCB; the device is measured under still air conditions whilst operating in a steady-state.  
 8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

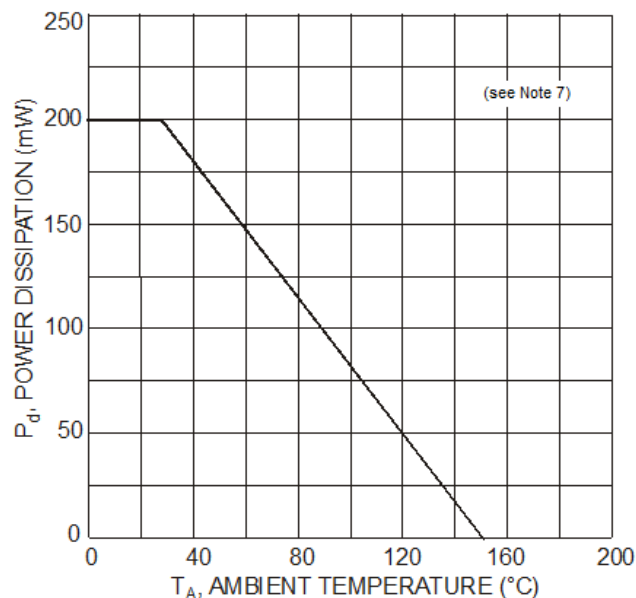
**Thermal Characteristics – Total Device**


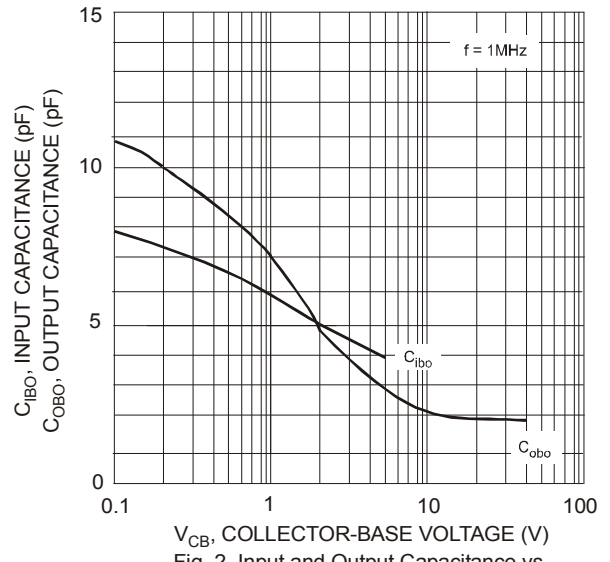
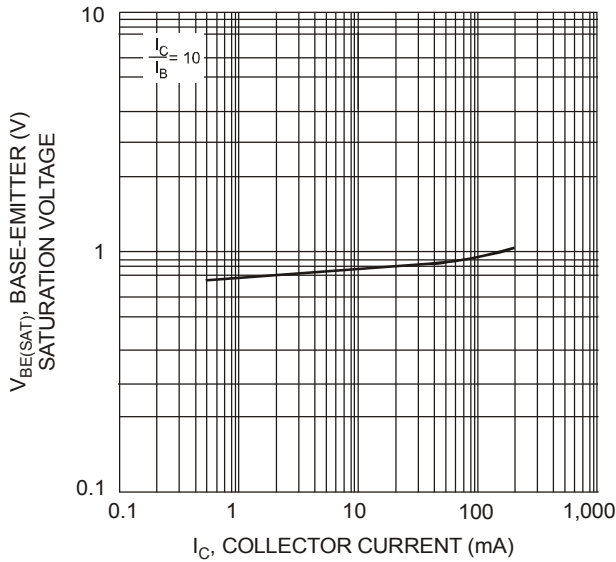
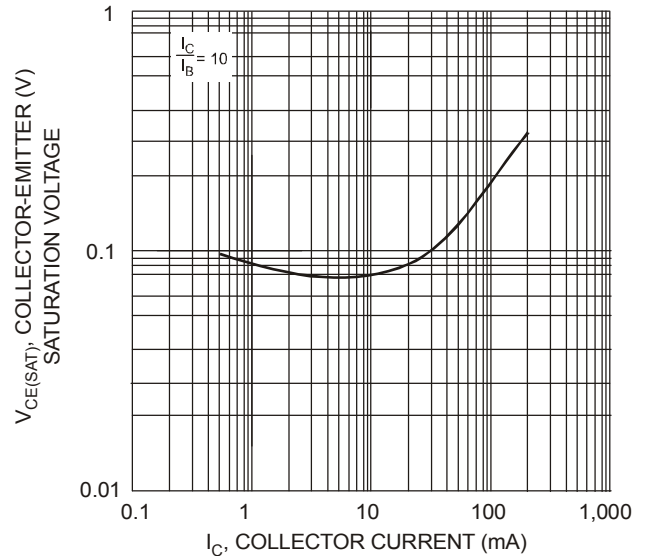
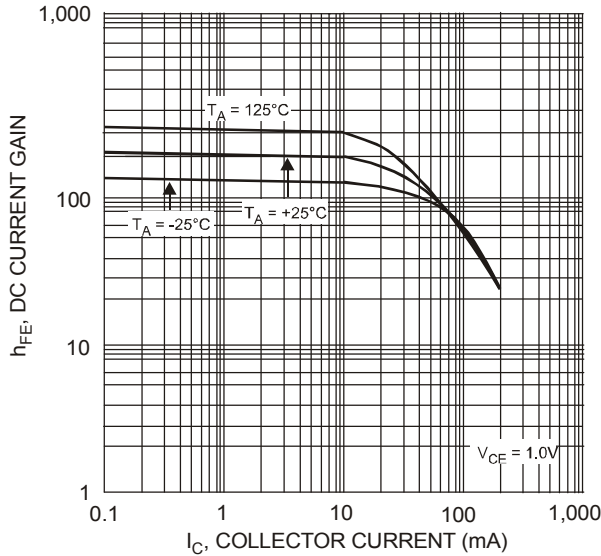
Fig. 1, Power Derating Curve (Total Device)

