

# Power Management, Dual Transistors

## NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

### EMF5XV6T5

#### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These are Pb-Free Devices

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
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Q<sub>1</sub> (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

Collector-Base Voltage	V <sub>CB0</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc
Electrostatic Discharge	ESD	HBM Class 1 MM Class B	

Q<sub>2</sub> (T<sub>A</sub> = 25°C)

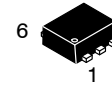
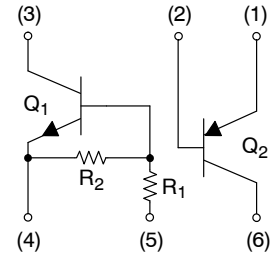
Collector-Emitter Voltage	V <sub>CEO</sub>	-12	Vdc
Collector-Base Voltage	V <sub>CB0</sub>	-15	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	-6.0	Vdc
Collector Current – Peak – Continuous	I <sub>C</sub>	-1.0 (Note 1) -0.5	Adc
Electrostatic Discharge	ESD	HBM Class 3B MM Class C	

#### THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	357 (Note 2) 2.9 (Note 2)	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	350 (Note 2)	°C/W
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	500 (Note 2) 4.0 (Note 2)	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	250 (Note 2)	°C/W
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

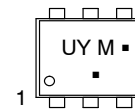
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Single pulse 1.0 ms.
2. FR-4 @ Minimum Pad.



SOT-563  
CASE 463A  
PLASTIC

#### MARKING DIAGRAM



UY = Specific Device Code  
M = Date Code  
■ = Pb-Free Package  
(Note: Microdot may be in either location)

#### ORDERING INFORMATION

Device	Package	Shipping†
EMF5XV6T5G	SOT-563 (Pb-Free)	8000/Tape & Reel
EMF5XV6T1G	SOT-563 (Pb-Free)	4000/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.

# EMF5XV6T5

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted, common for $Q_1$ and $Q_2$ )

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

### $Q_1$

#### OFF CHARACTERISTICS

Collector-Base Cutoff Current ( $V_{CB} = 50\text{ V}, I_E = 0$ )	$I_{CBO}$	-	-	100	nAdc
Collector-Emitter Cutoff Current ( $V_{CE} = 50\text{ V}, I_B = 0$ )	$I_{CEO}$	-	-	500	nAdc
Emitter-Base Cutoff Current ( $V_{EB} = 6.0\text{ V}, I_C = 0$ )	$I_{EBO}$	-	-	0.1	mAdc
Collector-Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}, I_E = 0$ )	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0\text{ mA}, I_B = 0$ )	$V_{(BR)CEO}$	50	-	-	Vdc

#### ON CHARACTERISTICS (Note 3)

DC Current Gain ( $V_{CE} = 10\text{ V}, I_C = 5.0\text{ mA}$ )	$h_{FE}$	80	140	-	
Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}, I_B = 0.3\text{ mA}$ )	$V_{CE(sat)}$	-	-	0.25	Vdc
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}, V_B = 3.5\text{ V}, R_L = 1.0\text{ k}\Omega$ )	$V_{OL}$	-	-	0.2	Vdc
Output Voltage (off) ( $V_{CC} = 5.0\text{ V}, V_B = 0.5\text{ V}, R_L = 1.0\text{ k}\Omega$ )	$V_{OH}$	4.9	-	-	Vdc
Input Resistor	R1	32.9	47	61.1	k $\Omega$
Resistor Ratio	R1/R2	0.8	1.0	1.2	

### $Q_2$

#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C = -10\text{ mAdc}, I_B = 0$ )	$V_{(BR)CEO}$	-12	-	-	Vdc
Collector-Base Breakdown Voltage ( $I_C = -0.1\text{ mAdc}, I_E = 0$ )	$V_{(BR)CBO}$	-15	-	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -0.1\text{ mAdc}, I_C = 0$ )	$V_{(BR)EBO}$	-6.0	-	-	Vdc
Collector Cutoff Current ( $V_{CB} = -15\text{ Vdc}, I_E = 0$ )	$I_{CBO}$	-	-	-0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = -6.0\text{ Vdc}$ )	$I_{EBO}$	-	-	-0.1	$\mu\text{Adc}$

