

## Anexo 9: Hojas de datos

- Shaft: Steel 15.9mm (5/8") diameter, 48mm length, with 4.8mm (3/16in) key.
- Armature: 21-slot armature 76.4mm dia. series wound with AWG18 magnet wire (fusing current:82 amps).
- Brushes: Extra-large 19x25mm brushes - replacement stock no. 443730 \$ 24.90 per set
- Magnets: Two high-energy saturated C8 ceramic magnets, 12x164mm.
- Bearings: Two sealed 40mm OD ball bearings
- Rotation: Either direction - The red output wire is positive for clockwise rotation from the shaft end. Use Full Wave Bridge Rectifier if shaft will be turned in both directions.
- Speed: Zero to 2,500 rpm (5,000 rpm intermittent), generates at all speeds - depends on load. Load introduces current. See current rating at top of page or on curves.
- Mounting: Four 3/8" tapped holes on the faceplate, bolt circle 150 mm or by removable baseplate.
- Weight: 12.6Kg (27.6lb) Shipping weight 14Kg (31lb), dimensions 380x230x204mm (15x9x8in).
- Resistance: Internal resistance 1.1 ohms. Inductance 4.8mH.
- Output Voltages: 12, 24, 36, 48, 90, or 120 (determined by load and rpm)
- Output ratings determined by rpm and load.
- Generators are not weatherproof and need to be enclosed if used outside.
- **\*Generators are non- returnable once installed and connected to a power supply**

If you receive a generator that is damaged in shipping, please notify us **before** you install the generator in your application

More about [Startup Torque](#)

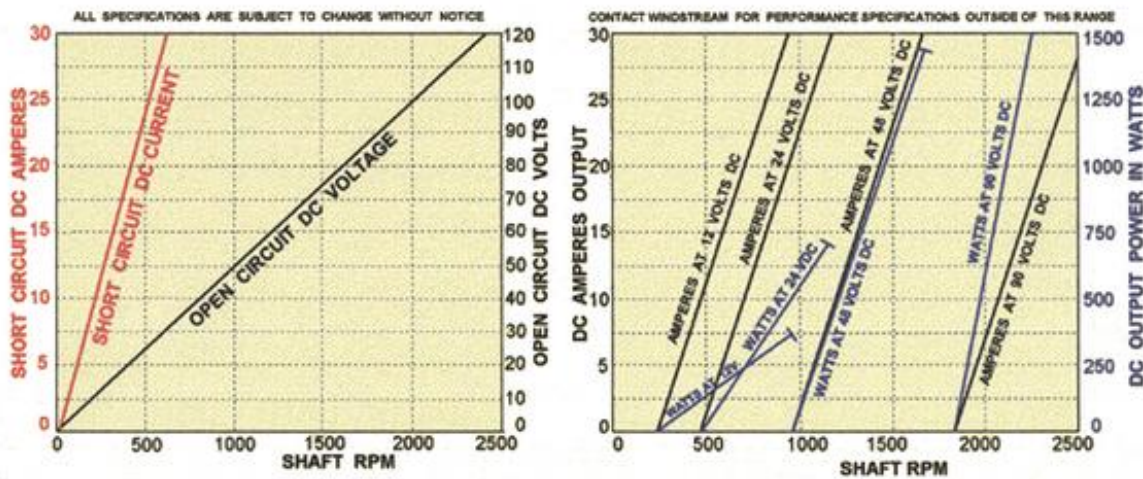


Figura A8.1: Datos y gráficas de funcionamiento del generador utilizado. Fuente: Windstream Power.

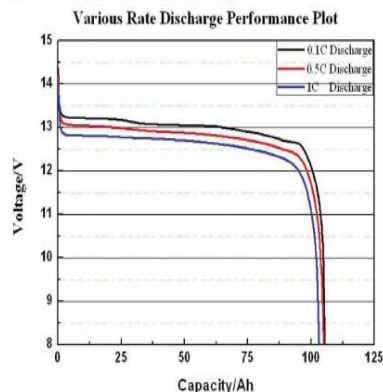


## SB40 DATA SHEET

### 12V 40AH Lithium Ion Battery



#### Discharge Curves 25°C (77°F)



#### Cycle life

Capacity at different cycles(%)	100 cycles	102
	500 cycles	96.3
	1000 cycles	90.8
	1500 cycles	85.4
	2000 cycles	80.1
Max.Charge Voltage	14.6 V	
Cut-off Voltage	8 V	



Amp Hours: 40AH  
Voltage: 12.8V Nominal  
Cold Cranking Amps: 400  
Life Expectancy: 3000 - 5000 Cycles  
LiFePo4 - SAFE BATTERY

Weight: 15 Lbs.  
Group Size SB40  
Minutes @ 20A 120  
Efficiency: 99%  
No Memory

Max Continuous Discharge 2C = 80A  
Max Continuous Charge 1C = 40A  
Operating Temp. - 4 F + 175 F  
Auto Low Voltage Cutoff 8V  
Auto Over Voltage Cutoff 16V



Smart Battery®  
6011 Benjamin Rd. Tampa FL, 33634

WWW.SMARTBATTERY.COM 1-855-GO-LITHIUM



Figura A9.2: Hoja técnica de la batería principal utilizada. Fuente: Smart Battery.

