Provisional Data Sheet No. PD 6.068B

International
IOR Rectifier

IRSF3021

FULLY PROTECTED POWER MOSFET SWITCH

Features

- Controlled Slew Rate Reduces EMI
- Over Temperature Protection with Auto-Restart
- Linear Current-Limit Protection
- Active Drain-to-Source Clamp
- ESD Protection
- Compatible with Standard Power MOSFET
- Low Operating Input Current
- Monolithic Construction
- Logic Level Input Threshold

$V_{ds(clamp)}$	50 V
$R_{ds(on)}$	200 mΩ
I_{lim}	3.0 A
$T_{j(sd)}$	165°C
E_{AS}	200 mJ

Description

The IRSF3021 Lamp and DC Motor Driver is a fully protected three terminal monolithic SMART POWER MOSFET that features current limiting, over-temperature protection, gate-to-source ESD protection and gate-to-drain clamp for over-voltage protection.

The on-chip protection circuit limits the drain current in the on-state. The over-temperature circuitry turns off the POWER MOSFET when the junction temperature exceeds 165°C. The device restarts automatically once it has cooled down below the reset temperature.

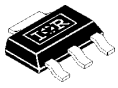
The IRSF3021 is specifically designed for driving loads that require overload protection and in-rush current control while operating in automotive and industrial environments. Targeted applications include resistive loads such as lamps or capacitive loads such as airbag squibs and DC motor drives.

Applications

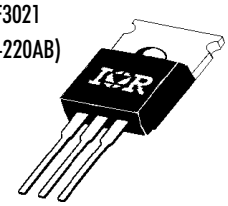
- Cabin Lighting
- Airbag System
- Programmable Logic Controller
- DC Motor Drive

Available Packages

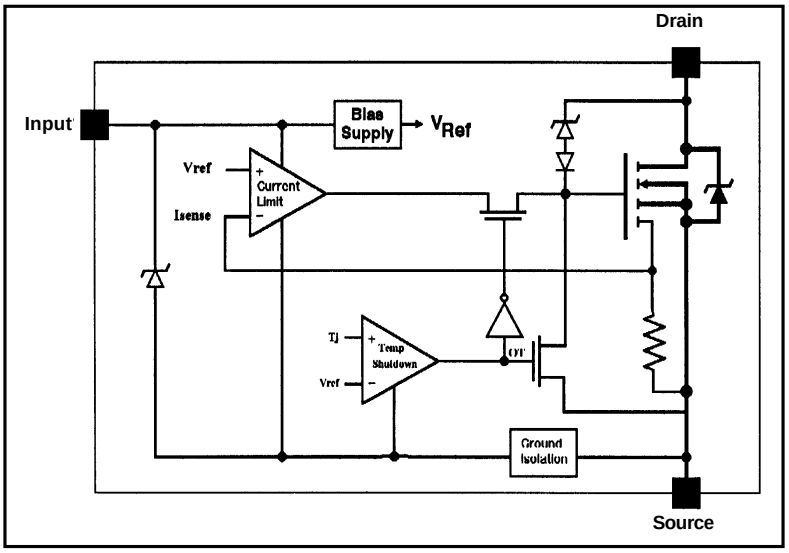
IRSF3021L
(SOT-223)



IRSF3021
(TO-220AB)



IRSF3021 Block Diagram



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	-0.3	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	self-limited	°C	
T_{Stg}	Storage Temperature Range	-40	175		
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} = 6A, t_p = 700 μS
$R_{ds(on)}$	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_{th}	Input Threshold Voltage	1.0	2.0	3.0	V	V_{ds} = V_{in}, I_{ds} + I_{in} = 10mA
$I_{i,on}$	Input Supply Current (Normal Operation)	—	100	300	μA	V_{in} = 5V
$I_{i,off}$	Input Supply Current (Protection Mode)	—	500	—	μA	V_{in} = 5V
$V_{in,\ clamp}$	Input Clamp Voltage	9	10	—	V	I_{in} = 1mA
V_{sd}	Body-Drain Diode Forward Drop③	—	1.5	—	V	I_{ds} = -2A, R_{in} = 1kΩ

Thermal Characteristics

		Minimum	Typical	Maximum	Units	Test Conditions
$R\Theta_{jc}$	Junction to Case	—	—	4	°C/W	TO-220AB
$R\Theta_{jA}$	Junction to Ambient	—	—	60		
$R\Theta_{jc}$	Junction to PCB	—	—	40	°C/W	SOT-223
$R\Theta_{jA}$	Junction to PCB①	—	—	60		

Switching ElectricalCharacteristics

(V_{CC} = 14V, Resistive Load (R_L) = 10Ω, R_{in}= 100Ω. Specifications measured at T_C= 25°C unless otherwise specified.)

