# **Dual Transistor - Power Management**

# **NPN/PNP Dual (Complementary)**

#### **Features**

- Low  $V_{CE(SAT)}$ , < 0.5 V
- These are Pb-Free Devices

## **MAXIMUM RATINGS**

Q

Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	Ic	100	mAdc

#### Q2

Rating	Symbol	Value	Unit
Collector - Emitter Voltage	V <sub>CEO</sub>	-60	٧
Collector - Base Voltage	V <sub>CBO</sub>	-50	V
Emitter - Base Voltage	V <sub>EBO</sub>	-6.0	V
Collector Current - Continuous	I <sub>C</sub>	-100	mAdc

## THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	357	mW
Derate above 25°C		(Note 1) 2.9 (Note 1)	mW/°C
Thermal Resistance, Junction-to-Ambient	$R_{ heta JA}$	350 (Note 1)	°C/W
Characteristic			
(Both Junctions Heated)	Symbol	Max	Unit
(Both Junctions Heated)  Total Device Dissipation T <sub>A</sub> = 25°C	Symbol P <sub>D</sub>	<b>Max</b> 500	<b>Unit</b> mW
,			
Total Device Dissipation T <sub>A</sub> = 25°C		500 (Note 1) 4.0	mW

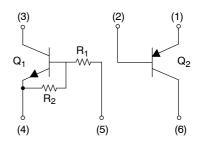
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR-4 @ Minimum Pad.



## ON Semiconductor®

http://onsemi.com





SOT-563 CASE 463A STYLE 1

## MARKING DIAGRAM



UW = Specific Device Code

M = Date Code

= Pb-Free Package

(Note: Microdot may be in either location)

## **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
EMF23XV6T5	SOT-563 (Pb-Free)	8000/Tape & Reel
EMF23XV6T5G	SOT-563 (Pb-Free)	8000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

1

## **ELECTRICAL CHARACTERISTICS** (T<sub>A</sub> = 25°C)

Characteristic	Symbol	Min	Тур	Max	Unit	
Q1: NPN						
Collector-Base Cutoff Current (V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	-	100	nAdc	
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	-	500	nAdc	
Emitter-Base Cutoff Current ( $V_{EB} = 6.0 \text{ V}, I_{C} = 0$ )	I <sub>EBO</sub>	-	-	0.5	mAdc	
Collector-Base Breakdown Voltage ( $I_C = 10 \mu A, I_E = 0$ )	V <sub>(BR)CBO</sub>	50	-	-	Vdc	
Collector-Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0$ mA, $I_B = 0$ )	V <sub>(BR)CEO</sub>	50	-	-	Vdc	
DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	h <sub>FE</sub>	35	60	-	-	
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA)	V <sub>CE(sat)</sub>	-	-	0.25	Vdc	
Output Voltage (on) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 2.5 V, R <sub>L</sub> = 1.0 k $\Omega$ )	V <sub>OL</sub>	-	-	0.2	Vdc	
Output Voltage (off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1.0 k $\Omega$ )	V <sub>OH</sub>	4.9	-	-	Vdc	
Input Resistor	R1	7.0	10	13	kΩ	
Resistor Ratio	R1/R2	0.8	1.0	1.2	-	
Q2: PNP						
Collector–Base Breakdown Voltage ( $I_C = -50 \mu Adc, I_E = 0$ )	V <sub>(BR)CBO</sub>	-60	-	-	Vdc	
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = -1.0 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	-50	-	-	Vdc	
Emitter-Base Breakdown Voltage ( $I_E = -50 \mu Adc$ , $I_E = 0$ )	V <sub>(BR)EBO</sub>	-6.0	-	-	Vdc	
Collector-Base Cutoff Current (V <sub>CB</sub> = -30 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	-	-0.5	nA	
Emitter-Base Cutoff Current (V <sub>EB</sub> = -5.0 Vdc, I <sub>B</sub> = 0)	I <sub>EBO</sub>	-	-	-0.5	μΑ	
Collector-Emitter Saturation Voltage (Note 3) (I <sub>C</sub> = -50 mAdc, I <sub>B</sub> = -5.0 mAdc)	V <sub>CE(sat)</sub>	_	-	-0.5	Vdc	
DC Current Gain (Note 3) (V <sub>CE</sub> = -6.0 Vdc, I <sub>C</sub> = -1.0 mAdc)	h <sub>FE</sub>	120	-	560	-	
Transition Frequency (V <sub>CE</sub> = -12 Vdc, I <sub>C</sub> = -2.0 mAdc, f = 30 MHz)	f <sub>T</sub>	-	140	-	MHz	
Output Capacitance (V <sub>CB</sub> = -12 Vdc, I <sub>E</sub> = 0 Adc, f = 1.0 MHz)	C <sub>OB</sub>	-	3.5	-	pF	

<sup>2.</sup> Device mounted on a FR-4 glass epoxy printed circuit board using the minimum recommended footprint. 3. Pulse Test: Pulse Width  $\leq$  300  $\mu$ s, DC  $\leq$  2%.