# **MJ11028, MJ11030, MJ11032 (NPN) MJ11029, MJ11033 (PNP)**

## **High-Current Complementary Silicon Power Transistors**

High-Current Complementary Silicon Power Transistors are for use as output devices in complementary general purpose amplifier applications.

### **Features**

- High DC Current Gain –  $h_{FE} = 1000$  (Min) @  $I_C = 25$  Adc  
 $h_{FE} = 400$  (Min) @  $I_C = 50$  Adc
- Curves to 100 A (Pulsed)
- Diode Protection to Rated  $I_C$
- Monolithic Construction with Built-In Base-Emitter Shunt Resistor
- Junction Temperature to +200°C
- Pb-Free Packages are Available\*

### **MAXIMUM RATINGS** ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage MJ11028/29 MJ11030 MJ11032/33	$V_{CEO}$	60 90 120	Vdc
Collector-Base Voltage MJ11028/29 MJ11030 MJ11032/33	$V_{CBO}$	60 90 120	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current – Continuous – Peak (Note 1)	$I_C$	50 100	Adc
Base Current – Continuous	$I_B$	2.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$P_D$	300 1.71	W W/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +200	°C

### **THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Maximum Lead Temperature for Soldering Purposes for $\leq 10$ seconds	$T_L$	275	°C
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.58	°C/W

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. Pulse Test: Pulse Width = 5  $\mu\text{s}$ , Duty Cycle  $\leq 10\%$ .

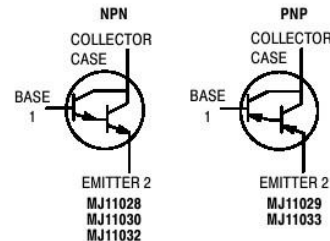
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



**ON Semiconductor®**

<http://onsemi.com>

## **50 AMPERE COMPLEMENTARY DARLINGTON POWER TRANSISTORS 60 – 120 VOLTS 300 WATTS**



**TO-204 (TO-3)  
CASE 197A  
STYLE 1**

### **MARKING DIAGRAM**



MJ110xx = Device Code  
xx = 28, 29, 30, 32, 33  
G = Pb-Free Package  
A = Location Code  
YY = Year  
WW = Work Week  
MEX = Country of Origin

### **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

Figura A9.3: Hoja de datos del transistor T1 y T2 Darlington MJ11032 utilizado. Fuente: ON Semiconductor.

## TIP29/TIP29A/TIP29B/TIP29C NPN Epitaxial Silicon Transistor

### Features

- Complementary to TIP30/TIP30A/TIP30B/TIP30C



1. Base 2. Collector 3. Emitter

### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

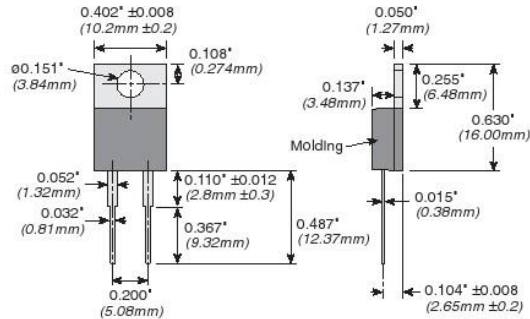
Symbol	Parameter	Value	Units
$V_{CB0}$	Collector-Base Voltage : TIP29	40	V
	: TIP29A	60	V
	: TIP29B	80	V
	: TIP29C	100	V
$V_{CE0}$	Collector-Emitter Voltage : TIP29	40	V
	: TIP29A	60	V
	: TIP29B	80	V
	: TIP29C	100	V
$V_{EB0}$	Emitter-Base Voltage	5	V
$I_C$	Collector Current (DC)	1	A
$I_{CP}$	Collector Current (Pulse)	3	A
$I_B$	Base Current	0.4	A
$P_C$	Collector Dissipation ( $T_C=25^\circ\text{C}$ )	30	W
	Collector Dissipation ( $T_a=25^\circ\text{C}$ )	2	W
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	- 65 ~ 150	$^\circ\text{C}$

Figura A9.4: Hoja de datos del transistor T3 utilizado. Fuente: Fairchild Semiconductor.



# **TBH Series**

**25 Watt TO220 Package  
Thick Film Power**



Note: These dimensions apply to TBH products manufactured after March 2007

## **ORDERING INFORMATION**

RoHS compliant  
Non-RoHS version unavailable

**T B H 2 5 P 2 R 0 0 J E**

Series      Ohm Value      Tolerance  
Example:      R030 = 0.030 Ω      J = 5%, standard  
10R0 = 10 Ω  
1K50 = 1500 Ω

