THE DATASHEET OF

IR6220S

International
IOR Rectifier

IR6220 **(NOTE: For new designs, we recommend IR's new products IPS521 and IPS521S)**

INTELLIGENT HIGH SIDE MOSFET POWER SWITCH

Features

- PWM current limit for short circuit protection
- Over-temperature protection
- Active output negative clamp
- Reverse battery protection for logic circuit
- Broken ground protection
- Short to V_{cc} protection
- Low noise charge pump
- Sleep mode supply current
- 4kV ESD protection on all leads
- Logic ground isolated from power ground

Product summary

$V_{cc(op)}$	5-50V
$R_{DS(on)}$	100mΩ
I_{lim}	10A
$T_{j(sd)}$	170°C
E_{av}	200mJ

General Description

The IR6220 is a 5 terminal monolithic HIGH SIDE SWITCH with built in short circuit, over- temperature, ESD protections, inductive load turn off capability and diagnostic feedback.

The on-chip protection circuit goes into PWM mode, limiting the average current during short circuit if the drain current exceeds 10A. The protection circuit latches off the high side switch if the junction temperature exceeds 170°C and latches on after the junction temperature falls by 10°C. The Vcc (drain) to out (source) voltage is actively clamped at 55V, improving its performance during turn off with inductive loads.

The on-chip charge pump high side driver stage is floating and referenced to the source of the Power MOSFET. Thus the logic to power ground isolation can be as high as 50V. This allows operation with larger offset as well as controlling the switch during load energy recirculation or regeneration.

A diagnostic pin is provided for status feedback of short circuit, over temperature and open load detection.

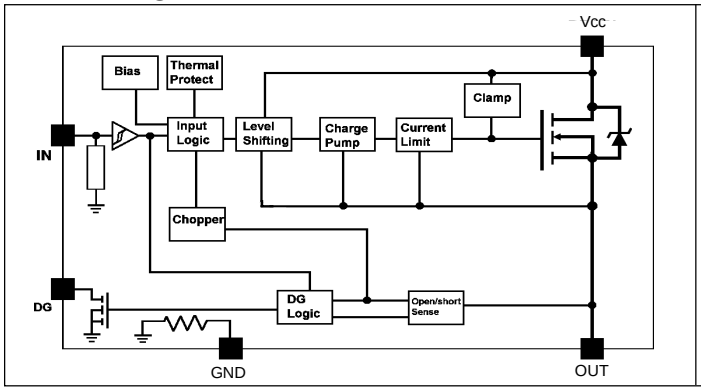
Applications

- Solenoid driver
- Programmable logic controller

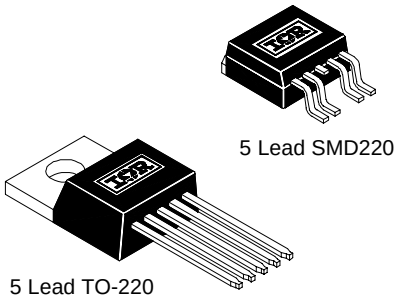
Truth Table

Condition	In	Out	Dg
Normal	H	H	H
Normal	L	L	L
Output Open	H	H	H
Output Open	L	H	H
Shorted Output	H	Current-Limiting PWM Mode	L
Shorted Output	L	L	L
Over-Temperature	H	L	L
Over-Temperature	L	L	L

Block Diagram



Available Packages



Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. (T_C = 25°C unless otherwise specified.)

Symbol	Parameter		Min.	Max.	Units	Test Conditions
V_{cc}	Supply voltage	permanent	-0.3	50	V	
		reverse	-16	—		For 10 seconds, (1)
V_{offset}	Logic to power ground offset		V_{cc} -50	V_{cc} +0.3		
V_{in}	Input voltage		-0.3	30		
I_{in}	Input current		—	10	mA	
V_{out}	Output voltage		V_{cc} -50	V_{cc} +0.3	V	
I_{out}	Output current		—	self-limited	A	
V_{dg}	Diagnostic output voltage		-0.3	30	V	
I_{dg}	Diagnostic output current		—	10	mA	
E_{av}	Repetitive avalanche energy		—	200	mJ	I = 2A (2)
ESD1	Electrostatic discharge (Human Body Model)		—	4000	V	C = 100 pF,R = 1500Ω
ESD2	Electrostatic discharge (Machine Model)		—	1000	V	C = 200 pF, R = 0Ω
P_D	Power dissipation		—	28	W	Tcase= 25°C
T_{Jop}	Operating junction temperature range		-40	150	°C	
T_{Stg}	Storage temperature range		-40	150		
T_L	Lead temperature (soldering, 10 seconds)		—	300		

NOTES: (1) with 15kΩ resistors in input and diagnostic

(2) maximum frequency depends on heatsink (rectangular waveform)

