

## Product Summary

- Continuous Drain Source Voltage:  $V_{DS} = 60V$
- On-State Resistance: 550m $\Omega$
- Nominal Load Current ( $V_{IN} = 5V$ ) : 1.4A
- Clamping Energy: 550mJ

## Description

The BSP75GQ is a Self-protected low-side MOSFET. It features monolithic over temperature, over current, over voltage (active clamp) and ESD protected logic level functionality. It is intended as a general purpose switch.

## Applications

- Especially Suited for Loads with a High In-Rush Current such as Lamps and Motors
- All Types of Resistive, Inductive and Capacitive Loads in Switching Applications
- $\mu C$  Compatible Power Switch for 12V and 24V DC Applications
- Automotive Rated
- Replaces Electromechanical Relays and Discrete Circuits
- Linear Mode Capability - the current-limiting protection circuitry is designed to de-activate at low  $V_{DS}$  in order not to compromise the load current during normal operation. The maximum DC operating current is therefore determined by the thermal capability of the package/board combination, rather than by the protection circuitry.

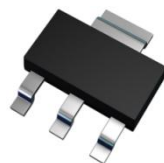
## Features and Benefits

- Short Circuit Protection with Auto Restart
- Over Voltage Protection (Active Clamp)
- Thermal Shutdown with Auto Restart
- Over-Current Protection
- Input Protection (ESD)
- Load Dump Protection (Actively Protects Load)
- Logic Level Input
- High Continuous Current Rating
- **Lead-Free Finish; RoHS Compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

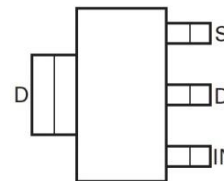
## Mechanical Data

- Case: SOT223 (Type DN)
- Case Material: Molded Plastic, "Green" Molding Compound  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish  $\text{e3}$
- Weight: 0.112 grams (Approximate)

SOT223 (Type DN)



Top View



Top View  
Pin Out

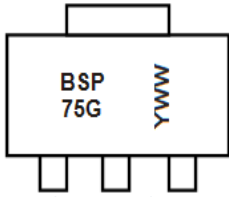
Note: The tab is connected to the drain pin, and must be electrically isolated from the source pin. Connection of significant copper to the tab is recommended for best thermal performance.

## Ordering Information (Note 5)

Product	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
BSP75GQTA	BSP75G	7	12	1,000 Units
BSP75GQTC	BSP75G	13	12	4,000 Units

