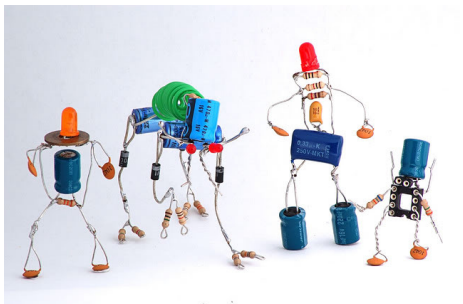
Instrumentación y Control - Componentes Electrónicos

22 de Agosto de 2018



Clasificación según la estructura física

Discretos: elementos individuales que cumplen un tarea específica

Integrados: circuitos compuestos por varios elementos

Clasificación según la función específica

Pasivos: solo consumen o almacenan energía

- Resistencias
- Capacitores
- Inductores

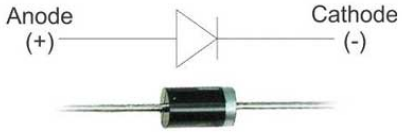
Activos: transfieren energía, modifican el nivel y la forma de las señales

- Diodos
- Transistores

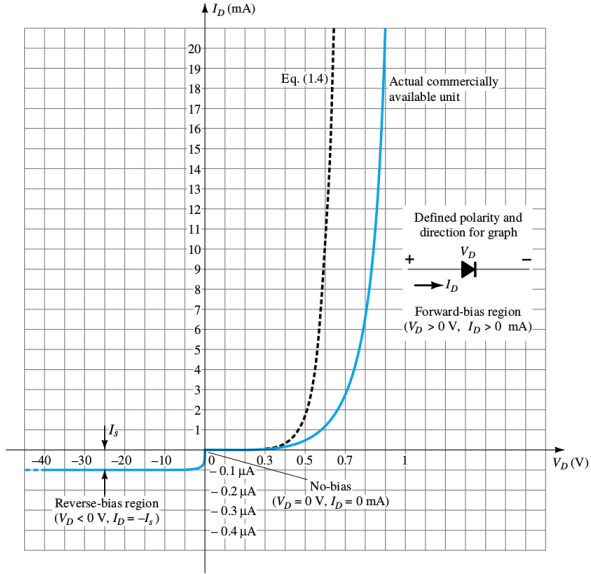
Electromecánicos: conjugan operaciones eléctricas y funciones mecánicas

- Relays
- Piezoeléctricos
- Fusibles

Diodos: Esquemático y curva característica



$$I_D(V_D) = I_S\left\{\exp\left(\frac{q\,V_D}{\eta\,K_B\,T}\right) - 1\right\}$$



Diodos: Especificación de datos

- Potencial de conducción en directa V_F
- Corriente máxima en directa I_F
- Corriente de saturación inversa I_R
- Potencial de ruptura PIV / PRV / $V(\mathrm{BR})$ / V_R
- Potencia disipada P_D
- Capacitancia C_T
- Tiempo de recuperación t_{rr}

Diodos: Hoja de datos

Absolute Maximum Ratings* $T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Value	Units
V_{RRM}	Maximum Repetitive Reverse Voltage	100	V
$I_{F(AV)}$	Average Rectified Forward Current	200	mA
I_{FSM}	Non-repetitive Peak Forward Surge Current Pulse Width = 1.0 second Pulse Width = 1.0 microsecond	 1.0 4.0	 A A
T_{stg}	Storage Temperature Range	-65 to +200	°C
T_J	Operating Junction Temperature	175	°C

Diodos: Hoja de datos

Thermal Characteristics

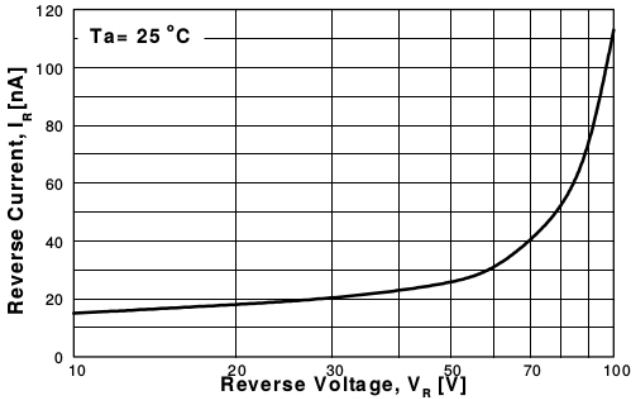
Symbol	Characteristic	Max	Units
		1N/FDLL 914/A/B / 4148 / 4448	
P_D	Power Dissipation	500	mW
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	300	°C/W