#### ON CHARACTERISTICS

DC Current Gain (Note 4) ( $I_C = -10\text{ mA}, V_{CE} = -2.0\text{ V}$ )	$h_{FE}$	270	-	680	
Collector-Emitter Saturation Voltage (Note 4) ( $I_C = -200\text{ mA}, I_B = -10\text{ mA}$ )	$V_{CE(sat)}$	-	-	-250	mV
Base-Emitter Saturation Voltage (Note 4) ( $I_C = -150\text{ mA}, I_B = -20\text{ mA}$ )	$V_{BE(sat)}$	-	-0.81	-0.90	V
Base-Emitter Turn-on Voltage (Note 4) ( $I_C = -150\text{ mA}, V_{CE} = -3.0\text{ V}$ )	$V_{BE(on)}$	-	-0.81	-0.875	V
Input Capacitance ( $V_{EB} = 0\text{ V}, f = 1.0\text{ MHz}$ )	$C_{ibo}$	-	52	-	pF
Output Capacitance ( $V_{CB} = 0\text{ V}, f = 1.0\text{ MHz}$ )	$C_{obo}$	-	30	-	pF
Turn-On Time ( $I_{B1} = -50\text{ mA}, I_C = -500\text{ mA}, R_L = 3.0\text{ }\Omega$ )	$t_{on}$	-	50	-	ns
Turn-Off Time ( $I_{B1} = I_{B2} = -50\text{ mA}, I_C = -500\text{ mA}, R_L = 3.0\text{ }\Omega$ )	$t_{off}$	-	80	-	ns

3. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%.

