



Lead-free Green

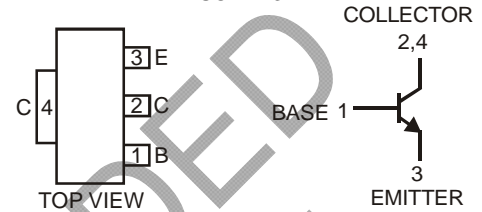
## Features

- Epitaxial Planar Die Construction
- Low Collector-Emitter Saturation Resistance  $R_{CE(SAT)} = 57.5m\Omega$  at 4A
- High DC Current Gain  $h_{FE} > 400$  at  $I_C = 3A$
- Complementary PNP Type Available (DPLS315E)
- Ideally Suited for Automated Assembly Processes
- Ideal for Medium Power Switching or Amplification Applications
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**



## Mechanical Data

- Case: SOT-223
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals: Finish — Matte Tin annealed over Copper Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208
- Marking Information: See Page 3
- Ordering Information: See Page 3
- Weight: 0.112 grams (approximate)



Schematic and Pin Configuration

## Maximum Ratings @ $T_A = 25^\circ C$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	12	V
Collector-Emitter Voltage	$V_{CEO}$	12	V
Emitter-Base Voltage	$V_{EBO}$	5	V
Continuous Collector Current	$I_C$	4	A
Peak Pulse Current	$I_{CM}$	10	A

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation @ $T_A = 25^\circ C$ (Note 3)	$P_D$	1	W
Thermal Resistance, Junction to Ambient Air (Note 3) @ $T_A = 25^\circ C$	$R_{\theta JA}$	125	$^\circ C/W$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ C$

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).
  3. Device mounted on FR-4 PCB, pad layout as shown on page 4 or in Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

### Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>Off Characteristics</b>						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	12	—	—	V	$I_C = 100\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	12	—	—	V	$I_C = 10\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5	—	—	V	$I_E = 100\mu\text{A}, I_C = 0$
Collector Cutoff Current	$I_{CBO}$	—	—	100	nA	$V_{CB} = 10\text{V}, I_E = 0$
Emitter Cutoff Current	$I_{EBO}$	—	—	100	nA	$V_{EB} = 4\text{V}, I_C = 0$
<b>On Characteristics (Note 4)</b>						
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.02	0.04	V	$I_C = 0.1\text{A}, I_B = 1\text{mA}$
		—	0.03	0.06		$I_C = 0.1\text{A}, I_B = 0.5\text{mA}$
		—	0.06	0.18		$I_C = 1\text{A}, I_B = 50\text{mA}$
		—	0.20	0.35		$I_C = 3\text{A}, I_B = 20\text{mA}$
		—	0.23	0.40		$I_C = 4\text{A}, I_B = 50\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	—	—	1.1	V	$I_C = 3\text{A}, I_B = 20\text{mA}$
Base-Emitter Turn-On Voltage	$V_{BE(ON)}$	—	—	1.0	V	$V_{CE} = 2\text{V}, I_C = 3\text{A}$
DC Current Gain	$h_{FE}$	500	—	—	—	$V_{CE} = 2\text{V}, I_C = 0.1\text{A}$
		400	—	—		$V_{CE} = 2\text{V}, I_C = 3\text{A}$
		100	—	—		$V_{CE} = 2\text{V}, I_C = 10\text{A}$
<b>AC Characteristics</b>						
Transition Frequency	$f_T$	150	—	—	MHz	$V_{CE} = 5\text{V}, I_C = 50\text{mA}, f = 50\text{MHz}$
Input Capacitance	$C_{ibo}$	—	240	—	pF	$V_{EB} = 0.5\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{obo}$	—	35	—	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$
Switching Times	$t_{on}$	—	40	—	ns	$V_{CC} = 10\text{V}, I_C = 500\text{mA}$
	$t_{off}$	—	500	—	ns	$I_{B1} = -I_{B2} = 50\text{mA}$

Notes: 4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2.0\%$ .

