BSP75GQ-13

60V SELF-PROTECTED LOW-SIDE IntelliFET MOSFET SWITCH

Product Summary

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

Description

The BSP75GQ-13 is a self-protected low-side IntelliFET® MOSFET. It features monolithic overtemperature, overcurrent, overvoltage (active clamp) and ESD protected logic-level functionality. It is intended as a general-purpose switch.

Applications

- Especially suited for loads with a high inrush current such as lamps and motors
- All types of resistive, inductive and capacitive loads in switching applications
- µC compatible power switches for 12V and 24V DC applications
- Automotive rated
- Replaces electromechanical relays and discrete circuits
- Linear mode capabilities - 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.

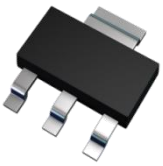
Features and Benefits

- Short-Circuit Protection with Auto Restart
- Overvoltage Protection (Active Clamp)
- Thermal Shutdown with Auto Restart
- Overcurrent Protection
- Input Protection (ESD)
- Load Dump Protection (Actively Protects Load)
- Logic-Level Input
- High Continuous Current Rating
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The BSP75GQ-13 is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

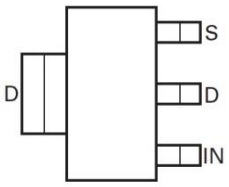
Mechanical Data

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

SOT223



Top View



Top View
Pin Out

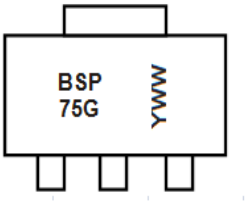
Note: The tab is connected to the drain pin, and must be electrically isolated from the source pin. Connection of significant copper to the tab is recommended for best thermal performance.

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
BSP75GQ-13	SOT223	BSP75G	13	12	4,000 Units	Reel

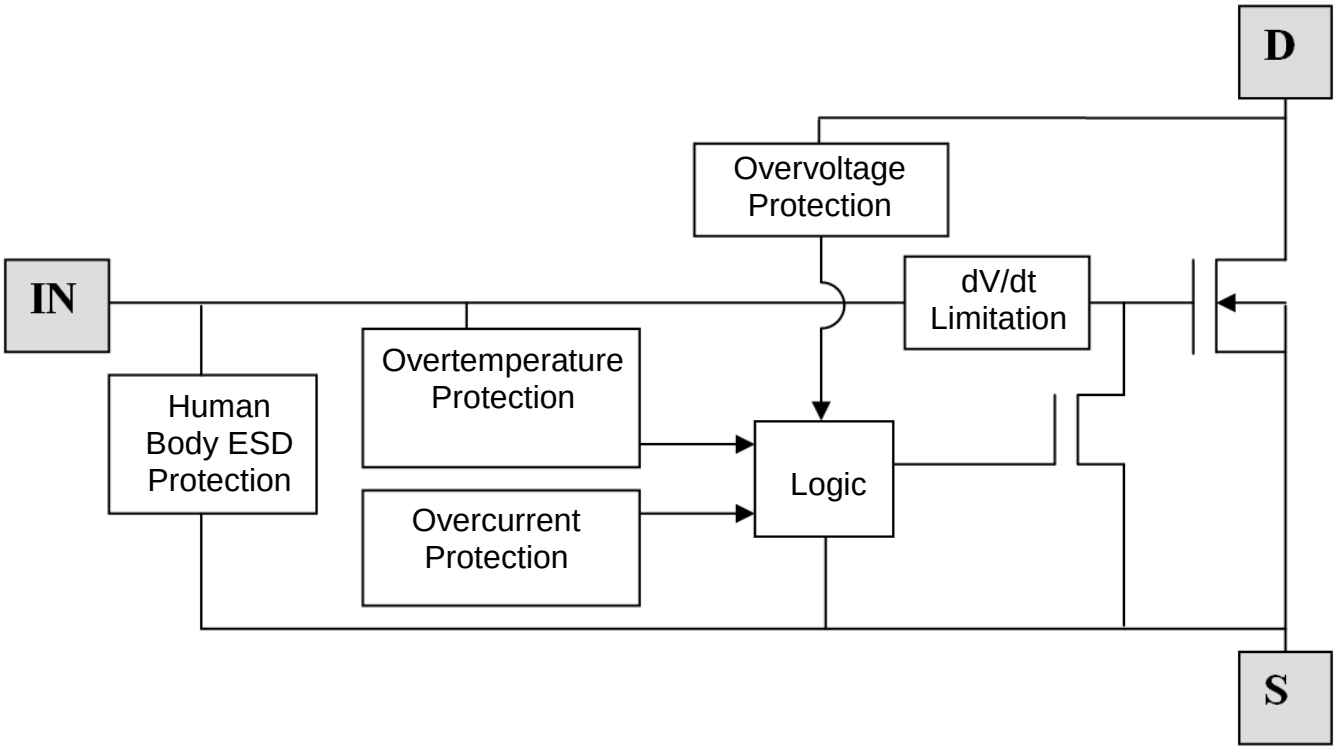
Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. 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. 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 $\overline{Y}$ = Last Digit of Year (ex: 4 = 2024)
WW or $\overline{WW}$ = Week Code (01 to 53)

