

# 4H11G(NPN) 5H11G(PNP)

Preferred Device

## Complementary Power Transistors

### DPAK For Surface Mount Applications

Designed for general purpose power and switching such as output or driver stages in applications such as switching regulators, converters, and power amplifiers.

#### Features

- Pb-Free Packages are Available
- Lead Formed for Surface Mount Application in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves (“-1” Suffix)
- Lead Formed Version in 16 mm Tape and Reel for Surface Mount (“T4” Suffix)
- Electrically Similar to Popular D44H/D45H Series
- Low Collector Emitter Saturation Voltage –  $V_{CE(sat)} = 1.0$  Volt Max @ 8.0 Amperes
- Fast Switching Speeds
- Complementary Pairs Simplifies Designs
- Epoxy Meets UL 94, V-0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V  
Machine Model, C > 400 V

#### MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector–Emitter Voltage	$V_{CEO}$	80	Vdc
Emitter–Base Voltage	$V_{EB}$	5	Vdc
Collector Current – Continuous Peak	$I_C$	8 16	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	20 0.16	W W/ $^\circ\text{C}$
Total Power Dissipation* @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.75 0.014	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

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.

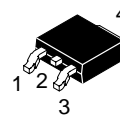
#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	6.25	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction–to–Ambient*	$R_{\theta JA}$	71.4	$^\circ\text{C}/\text{W}$
Lead Temperature for Soldering	$T_L$	260	$^\circ\text{C}$

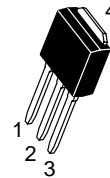
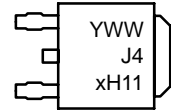
\*These ratings are applicable when surface mounted on the minimum pad sizes recommended.

**SILICON  
POWER TRANSISTORS  
8 AMPERES  
80 VOLTS  
20 WATTS**

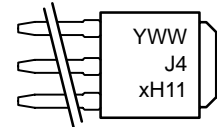
#### MARKING DIAGRAMS



DPAK  
CASE 369C  
STYLE 1



DPAK-3  
CASE 369D  
STYLE 1



Y = Year  
WW = Work Week  
x = 4 or 5



## 4H11 (NPN) 5H11 (PNP)

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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#### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ( $I_C = 30\text{ mA}$ , $I_B = 0$ )	$V_{CE(sus)}$	80	-	-	Vdc
Collector Cutoff Current ( $V_{CE} = \text{Rated } V_{CE0}$ , $V_{BE} = 0$ )	$I_{CES}$	-	-	10	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = 5\text{ Vdc}$ )	$I_{EBO}$	-	-	50	$\mu\text{A}$

#### ON CHARACTERISTICS

Collector-Emitter Saturation Voltage ( $I_C = 8\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ )	$V_{CE(sat)}$	-	-	1	Vdc
Base-Emitter Saturation Voltage ( $I_C = 8\text{ Adc}$ , $I_B = 0.8\text{ Adc}$ )	$V_{BE(sat)}$	-	-	1.5	Vdc
DC Current Gain ( $V_{CE} = 1\text{ Vdc}$ , $I_C = 2\text{ Adc}$ )	$h_{FE}$	60	-	-	-
DC Current Gain ( $V_{CE} = 1\text{ Vdc}$ , $I_C = 4\text{ Adc}$ )		40	-	-	-

#### DYNAMIC CHARACTERISTICS

Collector Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ )	MJD44H11 MJD45H11	$C_{cb}$	-	130 230	-	$\mu\text{F}$
Gain Bandwidth Product ( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 20\text{ MHz}$ )	MJD44H11 MJD45H11	$f_T$	-	50 40	-	MHz

#### SWITCHING TIMES

Delay and Rise Times ( $I_C = 5\text{ Adc}$ , $I_{B1} = 0.5\text{ Adc}$ )	MJD44H11 MJD45H11	$t_d + t_r$	-	300 135	-	ns
Storage Time ( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ )	MJD44H11 MJD45H11	$t_s$	-	500 500	-	ns
Fall Time ( $I_C = 5\text{ Adc}$ , $I_{B1} = I_{B2} = 0.5\text{ Adc}$ )	MJD44H11 MJD45H11	$t_f$	-	140 100	-	ns