		Minimum	Typical	Maximum	Units	Test Conditions
t_{don}	Turn-On Delay Time	—	10	50	μs	V_{in} = 0V to 5V, 50% to 90%
t_r	Rise Time	—	30	80		V_{in} = 0V to 5V, 90% to 10%
t_{doff}	Turn-Off Delay Time	—	20	60		V_{in} = 0V to 5V, 50% to 10%
t_f	Fall Time	—	15	50		V_{in} = 0V to 5V, 10% to 90%
SR	Output Positive Slew Rate	-4	—	4	V/μs	V_{in} = 0V to 5V, +dVds/dt
SR	Output Positive Slew Rate	-4	—	4		V_{in} = 0V 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	3.0	5.5	8.0	A	Vin = 5V, V_{DS} = 14V
$T_{j(sd)}$	Over Temperature Shutdown Threshold	155	165	—	°C	Vin = 5V, Ids = 2A
$V_{protect}$	Min. Input Voltage for Over-temp function	—	3	—	V	
t_{Iresp}	Current Limit Response Time	—	TBD	—	μs	
I_{peak}	Peak Short Circuit Current	—	10	—	A	
t_{Tresp}	Over-Temperature Response Time	—	TBD	—	μs	

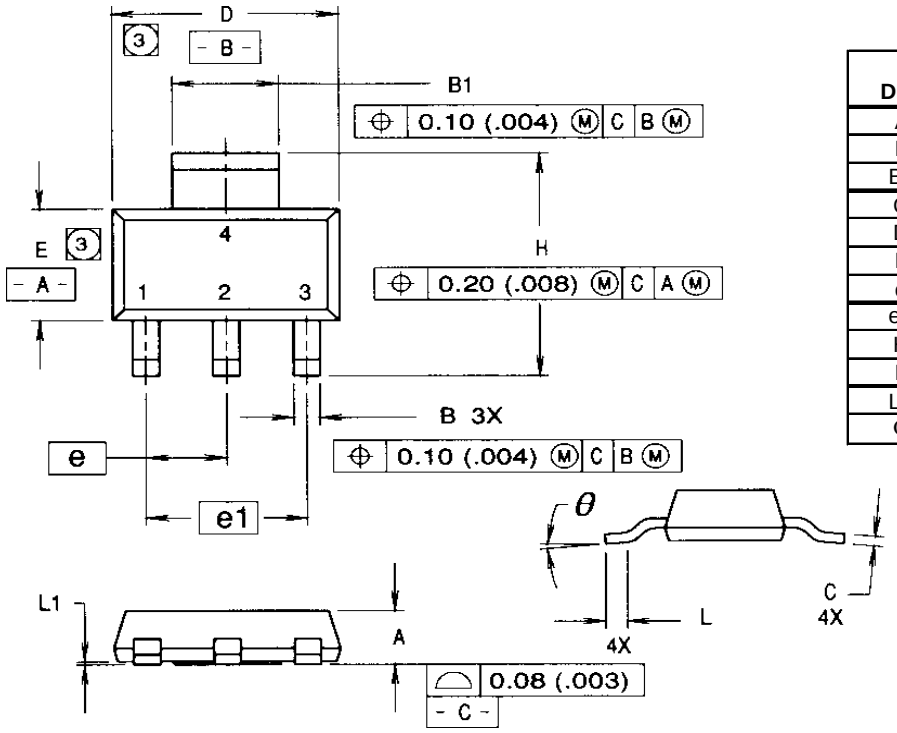
Notes:

① When mounted on a 1" square PCB (FR-4 or G10 material). For recommended footprint and soldering techniques, refer to International Rectifier Application Note AN-994.

② E_{AS} is tested with a constant current source of 6A applied for 700µS with V_{in} = 0V and starting T_j = 25°C.

③ Input current must be limited to less than 5mA with a 1kΩ resistor in series with the input when the Body-Drain Diode is forward biased.