Diodos: Hoja de datos

Electrical Characteristics $T_A = 25°C$ unless otherwise noted

Symbol	Parameter		Test Conditions	Min	Max	Units
V_R	Breakdown Voltage		$I_R = 100\ \mu A$	100		V
			$I_R = 5.0\ \mu A$	75		V
V_F	Forward Voltage	**1N914B/4448**	$I_F = 5.0$ mA	620	720	mV
		1N916B	$I_F = 5.0$ mA	630	730	mV
		1N914/916/4148	$I_F = 10$ mA		1.0	V
		1N914A/916A	$I_F = 20$ mA		1.0	V
		1N916B	$I_F = 20$ mA		1.0	V
		1N914B/4448	$I_F = 100$ mA		1.0	V
I_R	Reverse Current		$V_R = 20$ V		25	nA
			$V_R = 20$ V, $T_A = 150°C$		50	μA
			$V_R = 75$ V		5.0	μA
C_T	Total Capacitance					
		1N916A/B/4448	$V_R = 0$, f = 1.0 MHz		2.0	pF
		1N914A/B/4148	$V_R = 0$, f = 1.0 MHz		4.0	pF
t_{rr}	Reverse Recovery Time		$I_F = 10$ mA, $V_R = 6.0$ V (60mA), $I_{rr} = 1.0$ mA, $R_L = 100\Omega$		4.0	ns

Diodos: Hoja de datos



GENERAL RULE: The Reverse Current of a diode will approximately double for every ten (10) Degree C increase in Temperature

Figure 2. Reverse Current vs Reverse Voltage IR - 10 to 100 V

Diodos: Hoja de datos

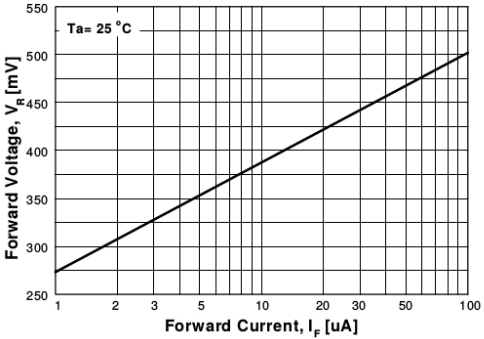


Figure 3. Forward Voltage vs Forward Current VF - 1 to 100 uA

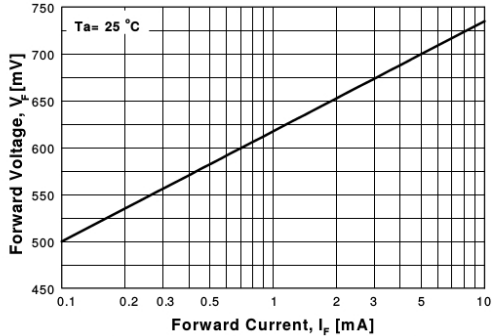


Figure 4. Forward Voltage vs Forward Current VF - 0.1 to 10 mA

Ojo, pueden haber typos!