Functional Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise stated.)

Parameter	Symbol	Value	Unit
Continuous Drain-Source Voltage	V_{DS}	60	V
Drain-Source Voltage for Short-Circuit Protection, V_{IN} = 5V	$V_{DS(SC)}$	36	V
Continuous Input Voltage	V_{IN}	-0.2 to +10	V
Peak Input Voltage	V_{IN}	-0.2 to +20	V
Operating Temperature Range	T_J	-40 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Power Dissipation at T_A = +25°C (Note 5)	P_D	2.5	W
Continuous Drain Current @ V_{IN} = 10V; T_A = +25°C (Note 5)	I_D	1.6	A
Continuous Drain Current @ V_{IN} = 5V; T_A = +25°C (Note 5)	I_D	1.4	A
Pulsed Drain Current @ V_{IN} = 10V	I_{DM}	5	A
Continuous Source Current (Body Diode) (Note 5)	I_S	3	A
Pulsed Source Current (Body Diode)	I_S	5	A
Unclamped Single Pulse Inductive Energy	E_{AS}	550	mJ
Load Dump Protection	V_{LOAD_DUMP}	80	V
Electrostatic Discharge (Human Body Model)	V_{ESD}	4000	V
DIN Humidity Category, DIN 40 040	—	E	—
IEC Climatic Category, DIN IEC 68-1	—	40/150/56	—

Thermal Resistance

Characteristic	Symbol	Value	Unit
Junction to Ambient (Note 5)	$R_{\theta JA}$	50	°C/W
Junction to Ambient (Note 6)	$R_{\theta JA}$	24	°C/W
Junction to Ambient (Note 7)	$R_{\theta JA}$	208	°C/W

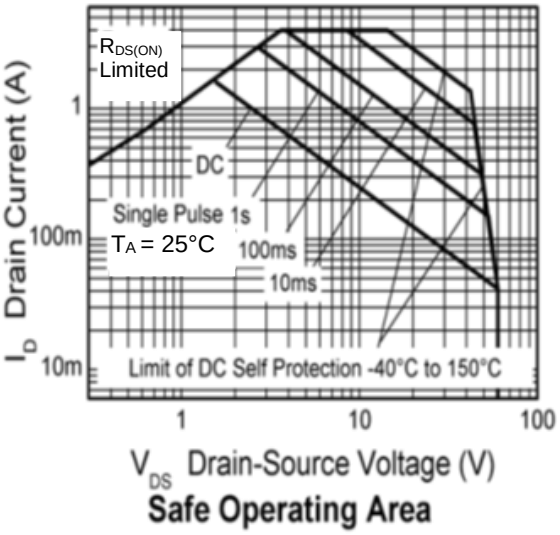
Notes: 5. For a device surface-mounted on 37mm x 37mm x 1.6mm FR-4 board with a high coverage of single sided 2oz weight copper.
6. For a device surface-mounted on FR-4 board and measured at t ≤ 10s.
7. For a device mounted on FR-4 board with the minimum copper required for electrical connections.

Electrical Characteristics (@T_A = +25°C, unless otherwise stated.)