Case Outline — SOT-223 (IRSF3021L)



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	

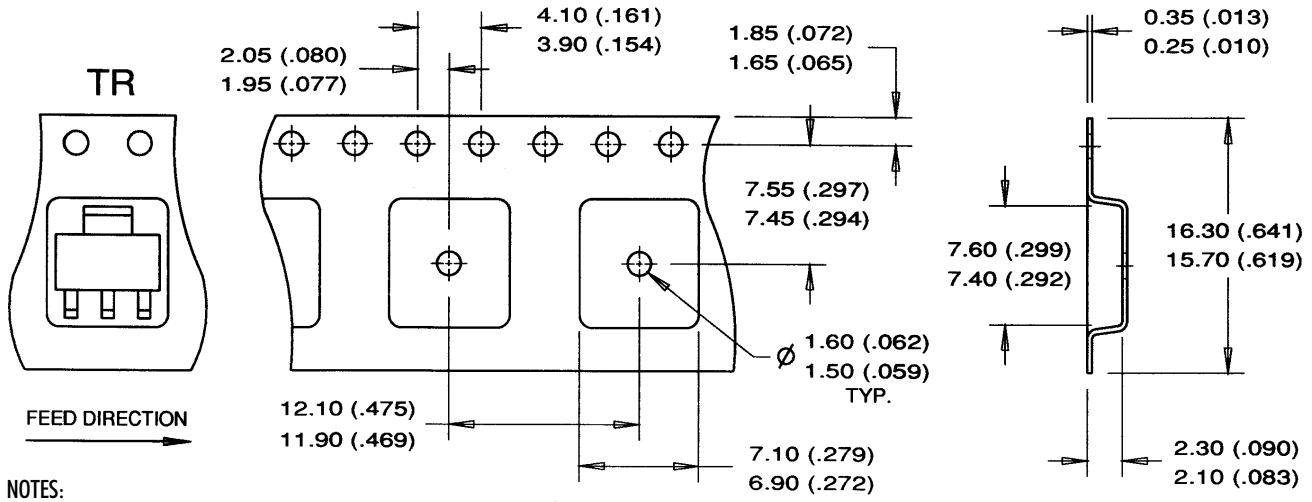
NOTES:

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

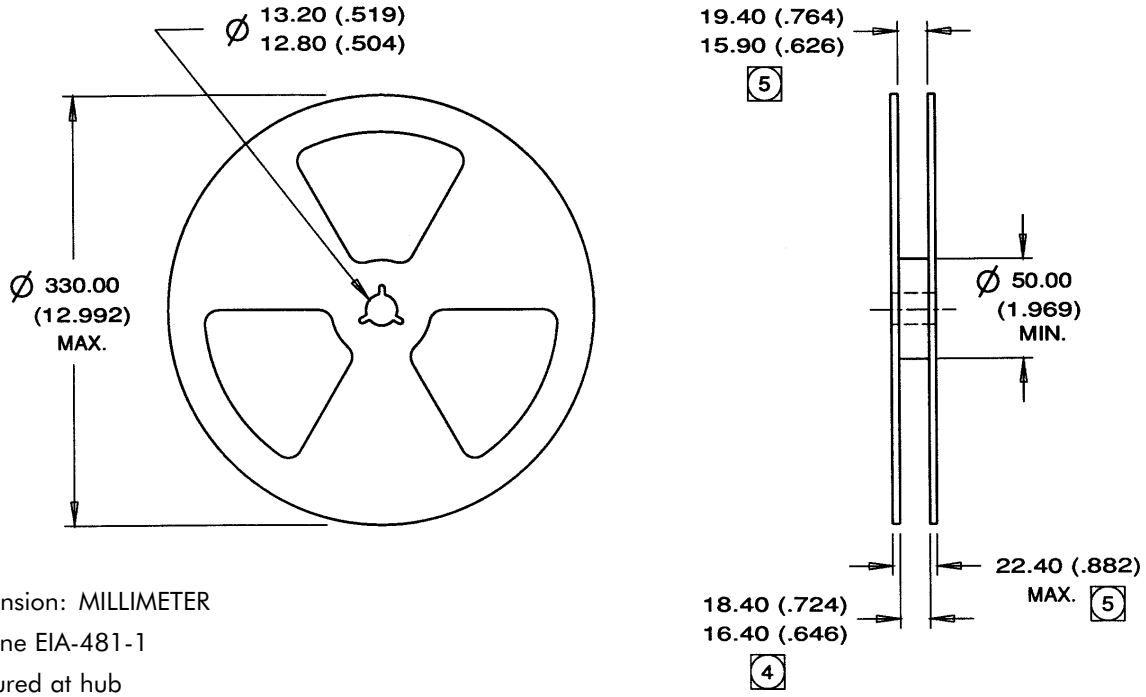
1. Gate
2. Drain
3. Source
4. Drain

Tape and Reel — SOT-223 (IRSF3021L)



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.