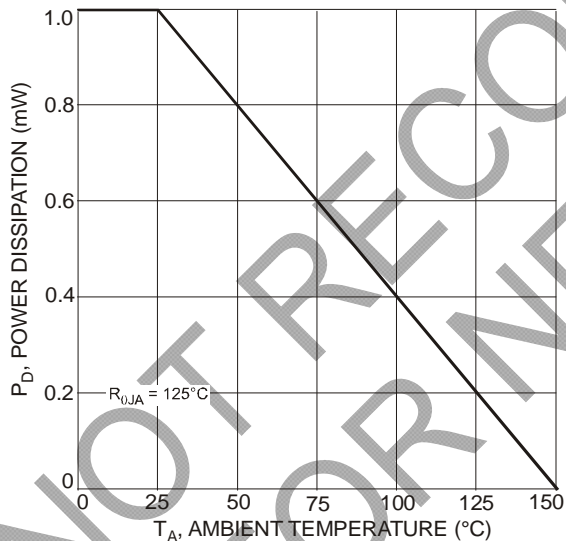


Fig. 1 Max Power Dissipation vs. Ambient Temperature

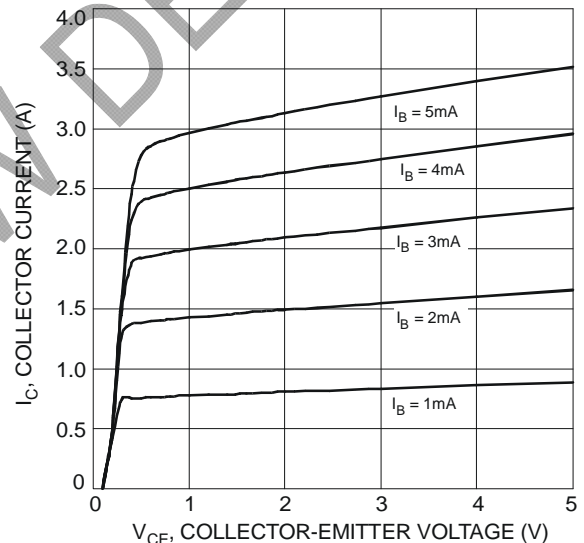


Fig. 2 Typical Collector Current vs. Collector-Emitter Voltage

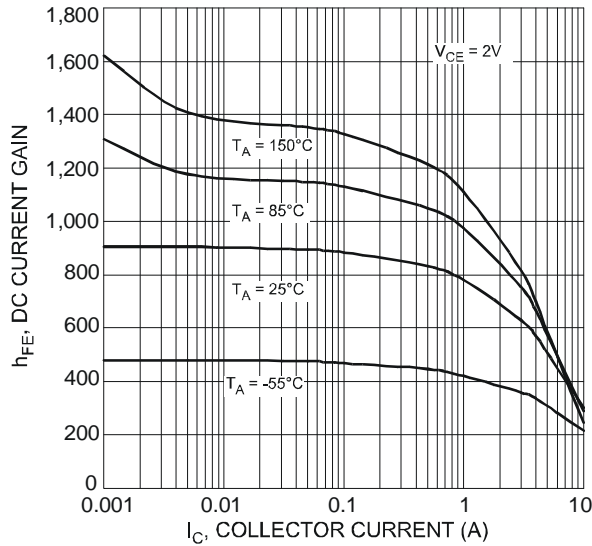


Fig. 3 Typical DC Current Gain vs. Collector Current

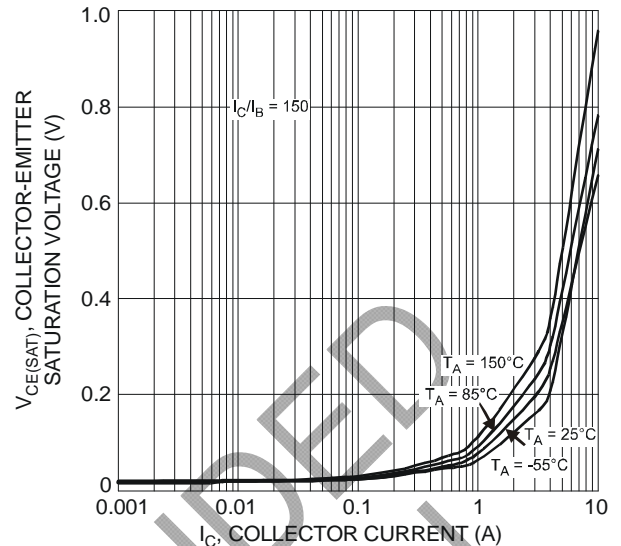


Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

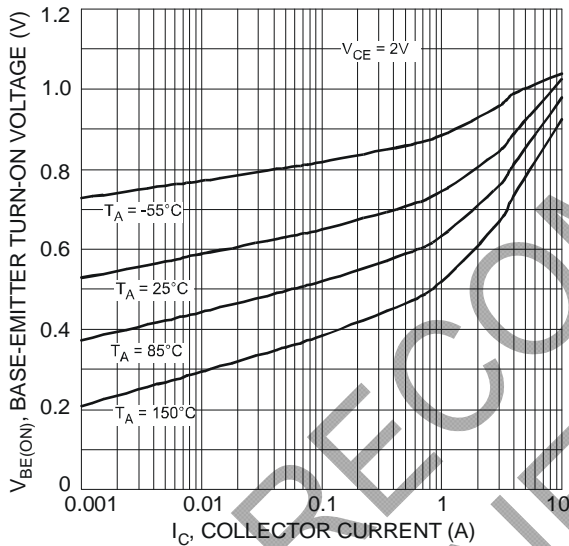


Fig. 5 Typical Base-Emitter Turn-On Voltage vs. Collector Current

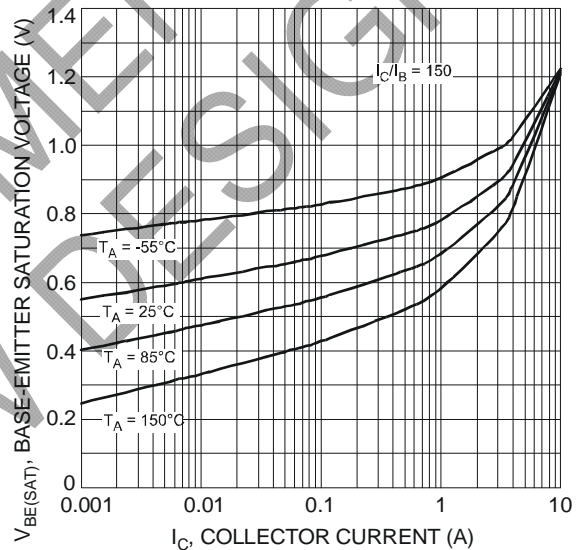


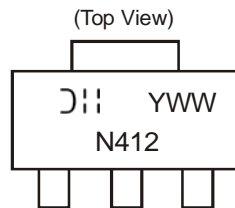
Fig. 6 Typical Base-Emitter Saturation Voltage vs. Collector Current

**Ordering Information** (Note 5)

Device	Packaging	Shipping