# 4H11 (NPN) 5H11 (PNP)

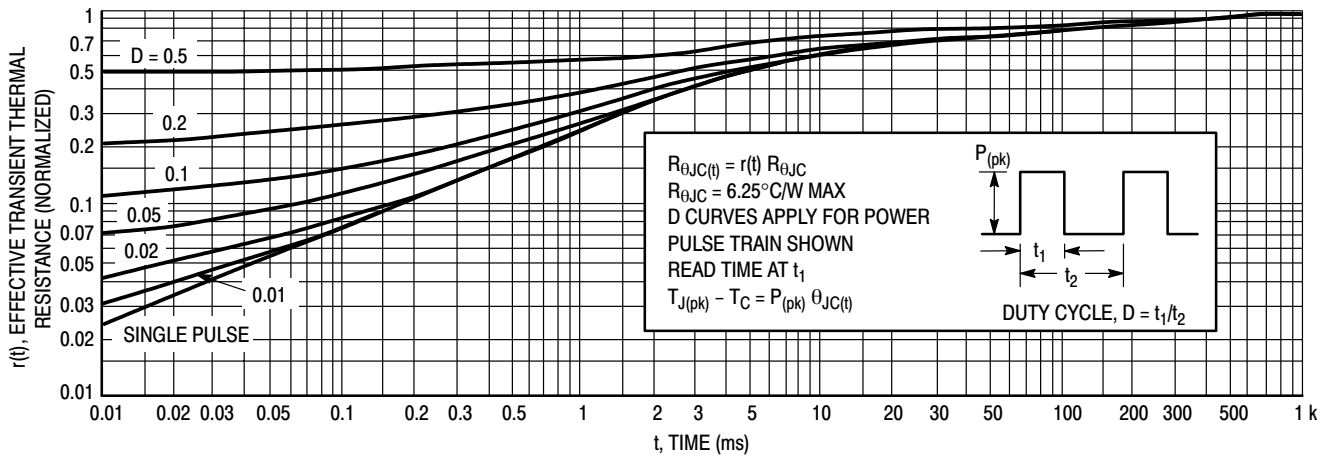


Figure 1. Thermal Response

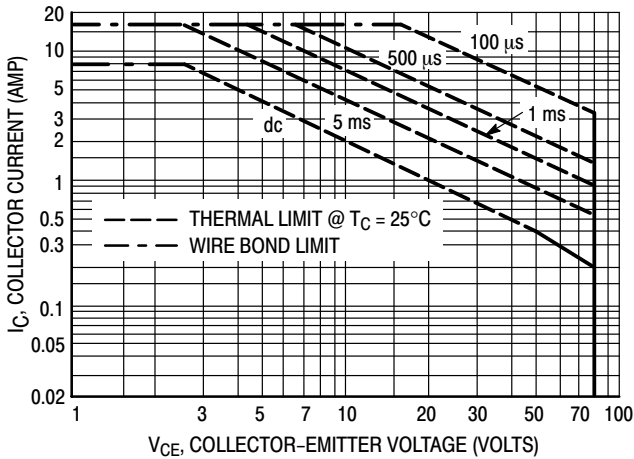


Figure 2. Maximum Forward Bias Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 2 is based on  $T_{J(pk)} = 150^{\circ}\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^{\circ}\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 1. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

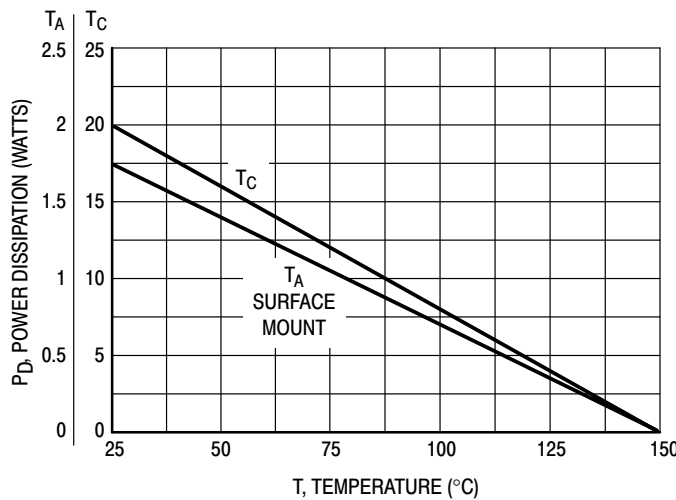


Figure 3. Power Derating

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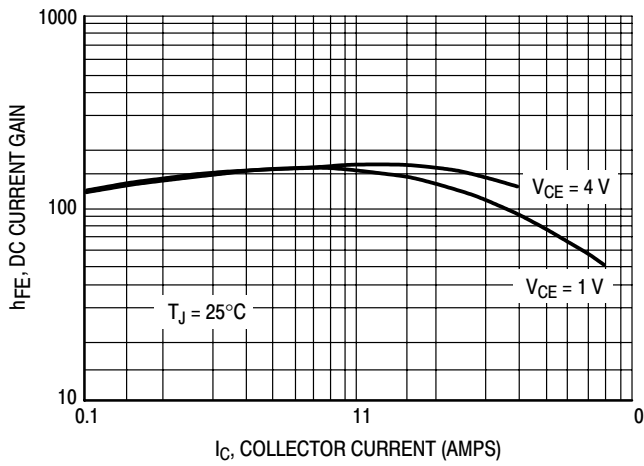