Diodos: Hoja de datos

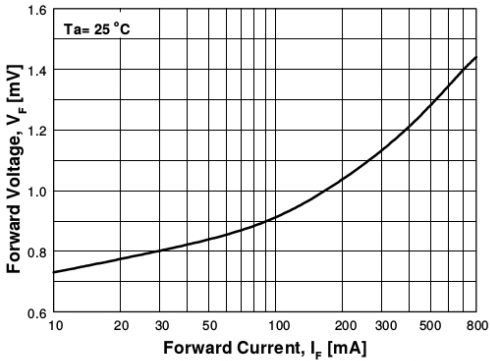


Figure 5. Forward Voltage vs Forward Current
VF - 10 to 800 mA

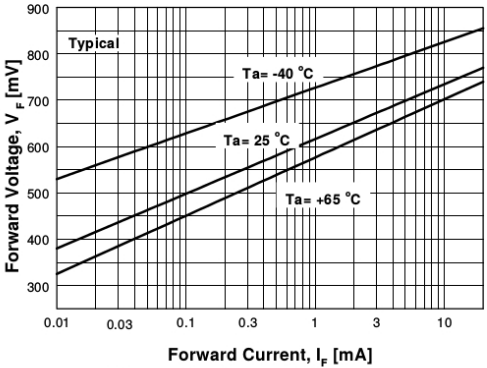


Figure 6. Forward Voltage
vs Ambient Temperature
VF - 0.01 - 20 mA (-40 to +65 Deg C)

Diodos: Hoja de datos

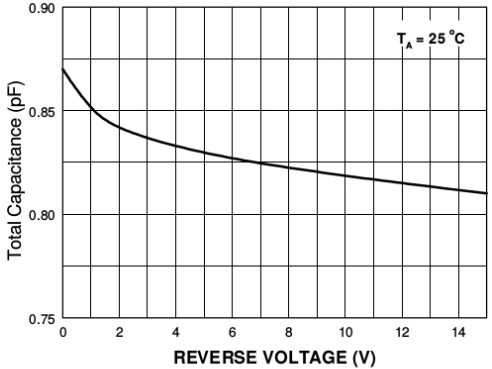


Figure 7. Total Capacitance

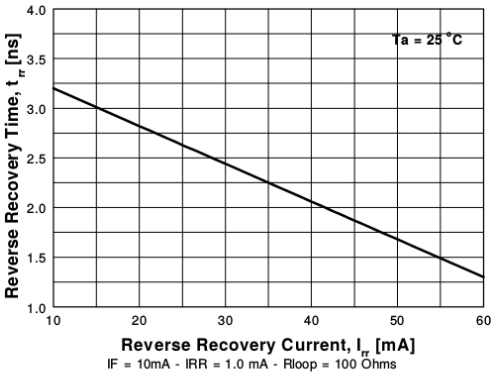


Figure 8. Reverse Recovery Time vs Reverse Recovery Current

Capacitor variable (mirar que pasa con otros diodos)

Diodos: Hoja de datos

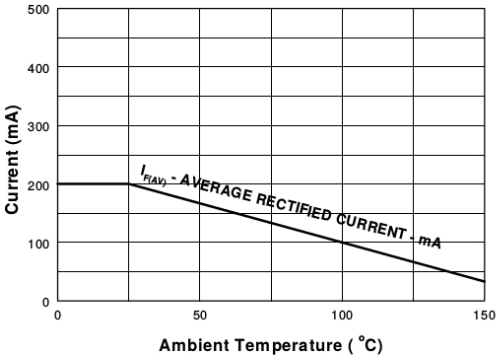


Figure 9. Average Rectified Current ($I_{F(AV)}$) versus Ambient Temperature (T_A)

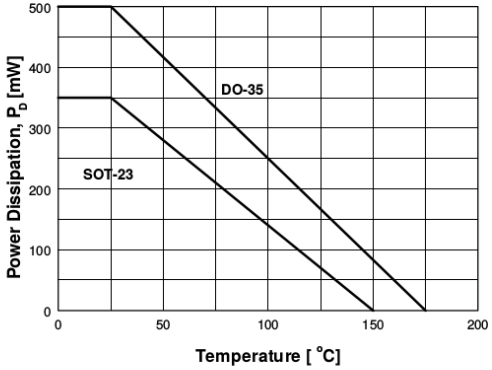
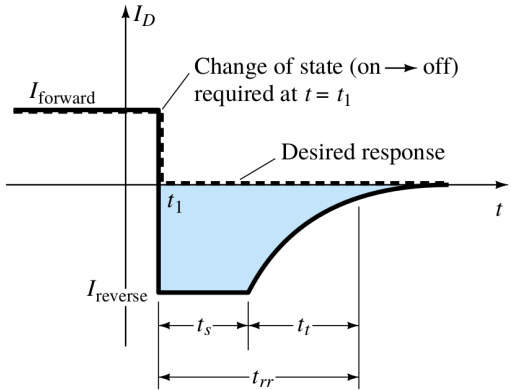