4. Pulsed Condition: Pulse Width = 300  $\mu\text{sec}$ , Duty Cycle  $\leq$  2%.

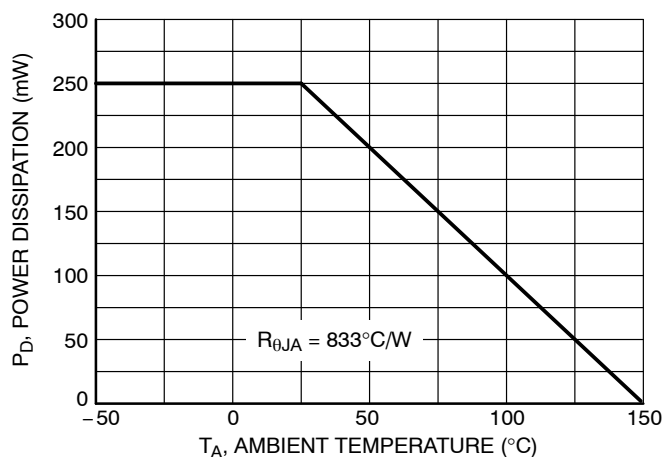


Figure 1. Derating Curve

# EMF5XV6T5

## TYPICAL ELECTRICAL CHARACTERISTICS FOR Q1

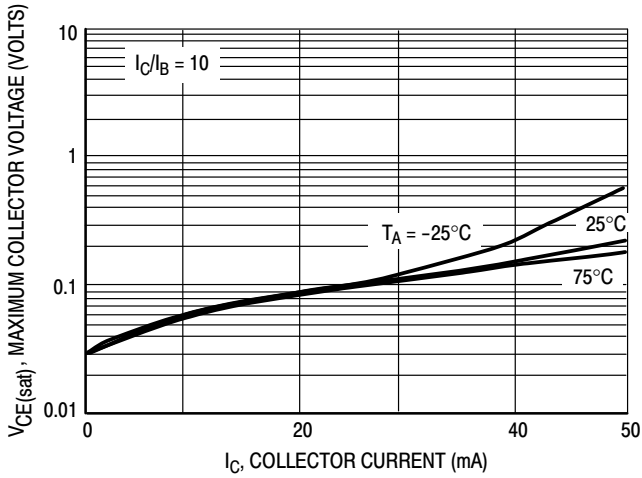


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