## TYPICAL ELECTRICAL CHARACTERISTICS — Q1, NPN

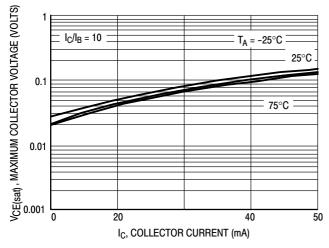


Figure 1. V<sub>CE(sat)</sub> versus I<sub>C</sub>

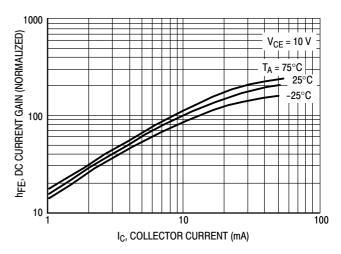


Figure 2. DC Current Gain

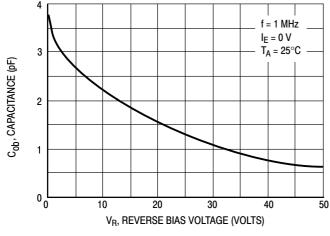


Figure 3. Output Capacitance

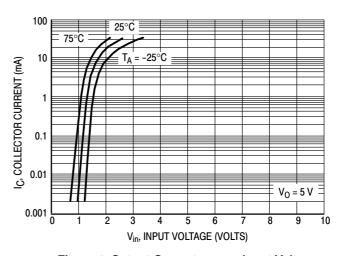


Figure 4. Output Current versus Input Voltage

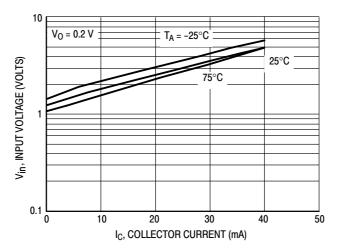
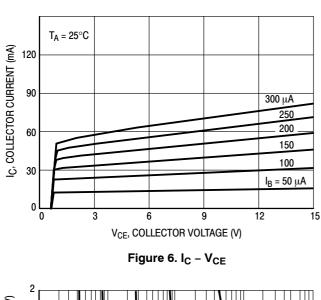


Figure 5. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS - Q2, PNP



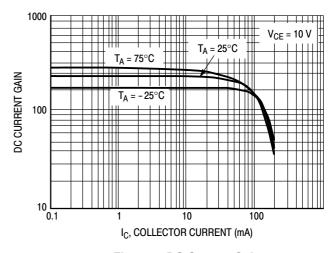
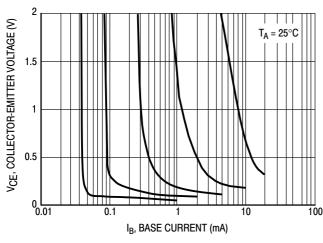


Figure 7. DC Current Gain



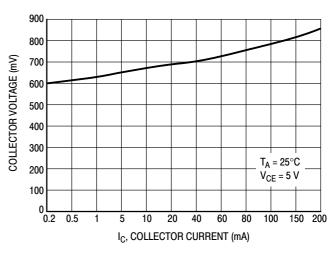
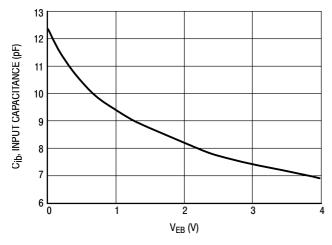


Figure 8. Collector Saturation Region

Figure 9. On Voltage



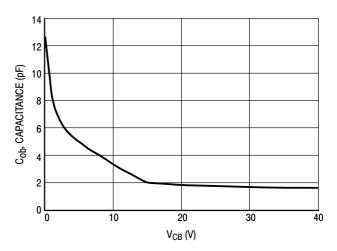
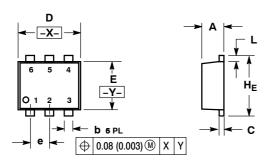


Figure 10. Capacitance

Figure 11. Capacitance

## PACKAGE DIMENSIONS

SOT-563, 6 LEAD CASE 463A-01 ISSUE F



#### NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETERS
- 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

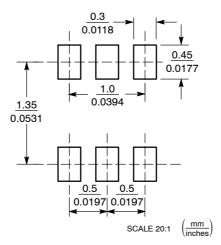
	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	0.50	0.55	0.60	0.020	0.021	0.023
b	0.17	0.22	0.27	0.007	0.009	0.011
С	0.08	0.12	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.062	0.066
Е	1.10	1.20	1.30	0.043	0.047	0.051
е	0.5 BSC		0.02 BSC			
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	1.50	1.60	1.70	0.059	0.062	0.066

#### STYLE 1:

PIN 1. EMITTER 1

- 2. BASE 1
- 3. COLLECTOR 2
- 4. EMITTER 2
- 5. BASE 2
- 6 COLLECTOR 1

### **SOLDERING FOOTPRINT\***



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### **PUBLICATION ORDERING INFORMATION**

#### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor P.O. Box 61312, Phoenix, Arizona 85082–1312 USA Phone: 480–829–7710 or 800–344–3860 Toll Free USA/Canada Fax: 480–829–7709 or 800–344–3867 Toll Free USA/Canada Email: orderlit@onsemi.com

N. American Technical Support: 800–282–9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center 2–9–1 Kamimeguro, Meguro–ku, Tokyo, Japan 153–0051 Phone: 81–3–5773–3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.