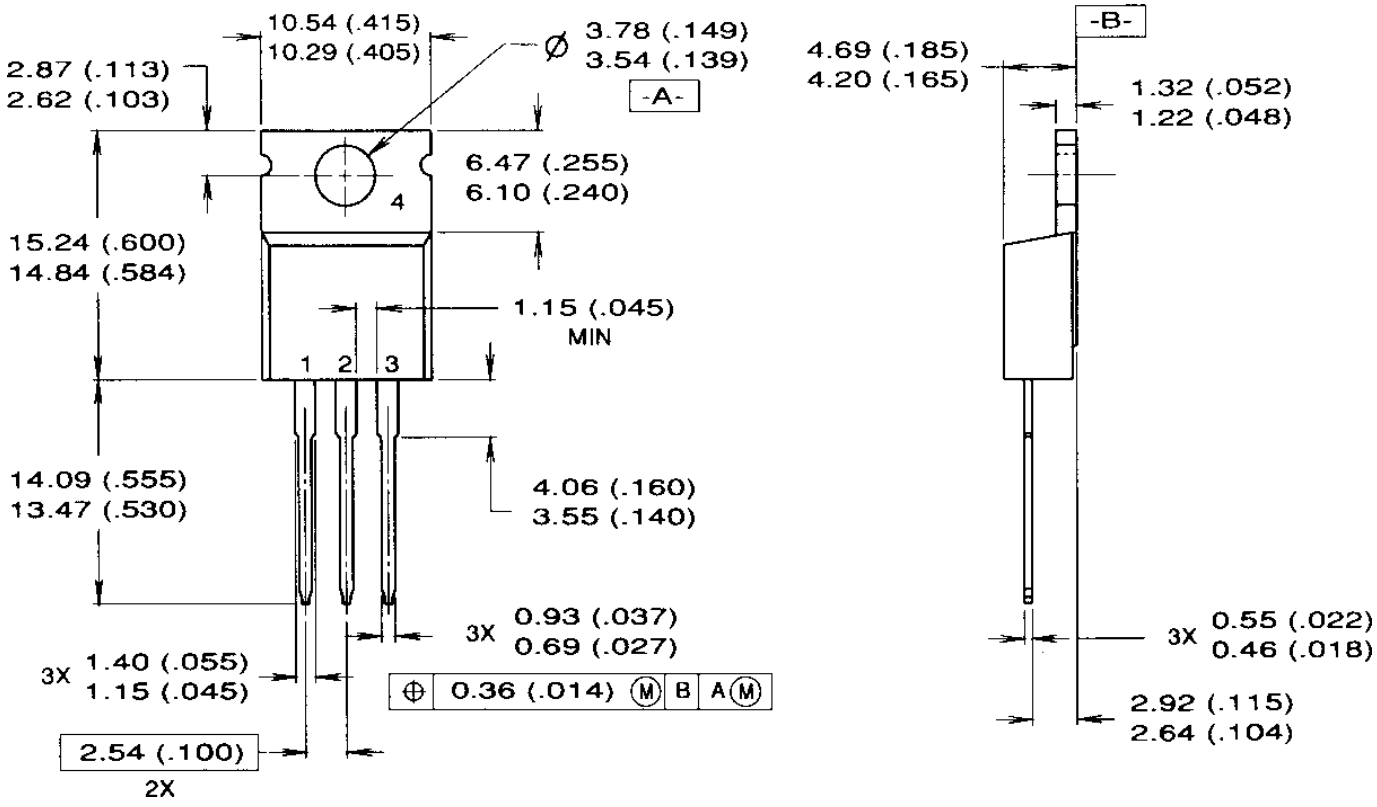
NOTES:

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 (IRSF3021)



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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IR FAR EAST: K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo Japan 171 Tel: 81 3 3983 0086
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