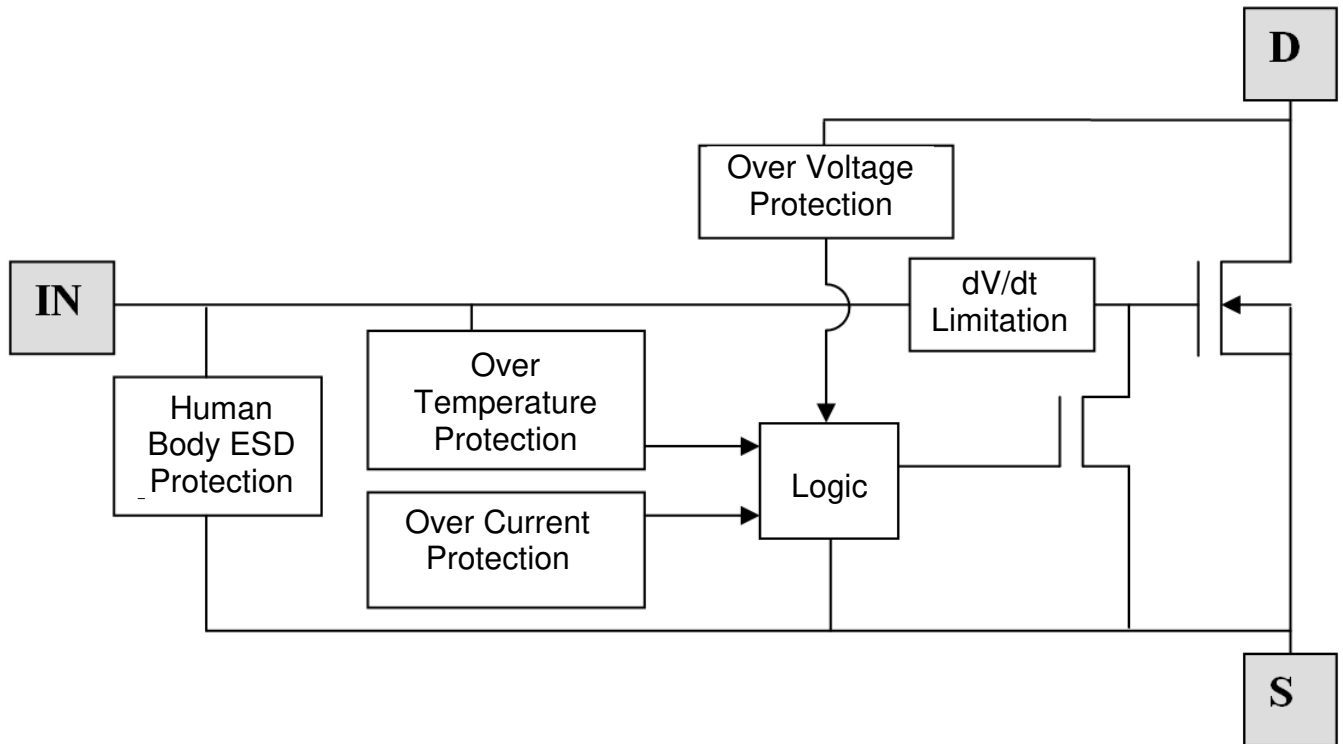
- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  2. See [http://www.diodes.com/quality/lead\\_free/](http://www.diodes.com/quality/lead_free/) for more information about Diodes Incorporated's definitions of Halogen- 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

**Marking Information**



BSP75G = Product Type Marking Code  
 YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 8 = 2018)  
 WW or  $\bar{W}W$  = Week Code (01 to 53)