## **STANDARD PART NUMBERS FOR TBH SERIES**

Ohms	Part Number 5% Tolerance	Ohms	Part Number 5% Tolerance
0.030	TBH25PR030JE	100	TBH25P100RJE
0.036	TBH25PR036JE	150	TBH25P150RJE
0.040	TBH25PR040JE	220	TBH25P220RJE
0.047	TBH25PR047JE	240	TBH25P240RJE
0.050	TBH25PR050JE	330	TBH25P330RJE
0.075	TBH25PR075JE		
2	TBH25P2R00JE	470	TBH25P470RJE
7.5	TBH25P750JE	510	TBH25P510RJE
10	TBH25P10R0JE	1000	TBH25P1K00JE
15	TBH25P15R0JE	1500	TBH25P1K50JE
22	TBH25P22R0JE	2000	TBH25P2K00JE
		2700	TBH25P2K70JE
30	TBH25P30R0JE	10,000	TBH25P10K0JE
33	TBH25P33R0JE		
47	TBH25P47R0JE		
51	TBH25P51R0JE		
75	TBH25P75R0JE		

Check product availability at [www.ohmite.com](http://www.ohmite.com)

Ohmite's TBH25 TO220 style resistors are designed for a variety of uses that require intermediate heatsinkable power at an economical price. Engineered for industrial applications, these resistors deliver reliable performance to traditional high-quality Ohmite standards.

## **FEATURES**

- 25 Watts, @ 25°C case temperature
- Non-Inductive Performance
- Low Thermal Resistance
- Anti-static tube packaging available
- Economically priced
- Resistance element is electrically insulated from metal heat sink mounting tab

## **APPLICATIONS**

- Power Supplies
- Industrial Controls
- Automotive Steering
- Pre-load/Damping
- Snubber/Bleeder
- Current Sensing

## **SPECIFICATIONS**

### **Material**

**Resistor:** Thick film element above 1Ω, Ni-Cu metal element below 1Ω

**Case:** High Temperature Plastic

**Terminals:** Solder coated phosphor bronze

### **Electrical:**

**Derating:** 100% @ 25°C to 0% @ 150°C curve referenced to case temperature

**Dielectric Strength:** 1000 VDC

**Max. Mounting Torque:** 0.9Nm

**Operating Temperature Range:** -55°C to +150°C

**Temperature Coefficient:**

0.03-10Ω @ ±100ppm

11Ω-10KΩ @ ±50ppm

**Thermal Resistance:** 5°C/W

**Tolerance:** 5%

**Power:** 25 Watts. Rating based on 25°C case temperature. The case temperature is to be used for the purposes of establishing the applied power limit. The case temperature must be made with thermocouple contacting the center of the component's mounting tab mounted on designated heat sink.

**Resistance Range:** 0.03Ω - 10KΩ. Standard values listed at left, others available upon special request.

**Max. Operating Voltage:** 350V

## **TEST DATA**

<b>Load Life</b>	(1000hrs @ rated power)	max. ΔR ±1%
<b>Moisture Resistance</b>	(MIL-STD-202, method 106)	max. ΔR ±0.5%
<b>Short Time Overload</b>	(2x rated power, not to exceed 1.5x max. operating voltage)	max. ΔR ±0.3%
<b>Solderability</b>	(MIL-STD-202, method 208)	
<b>Thermal Shock</b>	(MIL-STD-202, method 107, cond. F)	max. ΔR ±0.3%
<b>Terminal Strength</b>	(MIL-STD-202, method 211, cond. A (pull test) 2.4N)	max. ΔR ±0.2%
<b>Vibration</b>	(MIL-STD-202, method 204, cond. D)	max. ΔR ±0.2%

## **THIS PRODUCT IS DESIGNED FOR USE WITH PROPER HEATSINKING.**

Maximum base plate temperature of the resistor must be monitored and kept within specified limits to establish the power rating. Best technique is to attach a thermocouple to the side of the base plate of the resistor. Temperature of plastic housing or heat sink cannot be used to establish rating of the resistor.

Figura A9.5: Hoja de datos de la resistencia R2 utilizada. Fuente: Ohmite Mfg Co.