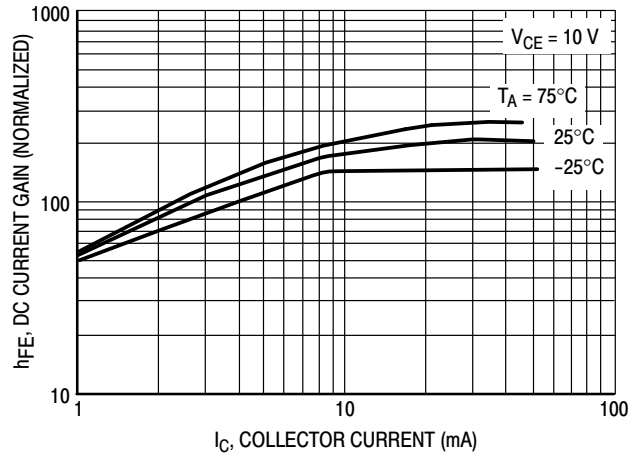


Figure 3. DC Current Gain

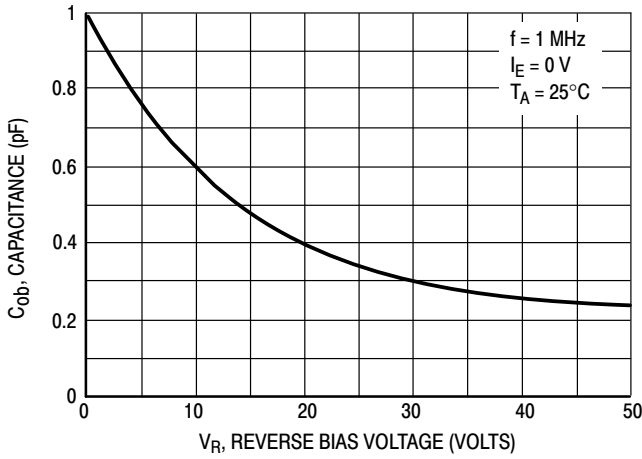


Figure 4. Output Capacitance

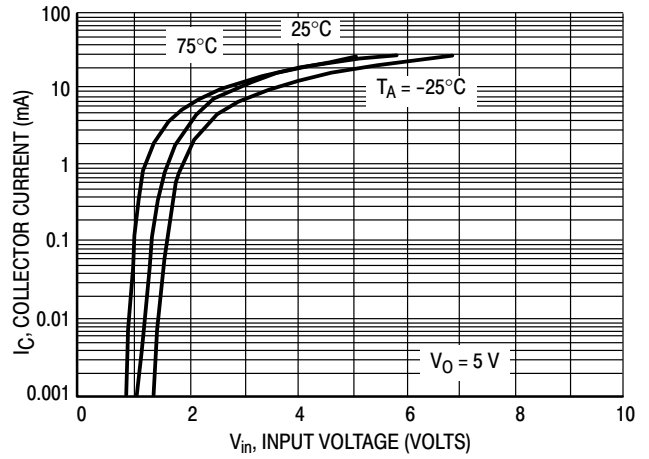


Figure 5. Output Current versus Input Voltage

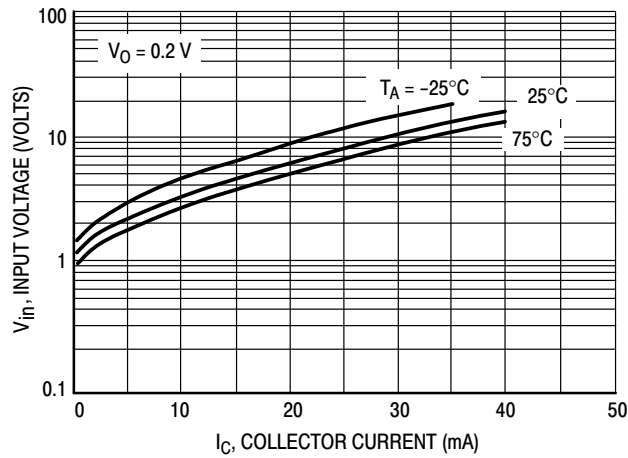


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS FOR Q2

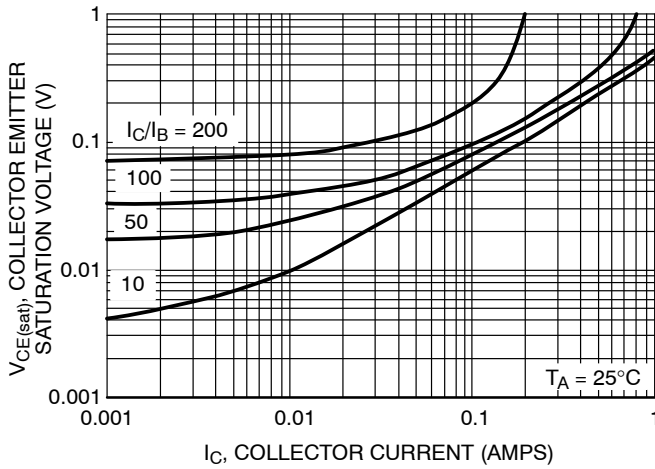


Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

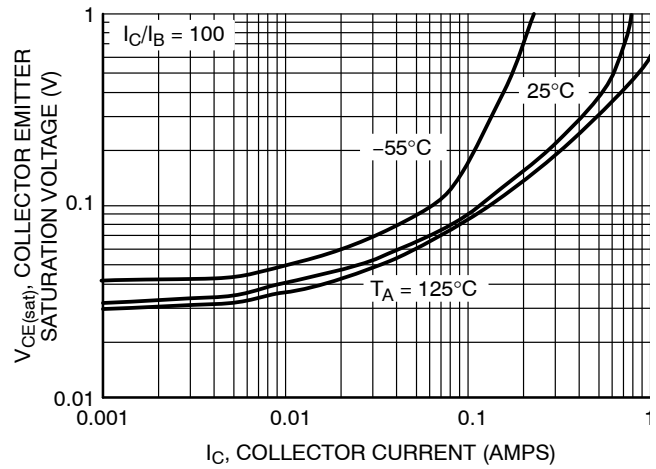


Figure 8. Collector Emitter Saturation Voltage vs. Collector Current

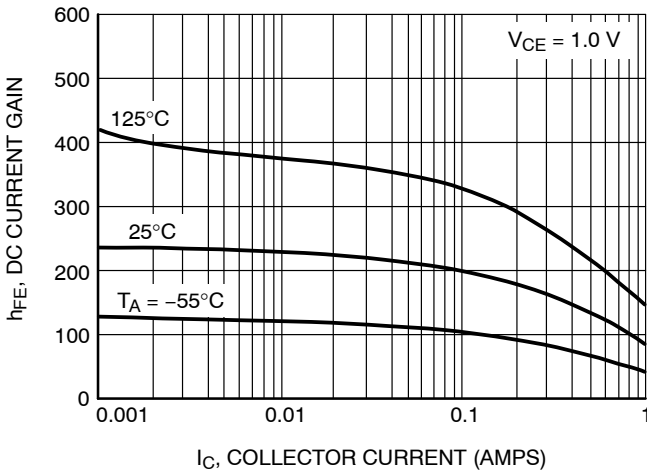


Figure 9. DC Current Gain