**Functional Block Diagram**



**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise stated.)

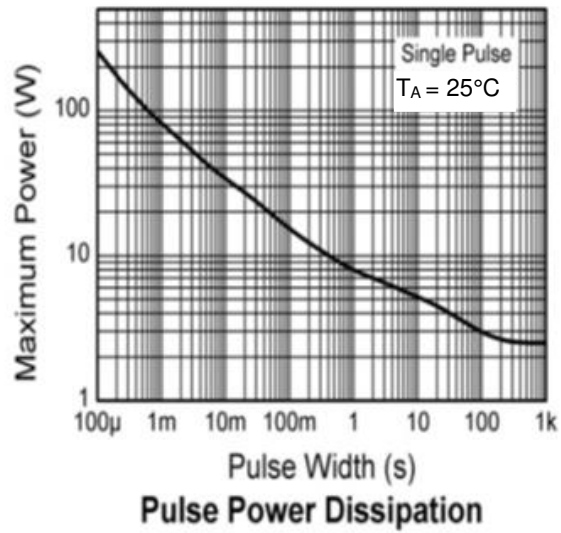
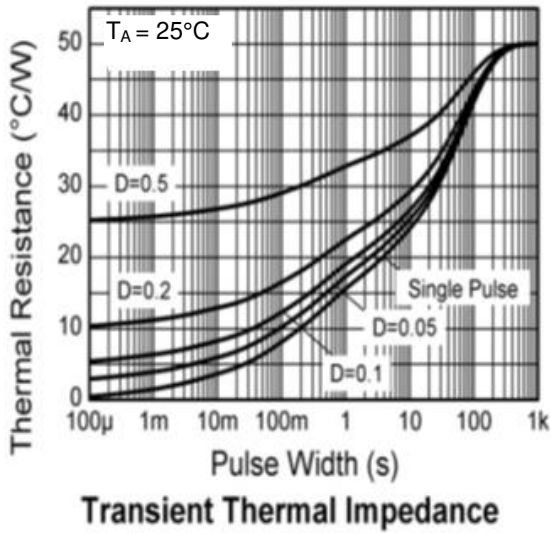
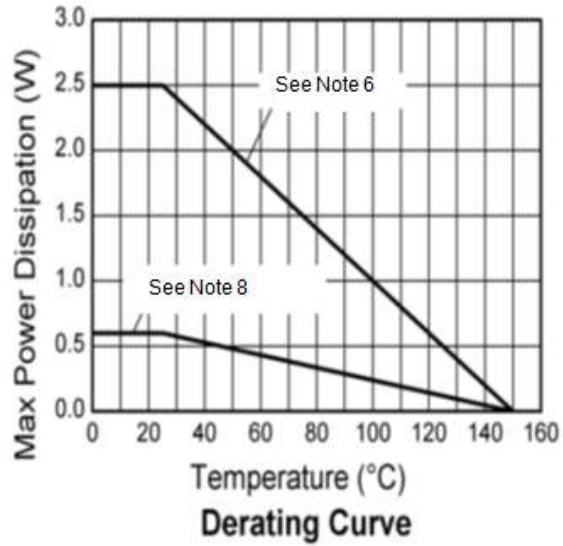
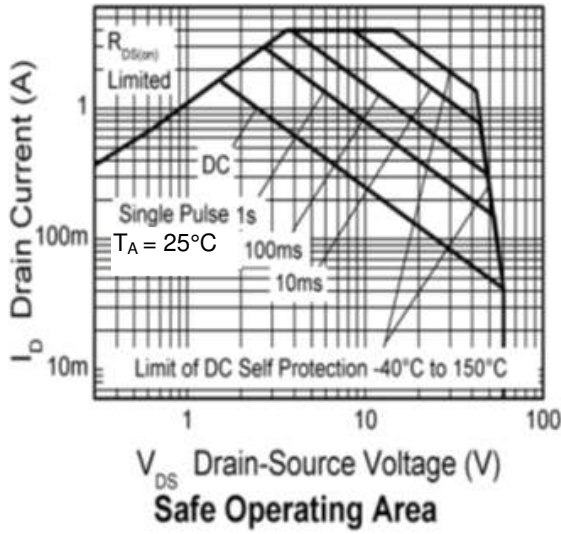
Parameter	Symbol	Limit	Unit
Continuous Drain-Source Voltage	V <sub>DS</sub>	60	V
Drain-Source Voltage for Short Circuit Protection V <sub>IN</sub> = 5V	V <sub>DS(SC)</sub>	36	V
Continuous Input Voltage	V <sub>IN</sub>	-0.2 to +10	V
Peak Input Voltage	V <sub>IN</sub>	-0.2 to +20	V
Operating Temperature Range	T <sub>J</sub>	-40 to +150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	°C
Power Dissipation at T <sub>A</sub> = +25°C (Note 6)	P <sub>D</sub>	2.5	W
Continuous Drain Current @ V <sub>IN</sub> = 10V; T <sub>A</sub> = +25°C (Note 6)	I <sub>D</sub>	1.6	A
Continuous Drain Current @ V <sub>IN</sub> = 5V; T <sub>A</sub> = +25°C (Note 6)	I <sub>D</sub>	1.4	A
Pulsed Drain Current @ V <sub>IN</sub> = 10V	I <sub>DM</sub>	5	A
Continuous Source Current (Body Diode) (Note 6)	I <sub>S</sub>	3	A
Pulsed Source Current (Body Diode)	I <sub>S</sub>	5	A
Unclamped Single Pulse Inductive Energy	E <sub>AS</sub>	550	mJ
Load Dump Protection	V <sub>LOAD_DUMP</sub>	80	V
Electrostatic Discharge (Human Body Model)	V <sub>ESD</sub>	4000	V
DIN Humidity Category, DIN 40 040	—	E	—
IEC Climatic Category, DIN IEC 68-1	—	40/150/56	—

**Thermal Resistance**

Characteristic	Symbol	Limit	Unit
Junction to Ambient (Note 6)	R <sub>θJA</sub>	50	°C/W
Junction to Ambient (Note 7)	R <sub>θJA</sub>	24	°C/W
Junction to Ambient (Note 8)	R <sub>θJA</sub>	208	°C/W

- Notes:
6. For a device surface mounted on 37mm x 37mm x 1.6mm FR-4 board with a high coverage of single sided 2oz weight copper.
  7. For a device surface mounted on FR-4 board and measured at t<sub><=</sub>10s.
  8. For a device mounted on FR-4 board with the minimum copper required for electrical connections.