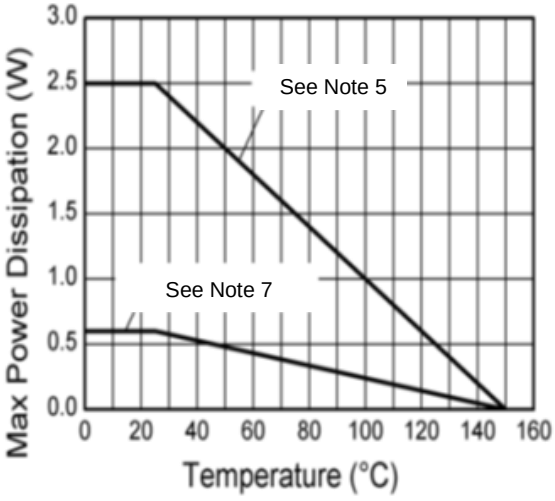
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Static Characteristics						
Drain-Source Clamp Voltage	$V_{DS(AZ)}$	60	70	75	V	I_D = 10mA
Off-State Drain Current	I_{DSS}	—	0.1	3	µA	V_{DS} = 12V, V_{IN} = 0V
Off-State Drain Current	I_{DSS}	—	3	15	µA	V_{DS} = 32V, V_{IN} = 0V
Input Threshold Voltage (Note 8)	$V_{IN(TH)}$	1	2.1	—	V	V_{DS} = V_{GS}, I_D = 1mA
Input Current	I_{IN}	—	0.7	1.2	mA	V_{IN} = 5V
Input Current	I_{IN}	—	1.5	2.7	mA	V_{IN} = 7V
Input Current	I_{IN}	—	4	7	mA	V_{IN} = 10V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	520	675	mΩ	V_{IN} = 5V, I_D = 0.7A
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	385	550	mΩ	V_{IN} = 10V, I_D = 0.7A
Current Limit (Note 9)	$I_{D(LIM)}$	0.7	1.1	1.75	A	V_{IN} = 5V, V_{DS} > 5V
Current Limit (Note 9)	$I_{D(LIM)}$	2	3	4	A	V_{IN} = 10V, V_{DS} > 5V
Dynamic Characteristics						
Turn-On Time (V_{IN} to 90% I_D)	t_{ON}	—	2.2	—	µs	R_L = 22Ω, V_{IN} = 0 to 10V, V_{DD} = 12V
Turn-Off Time (V_{IN} to 90% I_D)	t_{OFF}	—	13	—	µs	R_L = 22Ω, V_{IN} = 10V to 0V, V_{DD} = 12V
Slew Rate On (70 to 50% V_{DD})	$-dV_{DS}/dt_{ON}$	—	10	—	V/µs	R_L = 22Ω, V_{IN} = 0 to 10V, V_{DD} = 12V
Slew Rate Off (50 to 70% V_{DD})	dV_{DS}/dt_{ON}	—	3.2	—	V/µs	R_L = 22Ω, V_{IN} = 10V to 0V, V_{DD} = 12V
Protection Functions (Note 10)						
Minimum Input Voltage for Overtemperature Protection	V_{PROT}	4.5	—	—	V	—
Thermal Overload Trip Temperature	T_{JT}	+150	+175	—	°C	—
Thermal Hysteresis	—	—	+10	—	°C	—
Unclamped Single Pulse Inductive Energy T_J = +25°C	E_{AS}	550	—	—	mJ	$I_{D(ISO)}$ = 0.7A, V_{DD} = 32V
Unclamped Single Pulse Inductive Energy T_J = +150°C	E_{AS}	200	—	—	mJ	$I_{D(ISO)}$ = 0.7A, V_{DD} = 32V
Inverse Diode						
Source-Drain Voltage	V_{SD}	—	—	1	V	V_{IN} = 0V, $-I_D$ = 1.4A

Notes:
8. Protection features may operate outside spec for V_{IN} < 4.5V.
9. The drain current is limited to a reduced value when V_{DS} exceeds a safe level.
10. 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.