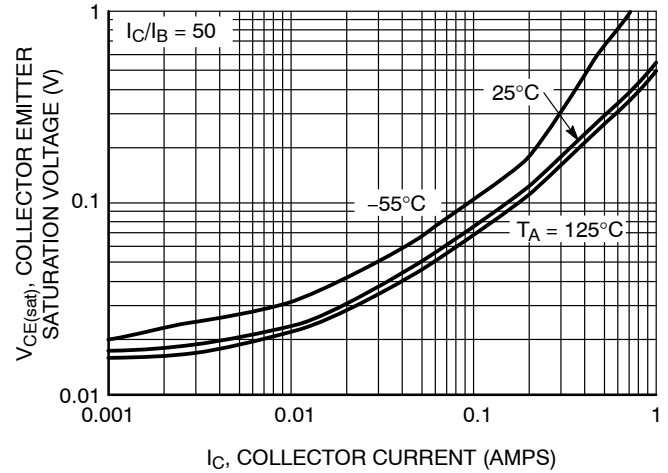


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

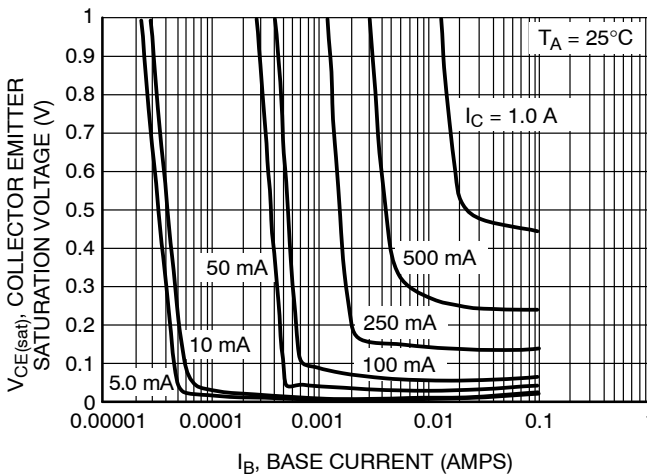


Figure 11. Collector Emitter Saturation Voltage vs Base Current

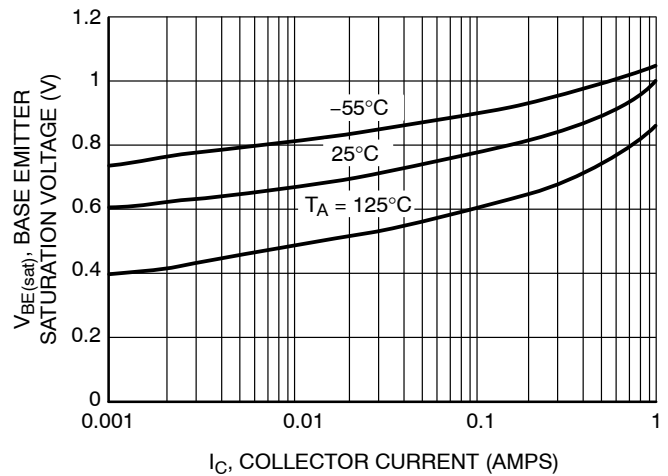
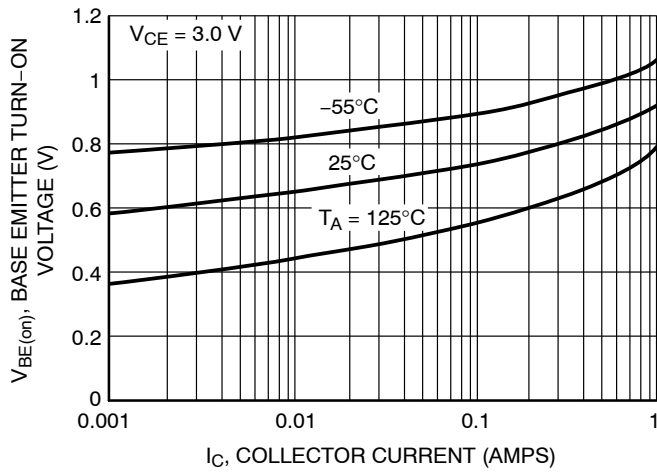
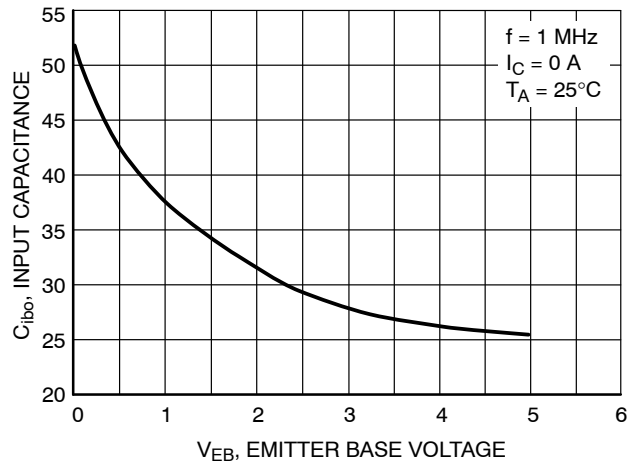