Figure 4. 4H11 DC Current Gain

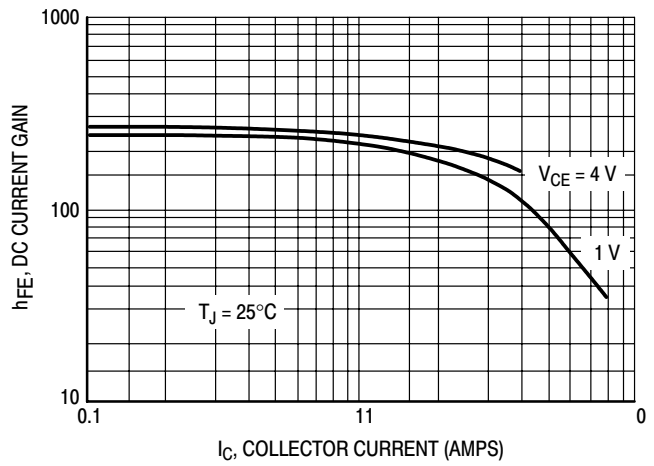


Figure 5. 5H11 DC Current Gain

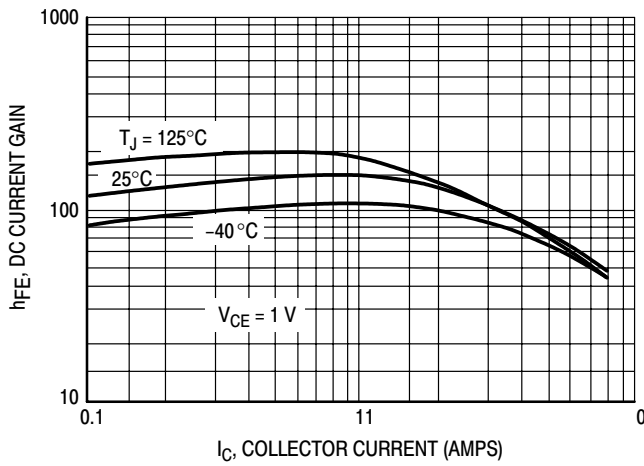


Figure 6. 4H11 Current Gain versus Temperature

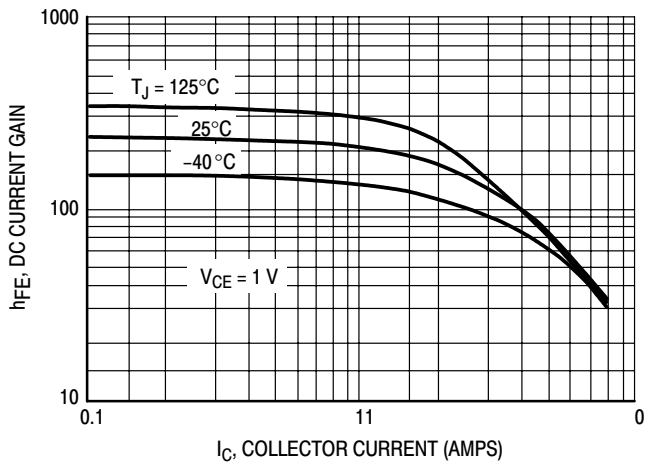


Figure 7. 5H11 Current Gain versus Temperature

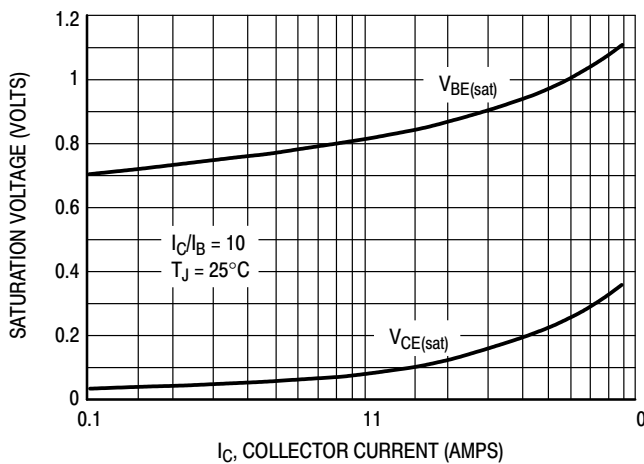


Figure 8. 4H11 On-Voltages

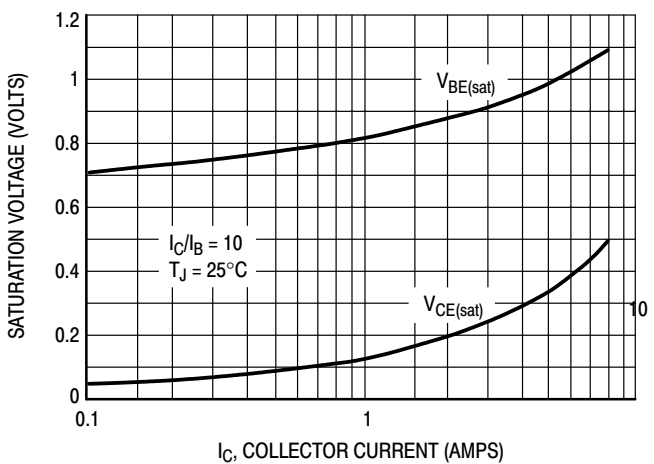
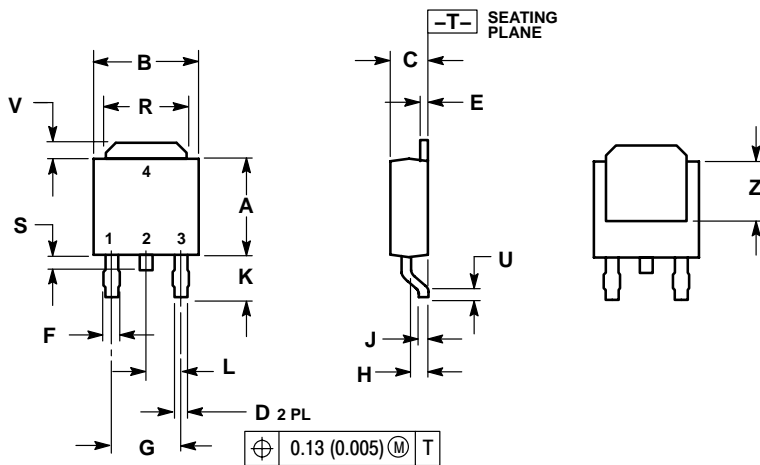


Figure 9. 5H11 On-Voltages

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## PACKAGE DIMENSIONS