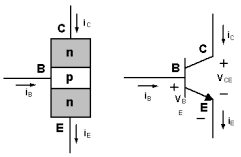
Figure 10. Power Derating Curve

Diodos: Propuesta de trabajo

Medir el tiempo de respuesta inverso t_{rr} para varios dispositivos



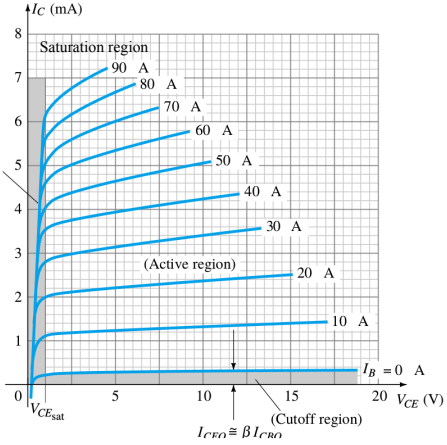
BJT: Esquemático y curvas características

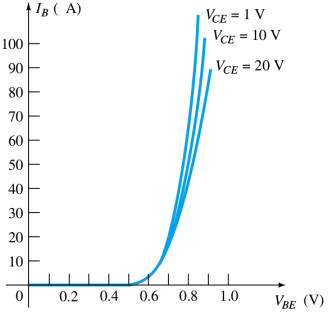


$$V_{BE} \approx 0,7 \text{ V}$$

$$I_C + I_B = I_E$$

$$I_C = \beta\, I_B$$





BJT: Especificación de datos

- Zona de ruptura
- Corrientes y temperaturas máximas
- Factores de ajuste
- Ganancia de corriente

BJT: Hoja de datos

Absolute Maximum Ratings T_a=25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage : BC546	80	V
	: BC547/550	50	V
	: BC548/549	30	V
V_{CEO}	Collector-Emitter Voltage : BC546	65	V
	: BC547/550	45	V
	: BC548/549	30	V
V_{EBO}	Emitter-Base Voltage : BC546/547	6	V
	: BC548/549/550	5	V
I_C	Collector Current (DC)	100	mA
P_C	Collector Power Dissipation	500	mW
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	-65 ~ 150	°C

BJT: Hoja de datos

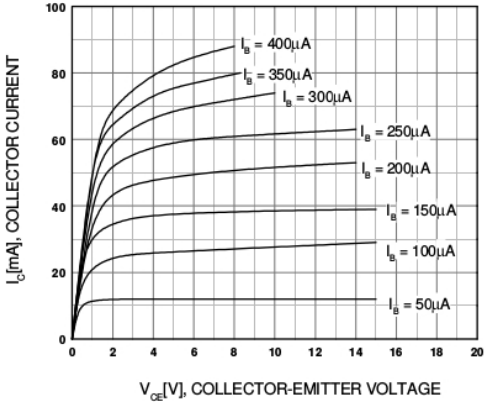
Electrical Characteristics T_a=25°C unless otherwise noted