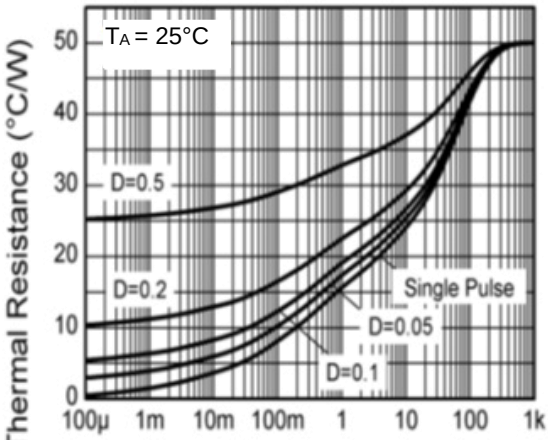
Typical Characteristics



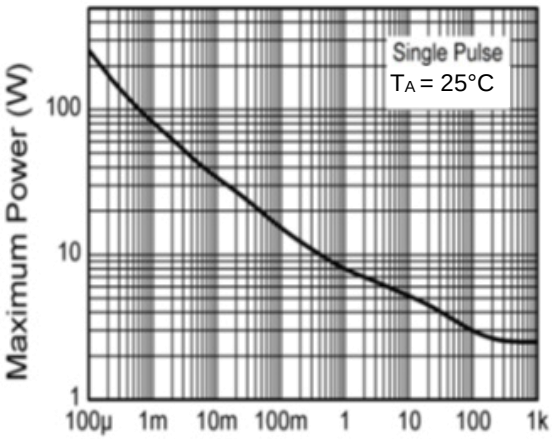
Safe Operating Area



Derating Curve

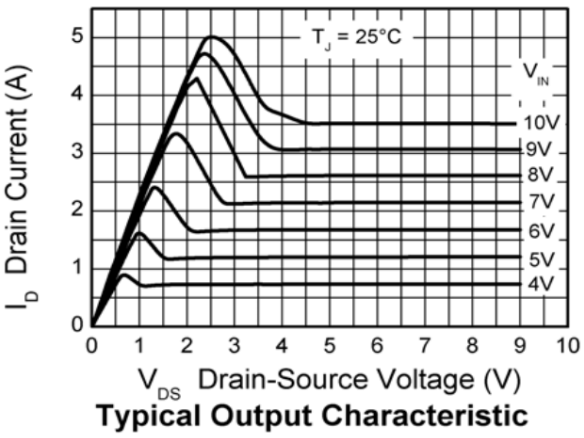


Transient Thermal Impedance

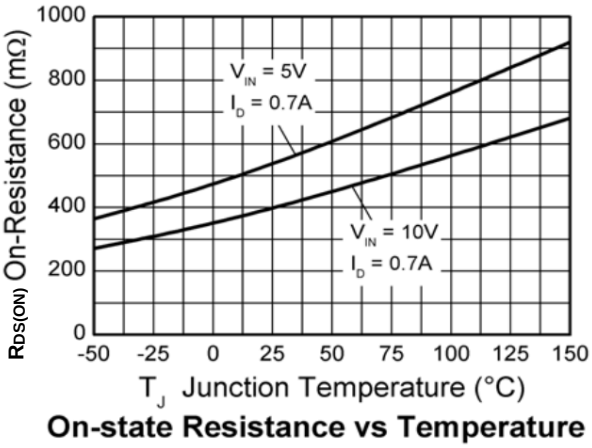


Pulse Power Dissipation

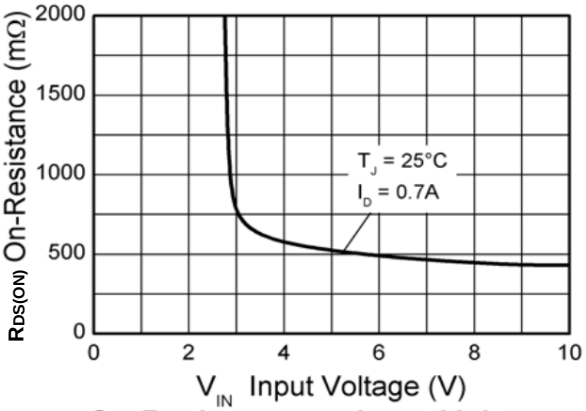
Typical Characteristics (continued)