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

Characteristic	Symbol	Min	Typ	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 9)	BV <sub>CEO</sub>	40	—	—	V	I <sub>C</sub> = 1.0mA, 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 Cutoff Current	I <sub>CEX</sub>	—	—	50	nA	V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3.0V
Base Cutoff Current	I <sub>BL</sub>	—	—	50	nA	V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3.0V
<b>ON CHARACTERISTICS (Note 9)</b>						
DC Current Gain	h <sub>FE</sub>	40 70 100 60 30	—	— — 300 — —	—	I <sub>C</sub> = 100μA, V <sub>CE</sub> = 1.0V I <sub>C</sub> = 1.0mA, V <sub>CE</sub> = 1.0V I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1.0V I <sub>C</sub> = 50mA, V <sub>CE</sub> = 1.0V I <sub>C</sub> = 100mA, V <sub>CE</sub> = 1.0V
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	—	—	200 300	mV	I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA I <sub>C</sub> = 50mA, I <sub>B</sub> = 5.0mA
Base-Emitter Saturation Voltage	V <sub>BE(SAT)</sub>	0.65 —	—	850 950	mV	I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA I <sub>C</sub> = 50mA, I <sub>B</sub> = 5.0mA
<b>MATCHING CHARACTERISTICS</b>						
DC Current Gain Matching (Note 10)	h <sub>FE1</sub> / h <sub>FE2</sub>	—	1	2	%	I <sub>C</sub> = 2mA, V <sub>CE</sub> = 5V
Base-Emitter Voltage Matching (Note 11)	V <sub>BE1</sub> - V <sub>BE2</sub>	—	1	2	mV	I <sub>C</sub> = 2mA, V <sub>CE</sub> = 5V
Collector-Emitter Saturation Voltage (Note 10)	V <sub>CE(SAT)1</sub> / V <sub>CE(SAT)2</sub>	—	1	2	%	I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA
Base-Emitter Saturation Voltage (Note 10)	V <sub>BE(SAT)1</sub> / V <sub>BE(SAT)2</sub>	—	1	2	%	I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA
<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, f = 1.0kHz
Voltage Feedback Ratio	h <sub>re</sub>	0.5	—	8	x 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, f = 100MHz
Noise Figure	NF	—	—	5.0	dB	V <sub>CE</sub> = 5.0V, I <sub>C</sub> = 100μA, 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, V <sub>BE(off)</sub> = -0.5V, I <sub>B1</sub> = 1.0mA
Rise Time	t <sub>r</sub>	—	—	35	ns	
Storage Time	t <sub>s</sub>	—	—	200	ns	V <sub>CC</sub> = 3.0V, I <sub>C</sub> = 10mA, I <sub>B1</sub> = I <sub>B2</sub> = 1.0mA
Fall Time	t <sub>f</sub>	—	—	50	ns	

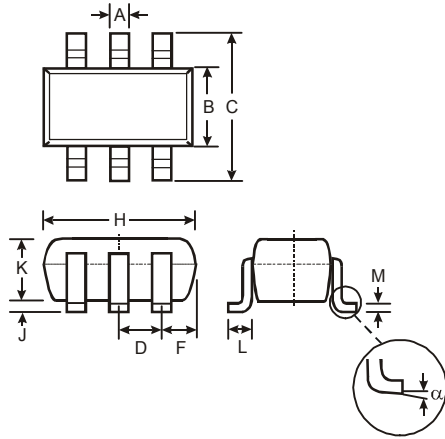
- Note:
9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.
  10. Is the ratio of one transistor compared to the other transistor.
  11. V<sub>BE1</sub> - V<sub>BE2</sub> is the absolute difference of one transistor compared to the other transistor.

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



**Package Outline Dimensions**

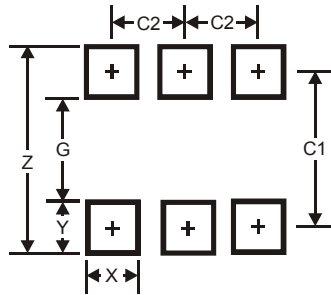
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SOT363			
Dim	Min	Max	Typ
A	0.10	0.30	0.25
B	1.15	1.35	1.30
C	2.00	2.20	2.10
D	0.65 Typ		
F	0.40	0.45	0.425
H	1.80	2.20	2.15
J	0	0.10	0.05
K	0.90	1.00	1.00
L	0.25	0.40	0.30
M	0.10	0.22	0.11
α	0°	8°	-
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

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