## NP-Series - Valve Regulated Lead Acid Battery

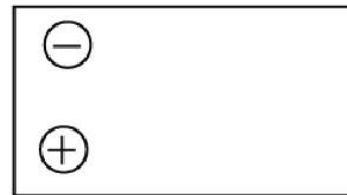
### NP3.2-12

SPECIFICATIONS		
Nominal voltage	12	V
20-hr rate Capacity to 1.75VPC at 20°C	3.2	Ah
10-hr rate Capacity to 1.75VPC at 20°C	2.9	Ah
DIMENSIONS		
Length	134 (±1)	mm
Width	67 (±1)	mm
Height		mm
(Height over terminals)	64 (±2)	mm
Mass (typical)	1.2	kg
TERMINAL TYPE		
FASTON (Quick fit /release)	4.75	mm
OPERATING TEMPERATURE RANGE		
Storage	-20°C to +60°C	
Charge	-15°C to +50°C	
Discharge	-20°C to +60°C	
STORAGE		
Capacity loss per month at 20°C (approx)	3	%
CASE MATERIAL		
Standard Option	ABS (UL94:HB)	
Flame retardant option (FR)	ABS (UL94:V0)	
CHARGE VOLTAGE		
Float charge voltage at 20°C	13.65 (±1%)	V
	2.275 (±1%)	V/cell
Float Charge voltage temperature correction factor (for variations from the standard 20°C)	-3	mV/cell/°C
Cyclic (or Boost) charge at 20°C	14.5 (±3%)	V
	2.42 (±3%)	V/cell
Cyclic Charge voltage temperature correction factor (for variations from the standard 20°C)	-4	mV/cell/°C
CHARGE CURRENT		
Float charge current limit	No limit	A
Cyclic (or Boost) charge current limit	0.8	A
MAXIMUM DISCHARGE CURRENT		
1 second	96	A
1 minute	32	A
SHORT-CIRCUIT CURRENT & INTERNAL RESISTANCE (according to EN IEC 60896-21)		
Internal resistance	N/A	mΩ
Short-Circuit current	N/A	A
IMPEDANCE		
Measured at 1 kHz	50	mΩ
PERFORMANCE & CHARACTERISTICS		
Refer to the technical manual	NP	
DESIGN LIFE		
EUROBAT Classification: Standard Commercial	3 to 5	years
Yuasa design life @ 20°C	up to 5	years
SAFETY		
<b>Installation</b> Can be installed and operated in any orientation except permanently inverted		
<b>Handles</b> Batteries must not be suspended by their handles (where fitted)		
<b>Vent valves</b> Each cell is fitted with a low pressure release valve to allow gasses to escape and then reseal.		
<b>Gas Release</b> VRLA Batteries release hydrogen gas which can form explosive mixtures in air. Do not place inside a sealed container		
<b>Recycling</b> YUASA's VRLA batteries must be recycled at the end of life in accordance with local and national laws and regulations		

## Data Sheet



### LAYOUT



### 3RD PARTY CERTIFICATIONS

ISO 9001 - Quality Management Systems  
 ISO 14001 - Environmental Management Systems  
 EN 18001 - OHSAS Management Systems  
 UNDERWRITERS LABORATORIES Inc.



### STANDARDS

IEC 61056



ALL DATA IS SUBJECT TO CHANGE WITHOUT NOTICE  
 Issue No.: V.2 / Issue Date: March 2011



YUASA BATTERY  
 IBERIA S.A.  
 C/ Toronga, 21  
 Local 1  
 28043 Madrid

[www.yuasaeurope.com](http://www.yuasaeurope.com)

NP

Figura A9.6: Hoja de datos de la batería secundaria utilizada. Fuente: Yuasa.

## BC546/547/548/549/550

### Switching and Applications

- High Voltage: BC546,  $V_{CE0}=65V$
- Low Noise: BC549, BC550
- Complement to BC556 ... BC560



### NPN Epitaxial Silicon Transistor

**Absolute Maximum Ratings**  $T_a=25^\circ C$  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	$^\circ C$
$T_{STG}$	Storage Temperature	-65 ~ 150	$^\circ C$

**Electrical Characteristics**  $T_a=25^\circ C$  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	$I_C=10mA, I_B=0.5mA$		90	250	mV
		$I_C=100mA, I_B=5mA$		200	600	mV
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C=10mA, I_B=0.5mA$		700		mV
		$I_C=100mA, I_B=5mA$		900		mV
$V_{BE(on)}$	Base-Emitter On Voltage	$V_{CE}=5V, I_C=2mA$	580	660	700	mV
		$V_{CE}=5V, I_C=10mA$			720	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	$V_{CE}=5V, I_C=200\mu A$		2	10	dB
		$f=1kHz, R_o=2K\Omega$		1.2	4	dB
		: BC549/550		1.4	4	dB
		: BC549		1.4	3	dB
		$R_o=2K\Omega, f=30\sim 15000MHz$				

### $h_{FE}$ Classification

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

Figura A9.7: Hoja de datos del transistor T5 utilizado. Fuente: Fairchild Semiconductor.

## BD435G, BD437G, BD439G, BD441G

### Plastic Medium-Power Silicon NPN Transistors

This series of plastic, medium-power silicon NPN transistors can be used for amplifier and switching applications.

#### Features

- Complementary Types are BD438 and BD442
- These Devices are Pb-Free and are RoHS Compliant\*

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage BD435G BD437G BD439G BD441G	$V_{CE0}$	32 45 60 80	Vdc
Collector-Base Voltage BD435G BD437G BD439G BD441G	$V_{CBO}$	32 45 60 80	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current	$I_C$	4.0	Adc
Base Current	$I_B$	1.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	36 288	W W/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

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.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.5	°C/W

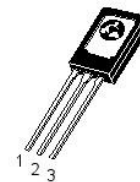
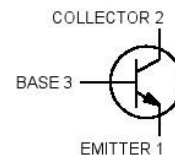
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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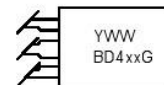
<http://onsemi.com>

### 4.0 AMPERES POWER TRANSISTORS NPN SILICON



TO-225  
CASE 77  
STYLE 1

#### MARKING DIAGRAM



BD4xx = Device Code  
xx = 35, 37, 37T, 39, 41  
Y = Year  
WW = Work Week  
G = Pb-Free Package

#### ORDERING INFORMATION

Device	Package	Shipping
BD435G	TO-225 (Pb-Free)	500 Units/Box
BD437G	TO-225 (Pb-Free)	500 Units/Box
BD437TG	TO-225 (Pb-Free)	50 Units/Rail
BD439G	TO-225 (Pb-Free)	500 Units/Box
BD441G	TO-225 (Pb-Free)	500 Units/Box

Figura A9.8: Hoja de datos del transistor T4 y T6 utilizado. Fuente: ON Semiconductor.