DNLS412E-13	SOT-223	2500/Tape & Reel

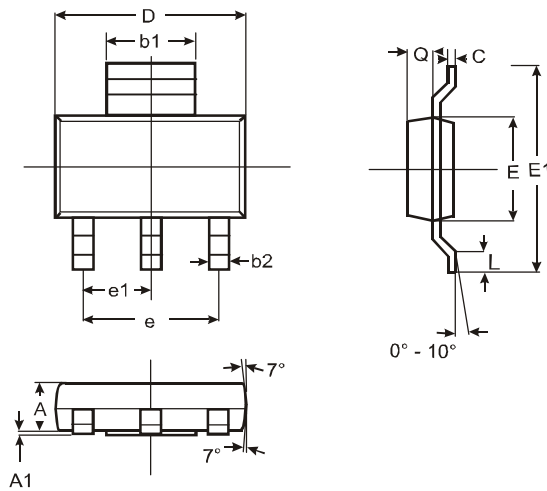
Notes: 5. For packaging details, go to our website at <http://www.diodes.com/ap2007.pdf>.

**Marking Information**



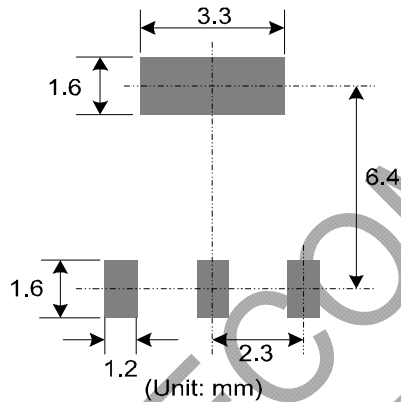
N412 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y = Last digit of year ex: 7 = 2007  
 WW = Week code 01 - 52

### Package Outline Dimensions



SOT-223			
Dim	Min	Max	Typ
A	1.55	1.65	1.60
A1	0.010	0.15	0.05
b1	2.90	3.10	3.00
b2	0.60	0.80	0.70
C	0.20	0.30	0.25
D	6.45	6.55	6.50
E	3.45	3.55	3.50
E1	6.90	7.10	7.00
e	—	—	4.60
e1	—	—	2.30
L	0.85	1.05	0.95
Q	0.84	0.94	0.89
<b>All Dimensions in mm</b>			

### Suggested Pad Layout:



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