**Typical Characteristics**

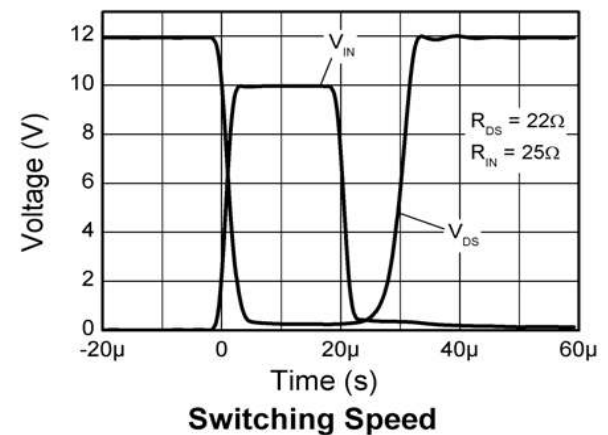
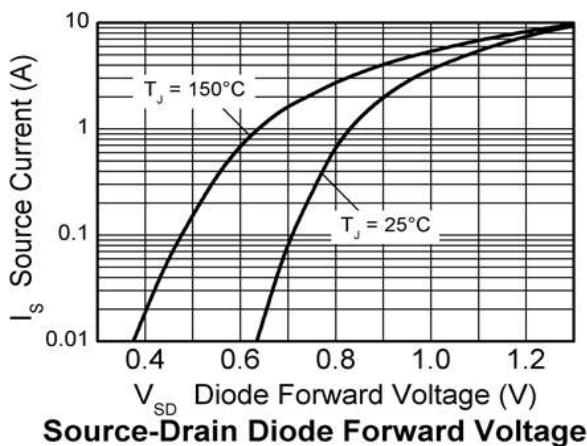
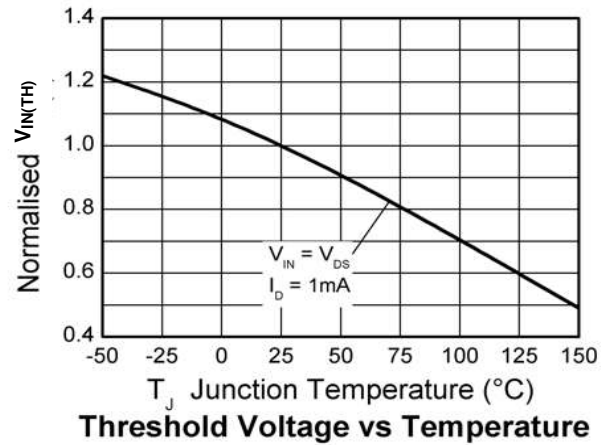
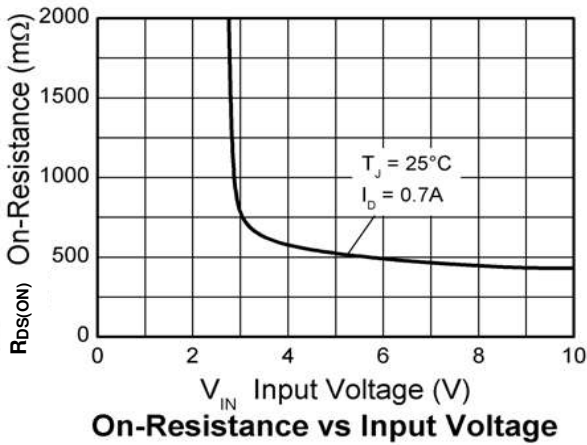
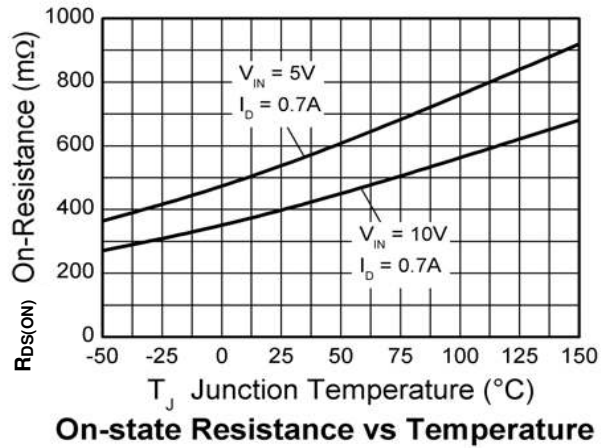
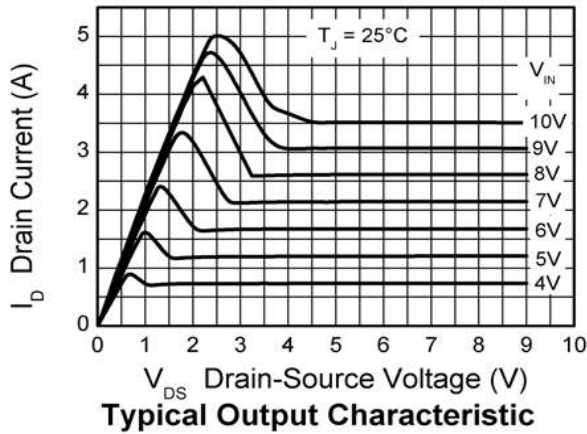