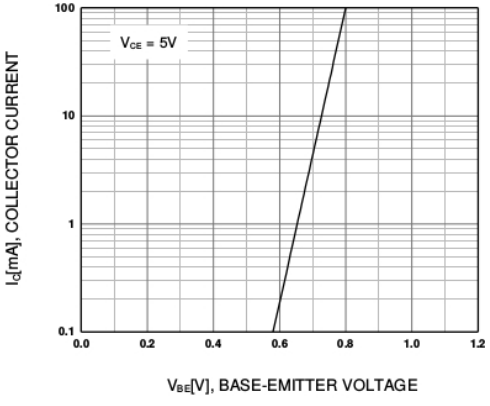
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
I_{CBO}	Collector Cut-off Current	V_{CB}=30V, I_E=0			15	nA
h_{FE}	DC Current Gain	V_{CE}=5V, I_C=2mA	110		800	
V_{CE} (sat)	Collector-Emitter Saturation Voltage	I_C=10mA, I_B=0.5mA I_C=100mA, I_B=5mA		90 200	250 600	mV mV
V_{BE} (sat)	Base-Emitter Saturation Voltage	I_C=10mA, I_B=0.5mA I_C=100mA, I_B=5mA		700 900		mV mV
V_{BE} (on)	Base-Emitter On Voltage	V_{CE}=5V, I_C=2mA V_{CE}=5V, I_C=10mA	580	660	700 720	mV mV
f_T	Current Gain Bandwidth Product	V_{CE}=5V, I_C=10mA, f=100MHz		300		MHz
C_{ob}	Output Capacitance	V_{CB}=10V, I_E=0, f=1MHz		3.5	6	pF
C_{ib}	Input Capacitance	V_{EB}=0.5V, I_C=0, f=1MHz		9		pF
NF	Noise Figure : BC546/547/548 : BC549/550 : BC549 : BC550	V_{CE}=5V, I_C=200μA f=1KHz, R_G=2KΩ V_{CE}=5V, I_C=200μA R_G=2KΩ, f=30~15000MHz		2 1.2 1.4 1.4	10 4 4 3	dB dB dB dB

h_{FE} Classification

Classification	A	B	C
h_{FE}	110 ~ 220	200 ~ 450	420 ~ 800

BJT: Hoja de datos





BJT: Hoja de datos

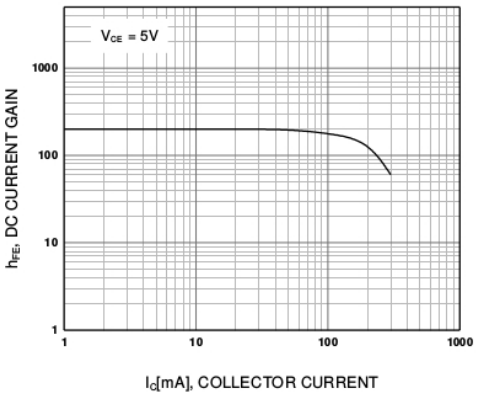


Figure 3. DC current Gain

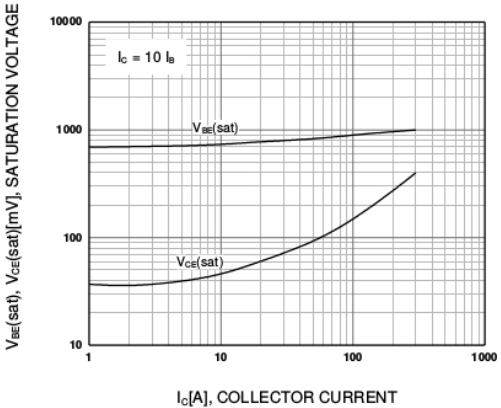


Figure 4. Base-Emitter Saturation Voltage Collector-Emitter Saturation Voltage

BJT: Hoja de datos

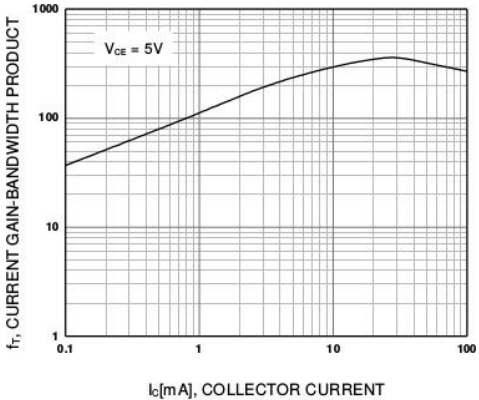
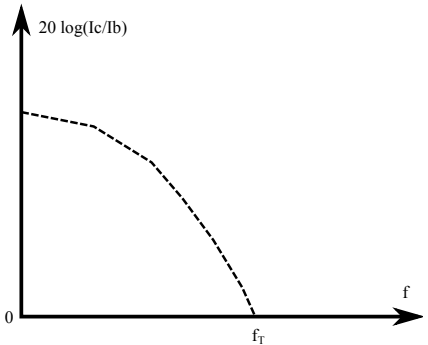
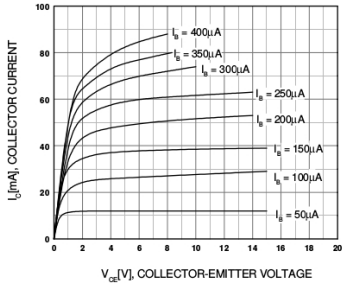