# 40V, Low Quiescent Current, 50mA Linear Regulator

## ISL80136

The ISL80136 is a high voltage, low quiescent current linear regulator ideally suited for “always-on” and “keep alive” applications. The ISL80136 operates from an input voltage of +6V to +40V under normal operating conditions, consuming only 18µA of quiescent current at no load.

The ISL80136 offers adjustable output voltages from 2.5V to 12V. It features an EN pin that can be used to put the device into a low-quiescent current shutdown mode where it draws only 1.8µA of supply current. The device features over-temperature shutdown and current limit protection.

The ISL80136 is rated over the -40 °C to +125 °C temperature range and is available in both an 8 lead EPSONIC with exposed pad package and an 8 lead DFN with exposed pad package.

TABLE 1. KEY DIFFERENCES IN FAMILY OF 40V LDO PARTS

PART NUMBER	MIN. I <sub>OUT</sub>	ADJ OR FIXED V <sub>OUT</sub>
ISL80136	50mA	ADJ
ISL80138	150mA	ADJ

## Features

- Wide V<sub>IN</sub> range of 6V to 40V
- Adjustable output voltage from 2.5V to 12V
- Guaranteed 50mA output current
- Ultra low 18µA typical quiescent current
- Low 1.8µA of typical shutdown current
- ±1% accurate voltage reference
- Low dropout voltage of 120mV at 50mA
- 40V tolerant logic level (TTL/CMOS) enable input
- Stable operation with 10µF output capacitor
- 5kV ESD HBM rated
- Thermal shutdown and current limit protection

## Applications

- Industrial
- Networking
- Telecom

## Related Literature

- See [FN7969](#), “ISL80138 40V, Low Quiescent Current, 150mA Linear Regulator”

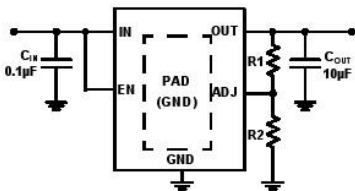


FIGURE 1. TYPICAL APPLICATION

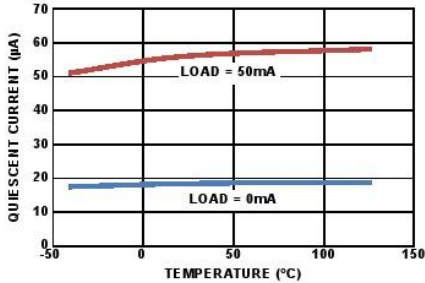


FIGURE 2. QUIESCENT CURRENT vs LOAD CURRENT (AT UNITY GAIN), V<sub>IN</sub> = 14V

## Picoamp Input Current, Microvolt Offset, Low Noise Op Amp

### FEATURES

- Guaranteed Bias Current
  - $T_A = 25^\circ\text{C}$ : 100pA Max
  - $T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ : 600pA Max
- Guaranteed Offset Voltage: 120 $\mu\text{V}$  Max
- Guaranteed Drift: 1.5 $\mu\text{V}/^\circ\text{C}$  Max
- Low Noise, 0.1Hz to 10Hz: 0.5 $\mu\text{V}_{\text{P-P}}$
- Guaranteed Low Supply Current: 600 $\mu\text{A}$  Max
- Guaranteed CMRR: 114dB Min
- Guaranteed PSRR: 114dB Min
- Guaranteed Voltage Gain with 5mA Load Current
- Available in 8-Lead PDIP and SO Packages

### APPLICATIONS

- Precision Instrumentation
- Charge Integrators
- Wide Dynamic Range Logarithmic Amplifiers
- Light Meters
- Low Frequency Active Filters
- Standard Cell Buffers
- Thermocouple Amplifiers

### DESCRIPTION

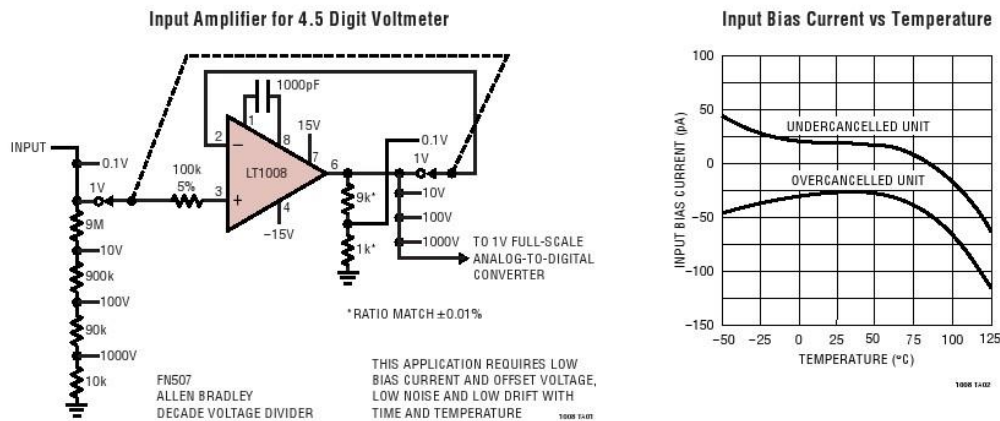
The LT<sup>®</sup>1008 is a universal precision operational amplifier that can be used in practically all precision applications. The LT1008 combines for the first time, picoampere bias currents (which are maintained over the full  $-55^\circ\text{C}$  to  $125^\circ\text{C}$  temperature range), microvolt offset voltage (and low drift with time and temperature), low voltage and current noise, and low power dissipation. Extremely high common mode and power supply rejection ratios, and the ability to deliver 5mA load current with high voltage gain round out the LT1008's superb precision specifications.

The all around excellence of the LT1008 eliminates the necessity of the time consuming error analysis procedure of precision system design in many applications; the LT1008 can be stocked as the universal precision op amp.

The LT1008 is externally compensated with a single capacitor for additional flexibility in shaping the frequency response of the amplifier. It plugs into and upgrades all standard LM108A/LM308A applications. For an internally compensated version with even lower offset voltage but otherwise similar performance see the LT1012.

LT, LTC and LTM are registered trademarks of Linear Technology Corporation.

### TYPICAL APPLICATION



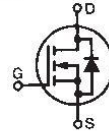


## PolarHT™ Power MOSFET

IXTH 88N30P  
IXTK 88N30P  
IXTQ 88N30P  
IXTT 88N30P

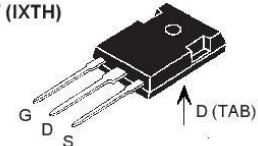
$V_{DSS} = 300 \text{ V}$   
 $I_{D25} = 88 \text{ A}$   
 $R_{DS(on)} \leq 40 \text{ m}\Omega$

N-Channel Enhancement Mode  
Avalanche Rated

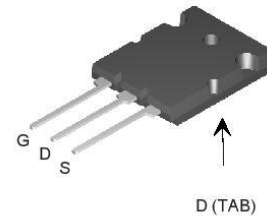


Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	300	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$	300	V
$V_{GS}$	Continuous	$\pm 20$	V
$V_{GSM}$	Transient	$\pm 30$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	88	A
$I_{D(RMS)}$	External lead current limit	75	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	220	A
$I_{AR}$	$T_C = 25^\circ\text{C}$	60	A
$E_{AR}$	$T_C = 25^\circ\text{C}$	60	mJ
$E_{AS}$	$T_C = 25^\circ\text{C}$	2.0	J
$dv/dt$	$I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ $T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$	10	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	600	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_L$	1.6 mm (0.062 in.) from case for 10 s	300	$^\circ\text{C}$
$T_{SOLD}$	Plastic body for 10 s	260	$^\circ\text{C}$
$M_d$	Mounting torque	1.13/10	Nm/lb.in.
Weight	TO-247	6.0	g
	TO-264	10	g
	TO-3P & TO-268	5.5	g

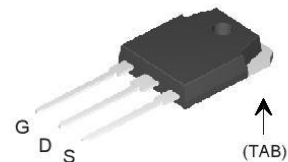
TO-247 (IXTH)



TO-264 (IXTK)



TO-3P (IXTQ)



TO-268 (IXTT)



G = Gate      D = Drain  
S = Source    TAB = Drain

### Features

- International standard package
- Unclamped Inductive Switching (UIS) rated
- Low package inductance - easy to drive and to protect

### Advantages

- Easy to mount
- Space savings
- High power density

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	300		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2.5		V
$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0$			$\pm 100 \text{ nA}$
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$			100 $\mu\text{A}$ 1 mA
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$ Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2\%$			40 m $\Omega$

Figura A9.11: Hoja de datos del MOSFET utilizado. Fuente: IXYS.

## Features

- 500mW Power Dissipation on Ceramic PCB
- Specified at a Low Test Current (50 $\mu$ A), ideal for low bias and portable battery-powered applications
- Ideally Suited for Automated Assembly Processes
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

- Case: SOD123
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: Cathode Band
- Terminals: Finish - Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208<sup>(3)</sup>
- Weight: 0.01 grams (approximate)

SOD123



Top View

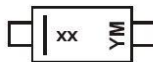
## Ordering Information (Notes 4 & 5)

Part Number	Compliance	Case	Packaging
(Type Number)-7*	Standard	SOD123	3000/Tape & Reel
(Type Number)Q-7* (Note 6)	Automotive	SOD123	3000/Tape & Reel

\*Example: The part number for the commercial grade 4.7 Volt device would be DDZ9688-7 and the part number for the automotive grade 4.7 Volt device would be DDZ9688Q-7.

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. 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.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Product manufactured with Date Code V9 (week 33, 2008) and newer are built with Green Molding Compound. Product manufactured prior to Date Code V9 are built with Non-Green Molding Compound and may contain Halogens or Sb<sub>2</sub>O<sub>3</sub> Fire Retardants.
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.
  6. Only products denoted Note 10 in the "Electrical Characteristics" table are currently available as automotive grade devices.

## Marking Information



xx = Product Type Marking Code -  
(See Electrical Characteristics Table)  
YM = Date Code Marking  
Y = Year (ex: T = 2006)  
M = Month (ex: 9 = September)

### Date Code Key

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Code	T	U	V	W	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



## **Loads & Rates**

Maximum torque possible,  $Torque_{max}$  : **27,097.318180 N**

Rate per degree : **2,280.962337539**

Spring constant (or Spring rate) per 360 degrees,  $k_{360 \text{ degrees}}$  : **821,146.44151 N-mm per 360 degrees**

## **Safe Travel**

Maximum safe travel,  $Travel_{max}$  : **11.879774 degrees**

## **Physical Dimensions**

Diameter of spring wire,  $d$  : **7.000 mm**

Outer diameter of spring,  $D_{outer}$  : **35.000 mm**

Inner diameter of spring,  $D_{inner}$  : **21.000 mm**

Mean diameter of spring,  $D_{mean}$  : **28.000 mm**

Number of active coils,  $n_a$  : **2.000**

Body length,  $L_{body}$  : **21.000 mm**

Length of leg 1 : **50.000 mm**

Length of leg 2 : **50.000 mm**

Total leg length : **100.000 mm**

Direction of wind : **Left hand**

Spring index,  $C$  : **4.000**

## **Material type**

Material type: **Oil Tempered MB A229**

## **Weights & Measures**

Weight of one spring,  $M$  : **0.083518 Kg**

Weight of one thousand springs,  $M$  : **83.518432 Kg**

Length of wire required to make one spring,  $L_{wire}$  : **275.929 mm**

## **Stress Factors**

Material shear modulus,  $G$  : **80,483.548 Pa**

Maximum shear stress possible,  $\tau_{max}$  : **7,907.152 Pa**

Wahl correction factor,  $W$  : **1.404**

## **Suggested Part Number**

Suggested part number : **PT700035000-2-OT-LH**

Figura A9.13: Especificaciones del resorte de torsión utilizado.  
Fuente: Acxess Spring.



**Type: REGL F2-D2(D3)**

REGL F2-D2(D3) Series														
Type	d <sub>H7</sub>	D <sub>h6</sub>	L	L <sub>2</sub>	L <sub>3</sub>	s	D <sub>4</sub>	D <sub>5</sub>	o	z	Weight	n <sub>max</sub> [1] Inner race	n <sub>max</sub> [2] Outer race	T <sub>N</sub> [3]
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	qty	(Kg)	(min · °)	(min · °)	(Nm)
REGL F2-D2(D3) 12	12	62	42	20	64	10	85	72	5.5	3	0.90	4000	5600	55
REGL F2-D2(D3) 15	15	68	52	28	78	11	92	78	5.5	3	1.30	3700	5300	125
REGL F2-D2(D3) 20	20	75	57	34	82	10.5	98	85	5.5	4	1.70	2700	4600	181
REGL F2-D2(D3) 25	25	90	60	35	85	11.5	108	104	6.6	4	2.60	2200	3600	288
REGL F2-D2(D3) 30	30	100	68	43	95	11.5	128	114	6.6	6	3.50	1800	3300	500
REGL F2-D2(D3) 35	35	110	74	45	102	13.5	140	124	6.6	6	4.50	1500	3000	725
REGL F2-D2(D3) 40	40	125	86	53	115	15.5	160	142	9	6	6.90	1200	2600	1025
REGL F2-D2(D3) 45	45	130	86	53	115	15.5	165	146	9	8	7.10	1000	2400	1125
REGL F2-D2(D3) 50	50	150	94	64	123	14	185	166	9	8	10.10	850	2200	2125
REGL F2-D2(D3) 55	55	160	104	66	138	18	204	182	11	8	13.10	750	2000	2625
REGL F2-D2(D3) 60	60	170	114	78	147	17	214	192	11	10	15.60	650	1900	3500
REGL F2-D2(D3) 70	70	190	134	95	168	18.5	234	212	11	10	20.40	550	1700	5750
REGL F2-D2(D3) 80	80	210	144	100	178	21	254	232	11	10	26.70	500	1600	8500
REGL F2-D2(D3) 90	90	230	158	115	192	20.5	278	254	14	10	39.00	450	1500	14500
REGL F2-D2(D3) 100	100	270	182	120	217	30	335	305	18	10	66.00	350	1250	20000
REGL F2-D2(D3) 120	120	310	202	140	-	30	375	345	18	12	91.00	300	1100	25000
REGL F2-D2(D3) 130	130	310	212	152	250	29	375	345	18	12	91.00	250	1000	31250
REGL F2-D2(D3) 150	150	400	246	180	286	32	485	445	22	12	200.00	200	800	70000

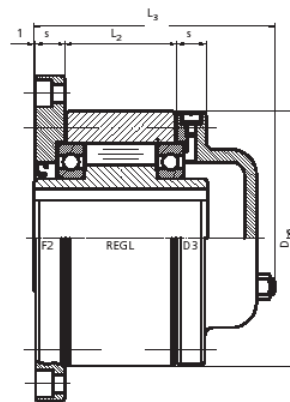
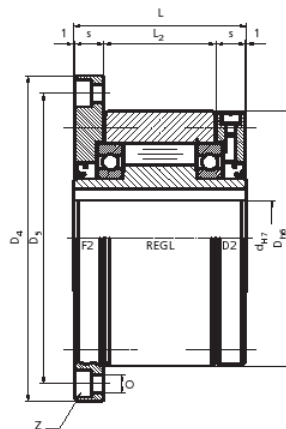
Notes