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise stated.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>Static Characteristics</b>						
Drain-Source Clamp Voltage	$V_{DS(AZ)}$	60	70	75	V	$I_D=10\text{mA}$
Off state Drain Current	$I_{DSS}$	—	0.1	3	$\mu\text{A}$	$V_{DS}=12\text{V}, V_{IN}=0\text{V}$
Off state Drain Current	$I_{DSS}$	—	3	15	$\mu\text{A}$	$V_{DS}=32\text{V}, V_{IN}=0\text{V}$
Input Threshold Voltage (Note 9)	$V_{IN(TH)}$	1	2.1	—	V	$V_{DS}=V_{GS}, I_D=1\text{mA}$
Input Current	$I_{IN}$	—	0.7	1.2	mA	$V_{IN}=5\text{V}$
Input Current	$I_{IN}$	—	1.5	2.7	mA	$V_{IN}=7\text{V}$
Input Current	$I_{IN}$	—	4	7	mA	$V_{IN}=10\text{V}$
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	520	675	$\text{m}\Omega$	$V_{IN}=5\text{V}, I_D=0.7\text{A}$
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	385	550	$\text{m}\Omega$	$V_{IN}=10\text{V}, I_D=0.7\text{A}$
Current Limit (Note 10)	$I_{D(LIM)}$	0.7	1.1	1.75	A	$V_{IN}=5\text{V}, V_{DS}>5\text{V}$
Current Limit (Note 10)	$I_{D(LIM)}$	2	3	4	A	$V_{IN}=10\text{V}, V_{DS}>5\text{V}$
<b>Dynamic Characteristics</b>						
Turn-On Time ( $V_{IN}$ to 90% $I_D$ )	$t_{ON}$	—	2.2	—	$\mu\text{s}$	$R_L=22\Omega, V_{IN}=0$ to $10\text{V}, V_{DD}=12\text{V}$
Turn-Off Time ( $V_{IN}$ to 90% $I_D$ )	$t_{OFF}$	—	13	—	$\mu\text{s}$	$R_L=22\Omega, V_{IN}=10\text{V}$ to $0\text{V}, V_{DD}=12\text{V}$
Slew Rate On (70 to 50% $V_{DD}$ )	$-dV_{DS}/dt_{ON}$	—	10	—	$\text{V}/\mu\text{s}$	$R_L=22\Omega, V_{IN}=0$ to $10\text{V}, V_{DD}=12\text{V}$
Slew Rate Off (50 to 70% $V_{DD}$ )	$dV_{DS}/dt_{ON}$	—	3.2	—	$\text{V}/\mu\text{s}$	$R_L=22\Omega, V_{IN}=10\text{V}$ to $0\text{V}, V_{DD}=12\text{V}$
<b>Protection Functions</b> (Note 11)						
Minimum Input Voltage for Over Temperature Protection	$V_{PROT}$	4.5	—	—	V	—
Thermal Overload Trip Temperature	$T_{JT}$	+150	+175	—	$^\circ\text{C}$	—
Thermal Hysteresis	—	—	+10	—	$^\circ\text{C}$	—
Unclamped Single Pulse Inductive Energy $T_J = +25^\circ\text{C}$	$E_{AS}$	550	—	—	mJ	$I_{D(ISO)}=0.7\text{A}, V_{DD}=32\text{V}$
Unclamped Single Pulse Inductive Energy $T_J = +150^\circ\text{C}$	$E_{AS}$	200	—	—	mJ	$I_{D(ISO)}=0.7\text{A}, V_{DD}=32\text{V}$
<b>Inverse Diode</b>						
Source Drain Voltage	$V_{SD}$	—	—	1	V	$V_{IN}=0\text{V}, -I_D=1.4\text{A}$