**DPAK**  
CASE 369C  
ISSUE O

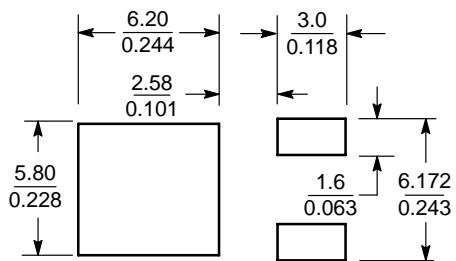


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

- STYLE 1:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

### SOLDERING FOOTPRINT\*



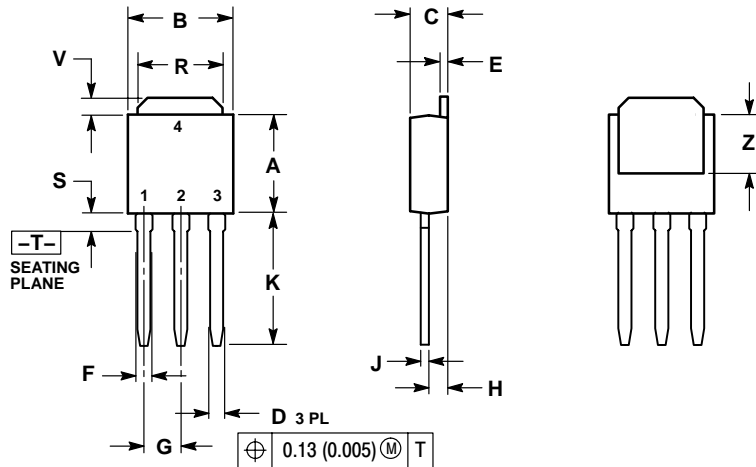
SCALE 3:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

# 4H11 (NPN) 5H11 (PNP)

## PACKAGE DIMENSIONS

DPAK-3  
CASE 369D-01  
ISSUE B



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

STYLE 1:

- PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR