Provisional Data Sheet No. PD 6.069A

International
IOR Rectifier

IRSF3031

FULLY PROTECTED DMOS POWER SWITCH

Features

- Extremely Rugged for Harsh Operating Environments
- Over Temperature Protection
- Over Current Protection
- Active Drain-to-Source Clamp
- ESD Protection
- Compatible with Standard Power MOSFET
- Low Operating Input Current
- Monolithic Construction
- Dual Set/Reset Threshold Input

$V_{ds(clamp)}$	50 V
$R_{ds(on)}$	200 mΩ
$I_{ds(sd)}$	1.8 A
$T_{j(sd)}$	165°C
E_{AS}	200 mJ

Description

The IRSF3031 is a three-terminal monolithic SMART POWER MOSFET with built-in short circuit, over-temperature, ESD and over-voltage protections and dual set/reset threshold input.

The on-chip protection circuit latches off the power MOSFET in case the drain current exceeds 4A (typical) or the junction temperature exceeds 165°C (typical) and keeps it off until the input is driven below the Reset Threshold voltage. The drain-to-source voltage is actively clamped at 55V (typical) prior to the avalanche of the power MOSFET, thus improving its performance during turn-off with inductive loads.

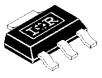
The input requirements are very low (100µA typical) which makes the IRSF3031 compatible with most existing designs based on standard power MOSFETs.

Applications

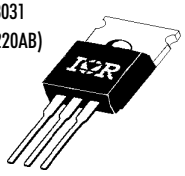
- Solenoid Driver
- DC Motor Driver

Available Packages

IRSF3031L
(SOT-223)



IRSF3031
(TO-220AB)



Absolute Maximum Ratings

Absolute Maximum Ratings indicate sustained limits beyond which damage to the device may occur. (T_c = 25°C unless otherwise specified.)

		Minimum	Maximum	Units	Test Conditions
$V_{ds, max}$	Continuous Drain to Source Voltage	—	50	V	
$V_{in, max}$	Continuous Input Voltage	0	8		
I_{ds}	Continuous Drain Current	—	self limited		
P_d	Power Dissipation	—	30	W	$T_c \leq 25°C$
E_{AS}	Unclamped Single Pulse Inductive Energy	—	200	mJ	
V_{esd1}	Electrostatic Discharge Voltage (Human Body Model)	—	4000	V	1000pF, 1.5kΩ
V_{esd2}	Electrostatic Discharge Voltage (Machine Model)	—	1000		200pF, 0Ω
T_{Jop}	Operating Junction Temperature Range	-40	150	°C	
T_{Stg}	Storage Temperature Range	-40	150		
T_L	Lead Temperature (Soldering, 10 seconds)	—	300		

Static Electrical Characteristics

(T_c = 25°C unless otherwise specified.)

		Minimum	Typical	Maximum	Units	Test Conditions
$V_{ds,clamp}$	Drain to Source Clamp Voltage	50	56	65	V	I_{ds} = 2A
$R_{ds(on)}$	Drain to Source On Resistance	—	155	200	mΩ	V_{in} = 5V, I_{ds} = 2A
I_{dss}	Drain to Source Leakage Current	—	—	250	μA	V_{ds} = 40V, V_{in} = 0V
V_{set}	Input Threshold Voltage	2.5	3.2	4.0	V	V_{ds} = 5V, I_{ds} > 10mA
V_{reset}	Input Protection Reset Threshold Voltage	0.5	1.0	1.5	V	V_{ds} = 5V, I_{ds} < 10μA
$I_{i,on}$	Input Supply Current (Normal Operation)	—	100	300	μA	V_{in} = 5V
$I_{i,off}$	Input Supply Current (Protection Mode)	—	120	400	μA	V_{in} = 5V
$V_{in,\ clamp}$	Input Clamp Voltage	9	10	—	V	I_{in} = 10mA
V_{sd}	Body-Drain Diode Forward Drop	—	1.5	—	V	I_{ds} = -2A, R_{in} = 1kΩ

Thermal Characteristics

		Minimum	Typical	Maximum	Units	Test Conditions
$R\Theta_{jc}$	Thermal Resistance, Junction-to-Case	—	—	4	°C/W	
$R\Theta_{jA}$	Thermal Resistance, Junction-to-Ambient	—	—	62		

Switching ElectricalCharacteristics

(V_{CC} = 14V, Resistive Load (R_L) = 10Ω, R_{in}= 100Ω. Typical specifications measured at T_C= 25°C. Min/max specifications are for T_C = -40°C to T_C=125°C unless otherwise specified.)

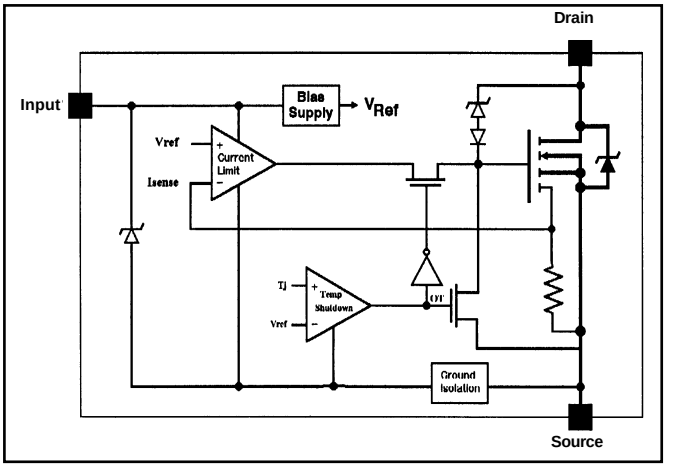
		Minimum	Typical	Maximum	Units	Test Conditions
t_{don}	Turn-On Delay Time	—	—	30	μs	V_{in} = 2V to 5V, 50% to 90%
t_r	Rise Time	—	—	30		V_{in} = 2V to 5V, 90% to 10%
t_{doff}	Turn-Off Delay Time	—	—	30		V_{in} = 2V to 5V, 50% to 10%
t_f	Fall Time	—	—	30		V_{in} = 2V to 5V, 10% to 90%
SR	Output Positive Slew Rate	-5	—	5	V/μs	V_{in} = 2V to 5V, +dVds/dt
SR	Output Positive Slew Rate	-5	—	5		V_{in} = 2V to 5V, -dVds/dt

Protection Characteristics

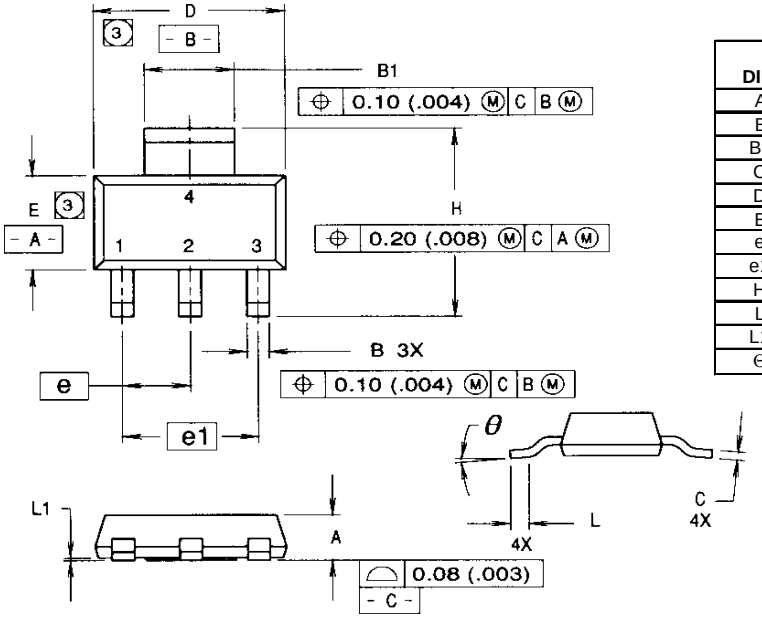
(T_C= 25 °C unless otherwise specified. Min/Max specifications are for T_C= -40°C to T_C = +125°C unless otherwise specified.)

		Minimum	Typical	Maximum	Units	Test Conditions
$I_{ds(sd)}$	Current Limit	1.8	4	6	A	Vin = 5V
$T_{j(sd)}$	Over Temperature Shutdown Threshold	155	165	—	°C	Vin = 5V, Ids = 2A
$V_{protect}$	Min. Input Voltage for Over-temp function	—	3	—	V	
t_{Iresp}	Over Current Response Time	—	TBD	—	μs	
I_{peak}	Peak Short Circuit Current	—	TBD	—	A	
t_{reset}	Protection Reset Time	—	TBD	—	μs	
t_{Tresp}	Over-Temperature Response Time	—	TBD	—		

Block Diagram



Case Outline — SOT-223 (IRSF3031L)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.287	0.264
L	—	0.91	—	0.036
L1	0.02	0.10	0.0006	0.004
Θ	10° MAX		10° MAX	

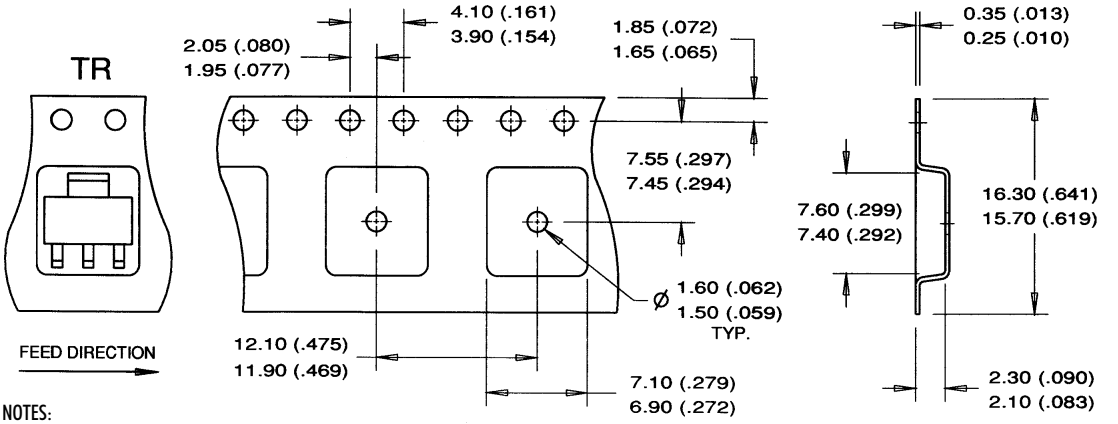
NOTES:

1. Dimensioning and tolerancing per ANSI Y14.5M, 1982
2. Controlling dimension: INCH
3. Dimensions do not include lead flash
4. Conforms to JEDEC outline TO-261AA

LEAD ASSIGNMENTS

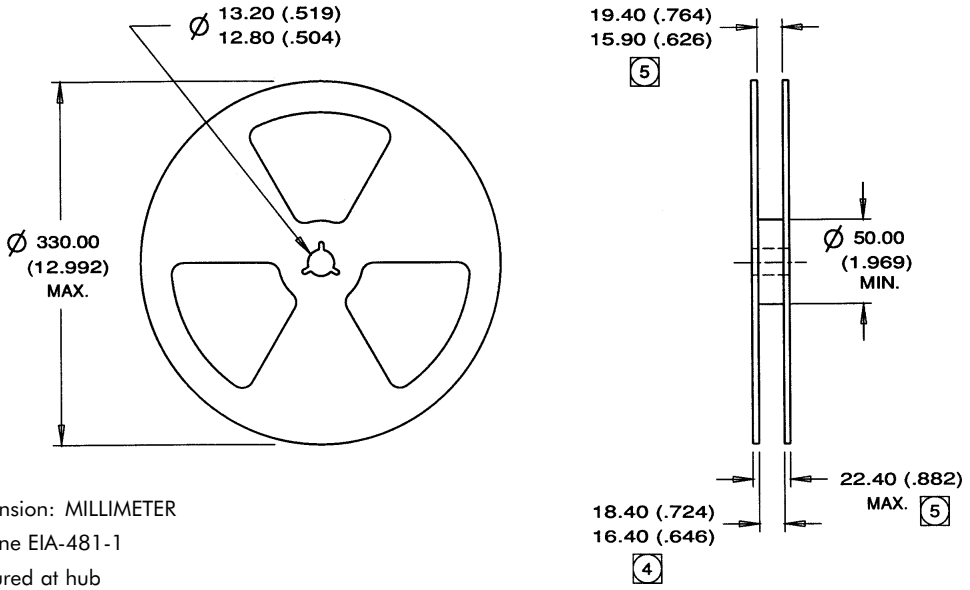
1. Gate
2. Drain
3. Source
4. Drain

Tape and Reel — SOT-223 (IRSF3031L)



NOTES:

1. Controlling dimension: MILLIMETER
2. Conforms to outline EIA-481 and EIA-541
3. Each ∅ 330.00 (13.00) reel contains 2,500 devices.



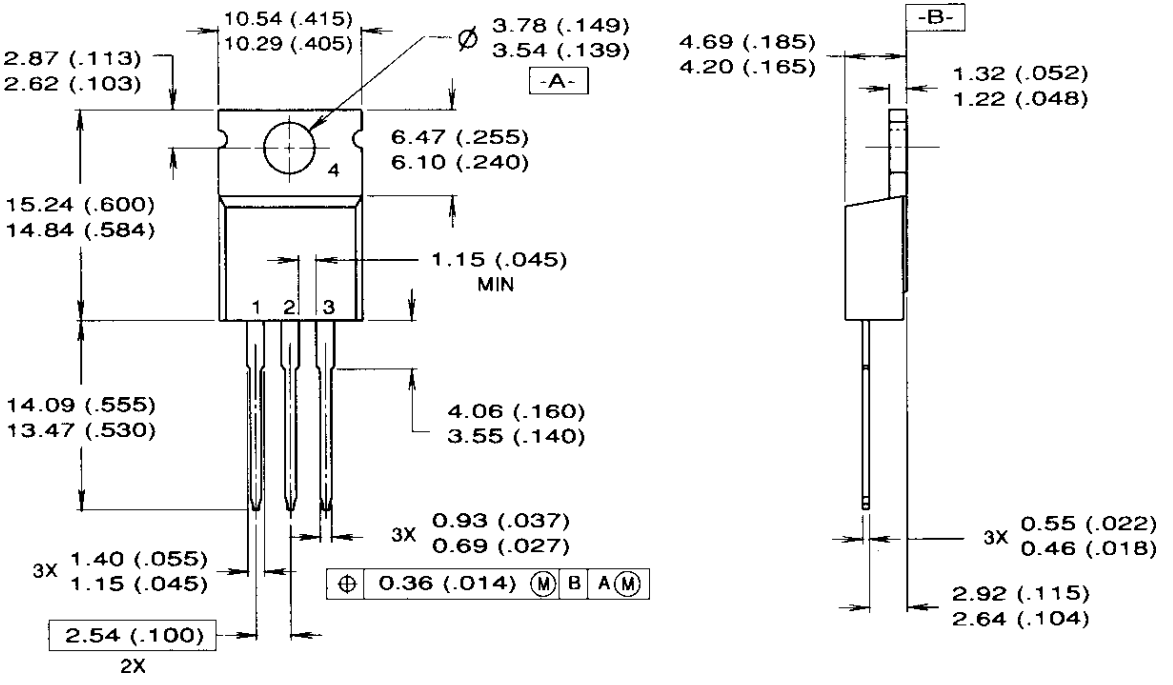
NOTES:

1. Controlling dimension: MILLIMETER
2. Conforms to outline EIA-481-1

3 Dimension measured at hub

4 Includes flange distortion at outer edge

Case Outline — TO-220AB (IRSF3031)



NOTES:

1. Dimensioning and tolerancing per ANSI Y14.5M, 1982
2. Controlling dimension: INCH
3. Dimensions shown are in millimeters (inches)
4. Conforms to JEDEC outline TO-251AA
5. Dimension does not include solder dip. Solder dip max. +0.16 (.006)

LEAD ASSIGNMENTS

1. Gate
2. Drain
3. Source
4. Drain

International
IOR Rectifier

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