- Notes:
9. Protection features may operate outside spec for  $V_{IN} < 4.5\text{V}$ .
  10. The drain current is limited to a reduced value when  $V_{DS}$  exceeds a safe level.
  11. Integrated protection functions are designed to prevent IC destruction under fault conditions described in the datasheet. Fault conditions are considered as "outside" normal operating range. Protection functions are not designed for continuous, repetitive operation.

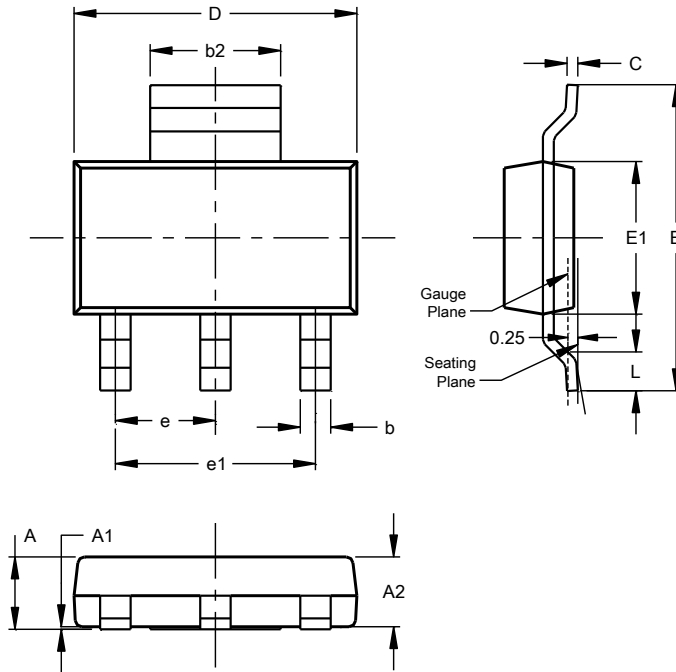
**Typical Characteristics**



**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT223 (Type DN)**

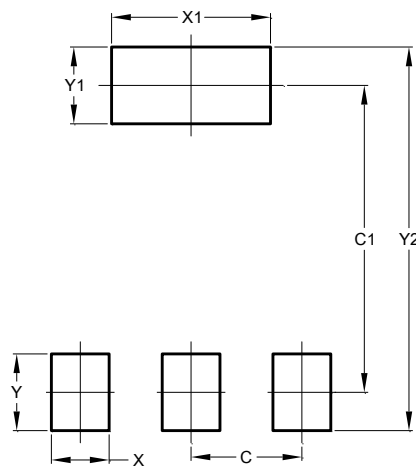


SOT223 (Type DN)			
Dim	Min	Max	Typ
A	--	1.70	--
A1	0.01	0.15	--
A2	1.50	1.68	1.60
b	0.60	0.80	0.70
b2	2.90	3.10	--
c	0.20	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	--	--	2.30
e1	--	--	4.60
L	0.85	--	--
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT223 (Type DN)**



Dimensions	Value (in mm)
C	2.30
C1	6.40
X	1.20
X1	3.30
Y	1.60
Y1	1.60
Y2	8.00

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