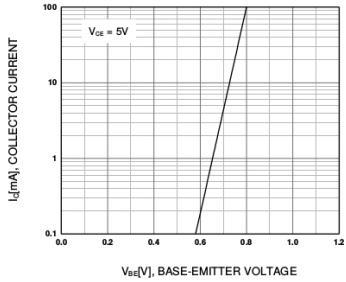
Figure 6. Current Gain Bandwidth Product



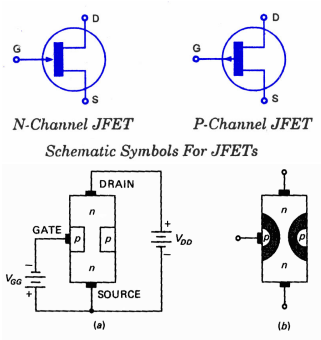
BJT: Propuesta de trabajo

Medir curva caracteristica I_C *vs.* V_{CE}





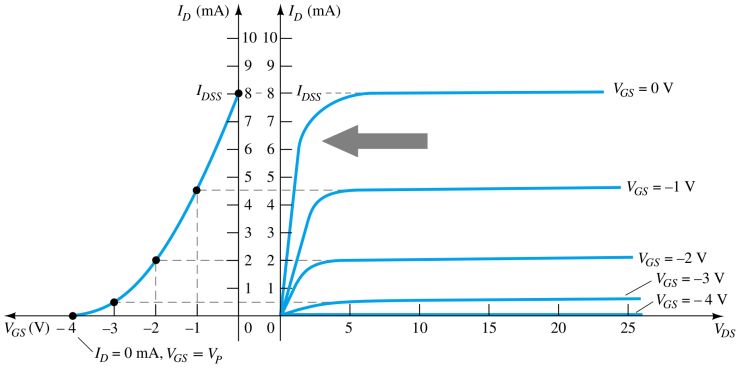
JFET: Esquemático y curvas características



$$I_G = 0$$

$$I_D = I_S$$

$$I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2$$



JFET: Hoja de datos

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DS}	25	Vdc
Drain–Gate Voltage	V_{DG}	25	Vdc
Gate–Source Voltage	V_{GS}	–25	Vdc
Gate Current	I_G	10	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	 350 2.8	 mW mW/°C
Junction Temperature Range	T_J	125	°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

JFET: Hoja de datos

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Gate – Source Breakdown Voltage (I_G = −10 μAdc, V_{DS} = 0)	$V_{(BR)GSS}$	−25	–	Vdc
Gate Reverse Current (V_{GS} = −15 Vdc, V_{DS} = 0) (V_{GS} = −15 Vdc, V_{DS} = 0, T_A = 100°C)	I_{GSS}	– –	−2.0 −2.0	nAdc μAdc
Gate – Source Cutoff Voltage (V_{DS} = 15 Vdc, I_D = 2.0 nAdc)	$V_{GS(off)}$	–	−8.0	Vdc
Gate – Source Voltage (V_{DS} = 15 Vdc, I_D = 0.2 mAdc)	V_{GS}	−0.5	−7.5	Vdc
ON CHARACTERISTICS				
Zero – Gate – Voltage Drain Current (Note 1) (V_{DS} = 15 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	2.0	20	mAdc

JFET: Propuesta de trabajo

Fuente de corriente / Resistencia controlado por tensión