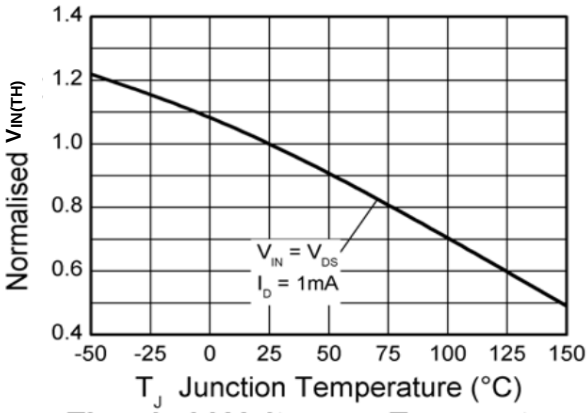
Typical Output Characteristic



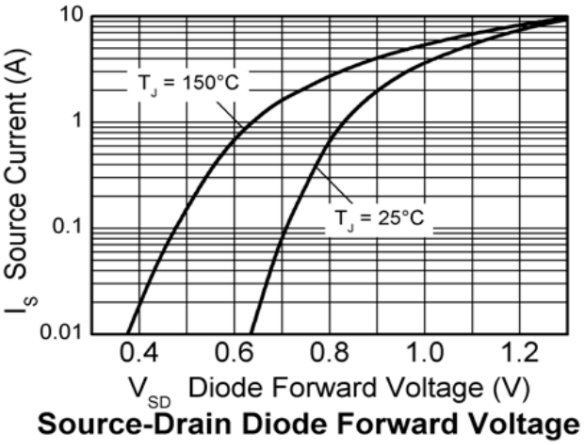
On-state Resistance vs Temperature



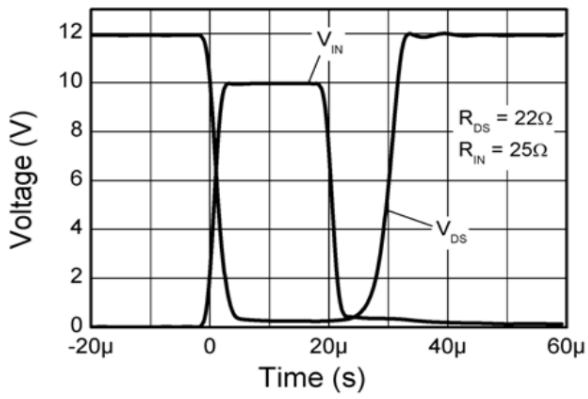
On-Resistance vs Input Voltage



Threshold Voltage vs Temperature



Source-Drain Diode Forward Voltage



Switching Speed

Package Outline Dimensions

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

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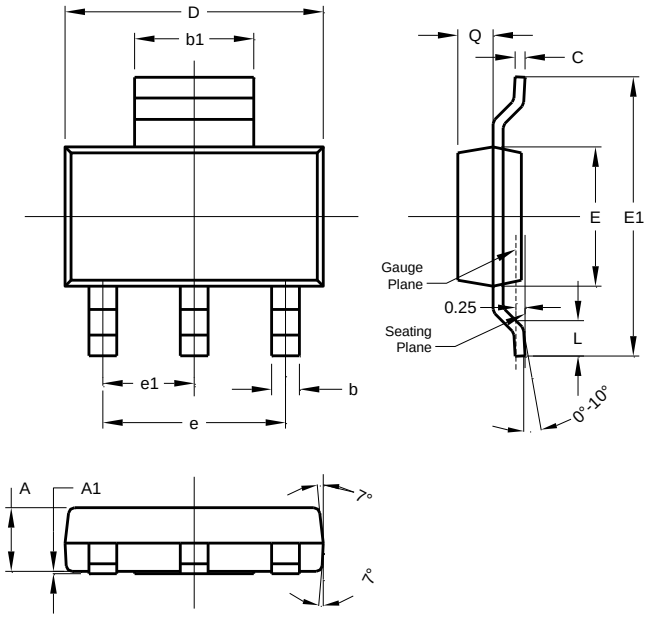
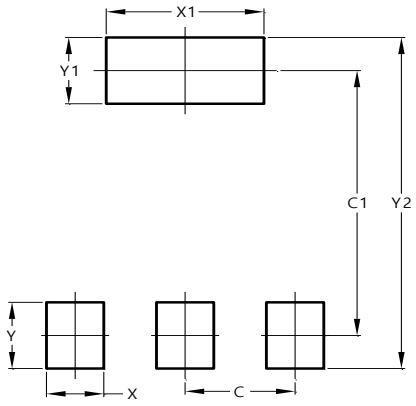


SOT223			
Dim	**Min**	**Max**	**Typ**
A	1.55	1.65	1.60
A1	0.010	0.15	0.05
b	0.60	0.80	0.70
b1	2.90	3.10	3.00
C	0.20	0.30	0.25
D	6.45	6.55	6.50
E	3.45	3.55	3.50
E1	6.90	7.10	7.00
e	-	-	4.60
e1	-	-	2.30
L	0.85	1.05	0.95
Q	0.84	0.94	0.89
All Dimensions in mm			

Suggested Pad Layout

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

SOT223



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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