Figure 12. Base Emitter Saturation Voltage vs. Collector Current

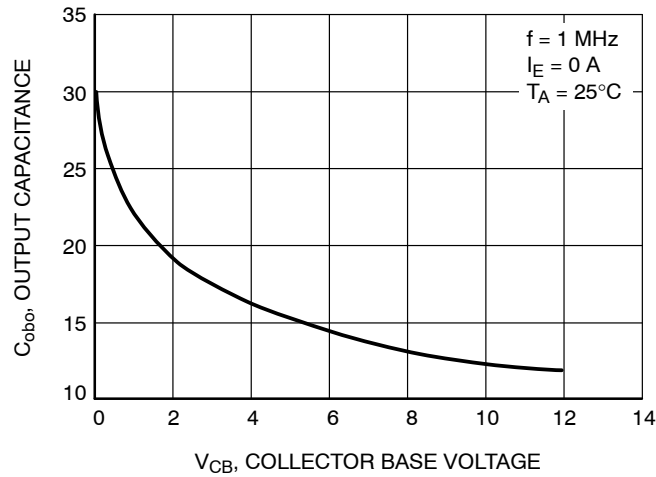
# EMF5XV6T5



**Figure 13. Base Emitter Turn-On Voltage vs. Collector Current**



**Figure 14. Input Capacitance**

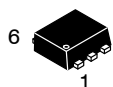


**Figure 15. Output Capacitance**

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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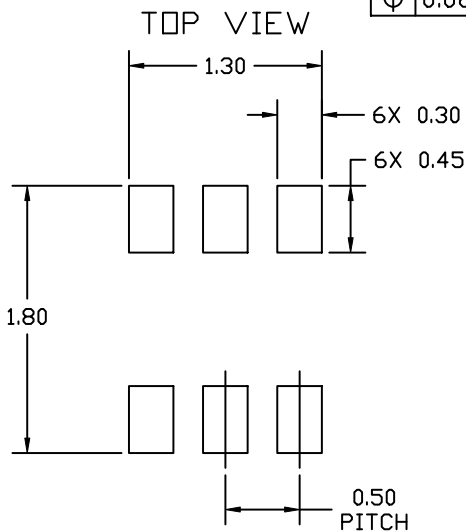
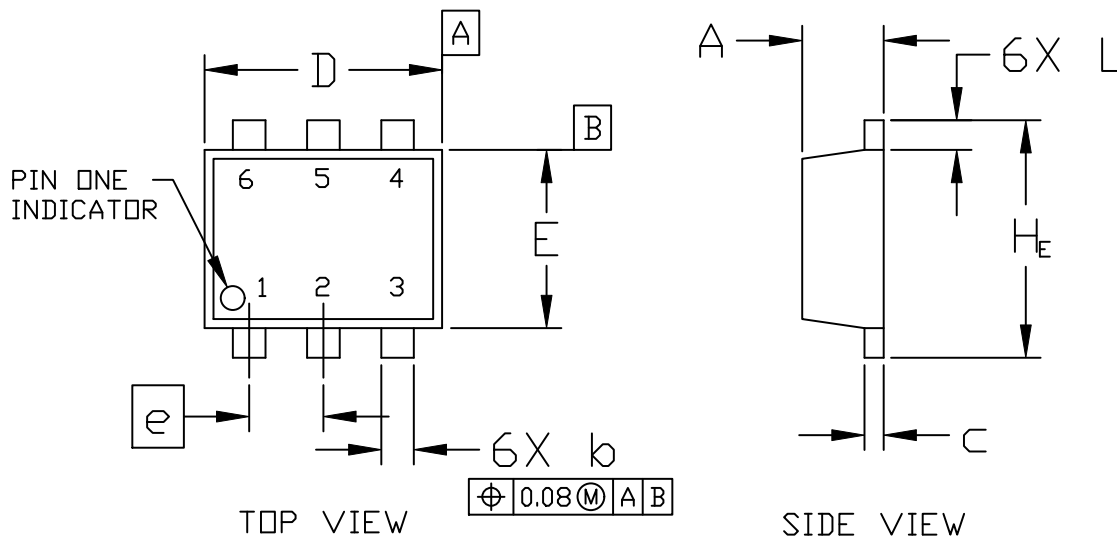
SCALE 4:1

**SOT-563, 6 LEAD**  
CASE 463A  
ISSUE H

DATE 26 JAN 2021

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.50	1.60	1.70
E	1.10	1.20	1.30
e	0.50 BSC		
L	0.10	0.20	0.30
H <sub>E</sub>	1.50	1.60	1.70

**RECOMMENDED MOUNTING 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.

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**SOT-563, 6 LEAD**  
CASE 463A  
ISSUE H

DATE 26 JAN 2021

STYLE 1:  
PIN 1. EMITTER 1  
2. BASE 1  
3. COLLECTOR 2  
4. EMITTER 2  
5. BASE 2  
6. COLLECTOR 1

STYLE 2:  
PIN 1. EMITTER 1  
2. EMITTER 2  
3. BASE 2  
4. COLLECTOR 2  
5. BASE 1  
6. COLLECTOR 1

STYLE 3:  
PIN 1. CATHODE 1  
2. CATHODE 1  
3. ANODE/ANODE 2  
4. CATHODE 2  
5. CATHODE 2  
6. ANODE/ANODE 1

STYLE 4:  
PIN 1. COLLECTOR  
2. COLLECTOR  
3. BASE  
4. EMITTER  
5. COLLECTOR  
6. COLLECTOR

STYLE 5:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE  
4. ANODE  
5. CATHODE  
6. CATHODE

STYLE 6:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. CATHODE  
5. CATHODE  
6. CATHODE

STYLE 7:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. CATHODE  
5. ANODE  
6. CATHODE

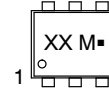
STYLE 8:  
PIN 1. DRAIN  
2. DRAIN  
3. GATE  
4. SOURCE  
5. DRAIN  
6. DRAIN

STYLE 9:  
PIN 1. SOURCE 1  
2. GATE 1  
3. DRAIN 2  
4. SOURCE 2  
5. GATE 2  
6. DRAIN 1

STYLE 10:  
PIN 1. CATHODE 1  
2. N/C  
3. CATHODE 2  
4. ANODE 2  
5. N/C  
6. ANODE 1

STYLE 11:  
PIN 1. EMITTER 2  
2. BASE 2  
3. COLLECTOR 1  
4. EMITTER 1  
5. BASE 1  
6. COLLECTOR 2

**GENERIC  
MARKING DIAGRAM\***



XX = Specific Device Code  
M = Month Code  
■ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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