[1] Inner race overrunning

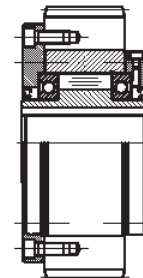
[2] Outer race overrunning

[3]  $T_{MAX} = 2 \times T_N$

REGL Keyways to DIN 6885 Part 1



Mounting example



V 155

VCN

AISI : ~ 4340 H

DIN : 34 Cr Ni Mo 6

WNº: 1.6582

Tipo de aleación : C0,34 Cr1,5 Ni1,5 Mo0,2 Si0,30 Mn0,50%  
 Color de identificación : Verde  
 Estado de suministro : Bonificado 240-380 HB Típico. Ver tabla inf.  
 Largo Standard : 3,5 - 5 metros.

**Acero especial de bonificación al cromo níquel molibdeno, altamente resistente a la tracción, a la torsión y a cambios de flexión. Insensible al sobrecalentamiento en el forjado y libre de propensión a fragilidad de revenido. Por su estado de suministro permite en la mayoría de los casos su aplicación, sin necesidad de tratamiento térmico adicional.**

**APLICACIONES:** Partes de maquinaria y repuestos de mayores dimensiones, sometidas a muy altos esfuerzos dinámicos y otras altas exigencias mecánicas. Cigüeñales, ejes de leva, árboles de transmisión, barras de torsión, ejes cardán, ejes para bombas, ejes para hélice de aviones, pernos y tuercas de alta tensión, rodillos de transportadora, vástagos y pines, muñones; brazos de dirección, ciertos engranajes, discos de embrague, etc.

#### INDICACIONES PARA EL TRATAMIENTO TÉRMICO

**Forjado:** 1050 - 850 °C  
**Recocido:** 650 - 700 °C  
 Enfriamiento lento en el horno  
**Temple:** al aceite 830 - 860 °C  
**Dureza Obtenible:** 52 - 56 HRC  
**Revenido:** 540 - 680 °C  
**Normalizado:** 850 - 880 °C  
**Nitrurar:** 580 °C



Resistencia en estado Recocido		CARACTERÍSTICAS MECÁNICAS EN ESTADO BONIFICADO						
máx. N/mm²	Dureza Brinell máx.	Diámetro mm.		Límite de fluencia N/mm²	Resistencia a la tracción N/mm²	Elongación (Lo = 5d) % mín.	Estricción % mín.	Resiliencia según DVM Joule
		desde	hasta					
800	248	16	16	980	1180 - 1380	9	40	41
		16	40	885	1080 - 1280	10	45	48
		40	100	785	980 - 1180	11	50	48
		100	160	685	880 - 1080	12	55	48
		160	250	590	780 - 930	13	55	48

Soldadura: Consultar con nuestro Departamento Técnico

Figura A9.15: Hoja de datos del acero AISI 4340 utilizado. Fuente: Aceros Böhler del Perú.

E 230	AISI : 3215
ECN	DIN : 1.8 Cr Ni 6
	W N° : 1.5819

Tipo de aleación : C 0,17 Cr 1,5 Ni 1,6 Si 0,30 Mn 0,50 %  
Color de identificación : Azul  
Estado de suministro : Recocido 217 HB máx.

**Acero especial de cementación aleado al Cromo-Níquel. Adquiere excelente dureza superficial en el temple de cementación. Insuperable tenacidad en el núcleo.**

APLICACIONES: Partes de maquinaria y repuestos de grandes dimensiones, de las cuales se exige muy alta dureza superficial, tenacidad y resistencia extraordinaria en el núcleo, ideal para la fabricación de piñones, cigüeñales, ejes de cajas

#### INDICACIONES PARA EL TRATAMIENTO TÉRMICO

Forjado: 1150 - 850 °C  
Recocido: 650 - 700 °C  
Enfriamiento lento en el horno  
Cementar: 900 - 950 °C  
Enfriamiento: en aceite o baño térmico de 160 - 260 °C  
Temple del Núcleo: 830 - 870 °C  
Revenido: mínimo 1 hora 150 - 200 °C  
Dureza Obtenible en la capa cementada: 59 - 63 HRC

CARACTERÍSTICAS MECÁNICAS						
En el núcleo de la pieza cementada						Dureza en la superficie HRC
Diám. mín.	Límite de fluencia N/mm <sup>2</sup>	Resistencia a la tracción N/mm <sup>2</sup>	Alargamiento (L=5d) mín. %	Contracción % mín.	Resiliencia según DVM Joule (val. de guía)	
10	700	1000 - 1300	8	35	-	59
30	650	900 - 1200	9	40	69	a
68	550	800 - 1100	10	40	-	63

**Soldadura:** Este acero es relativamente soldable. En este caso se debe pre-calentar a una temperatura de 250 - 350 °C y después de soldar someterlo a un recocido. Electrodo recomendable UTP 6020; en caso que la cementación de la costura no sea indispensable, se recomienda el uso de electrodos BOHLER UTP 65.

La capa cementada no es soldable.

Figura A9.16: Hoja de datos del acero AISI 4340. Fuente: Aceros Böhler del Perú.