Static Electrical Characteristics

(T_C= 25°C unless otherwise specified.)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{ccop}	Operating voltage range	5	—	35	V	
I_{ccoff}	Sleep mode supply current	—	40	—	µA	V_{cc}=24V, V_{in}= 0V
I_{ccon}	Supply current (average)	—	3	—	mA	V_{in} = 5V
I_{ccac}	Supply current (AC RMS)	—	20	—	µA	V_{in} = 5V
V_{ih}	High level input threshold voltage	—	2	2.5	V	
V_{il}	Low level input threshold voltage	1	1.8	—		
I_{lon}	On-state input current	10	—	70	µA	V_{in} = 3.5V
I_{loff}	Off-state input current	1	—	30		V_{in} = 0.4V
I_{oh}	Output leakage current	—	20	—		V_{out} = 6V
I_{ol}	Output leakage current	0	—	10		V_{out} = 0V
V_{dgl}	Low level diagnostic output voltage	—	0.3	—	V	I_{dg} = 1.6mA
I_{dgh}	Diagnostic output leakage current	0	—	10	µA	V_{dg} = 5V
$R_{DS(on)}$	On-state resistance	—	80	100	mΩ	I_{out} = 1A
		—	120	—		V_{cc} = 5V, I_{out} = 1A

Switching Electrical Characteristics

(V_{CC} = 14V, resistive load (R_L) = 12Ω, T_C= 25°C.)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t_c	Over-current cycle time	—	5	—	ms	
D_c	Over-current duty cycle	—	10	—	%	
t_{on}	Turn-on delay time to 90%	—	50	—	µs	
t_{off}	Turn-off delay time to 10%	—	60	—		
dv/dt_{on}	Slew rate on	—	3	—	V/µs	
dv/dt_{off}	Slew rate off	—	5	—		

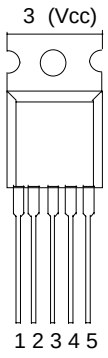
Protection Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_{lim}	Internal current limit	—	10	—	A	
V_{sc}	Short circuit detection voltage	—	3.5	—	V	
V_{slh}	Open load detection voltage	—	3.5	—		
V_{cl1}	Output negative clamp	50	54	—		I_{out} = 10mA
V_{cl2}	Output negative clamp	—	56	62		I_{out} = 2A

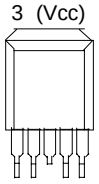
Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
T_{jsd}	Thermal shutdown temperature	—	170	—	°C	
T_{hys}	Thermal hysteresis	—	10	—		
R_{thjc}	Thermal resistance, junction to case	—	3.5	—	°C/W	
R_{thja}	Thermal resistance, junction to ambient	—	50	—		

Lead Assignments



1 - Ground
2 - In
3 - Vcc
4 - DG
5 - Out

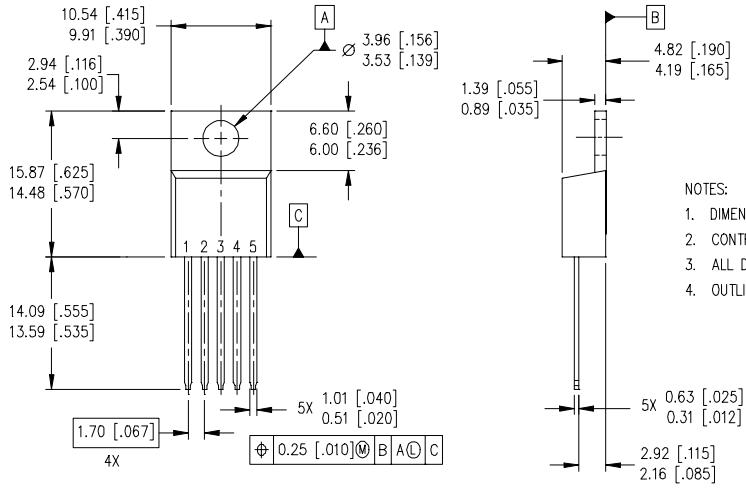


5 Lead - TO-220

5 Lead - D²PAK (SMD220)

IR6220	IR6220S
Part Number	

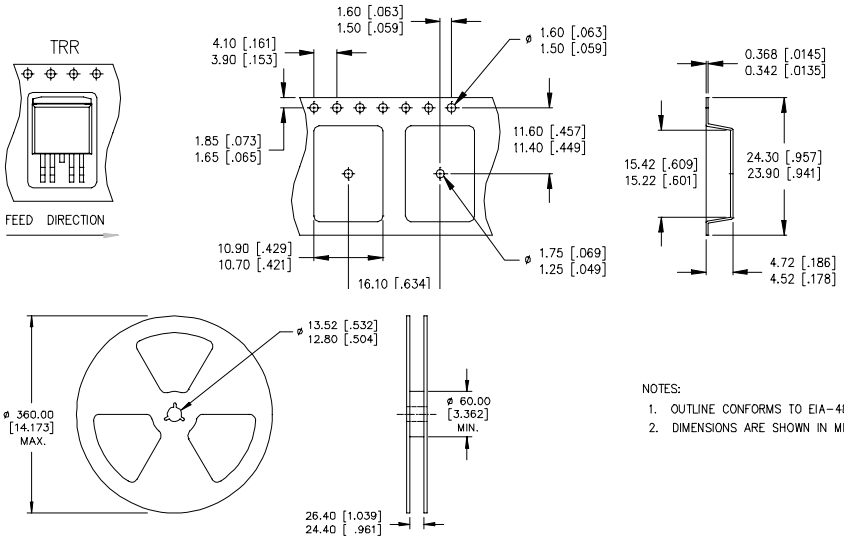
Case Outline 5 Lead - TO-220



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE SIMILAR TO JEDEC OUTLINE SERIES TS–001.

IRGB 01-3042 01

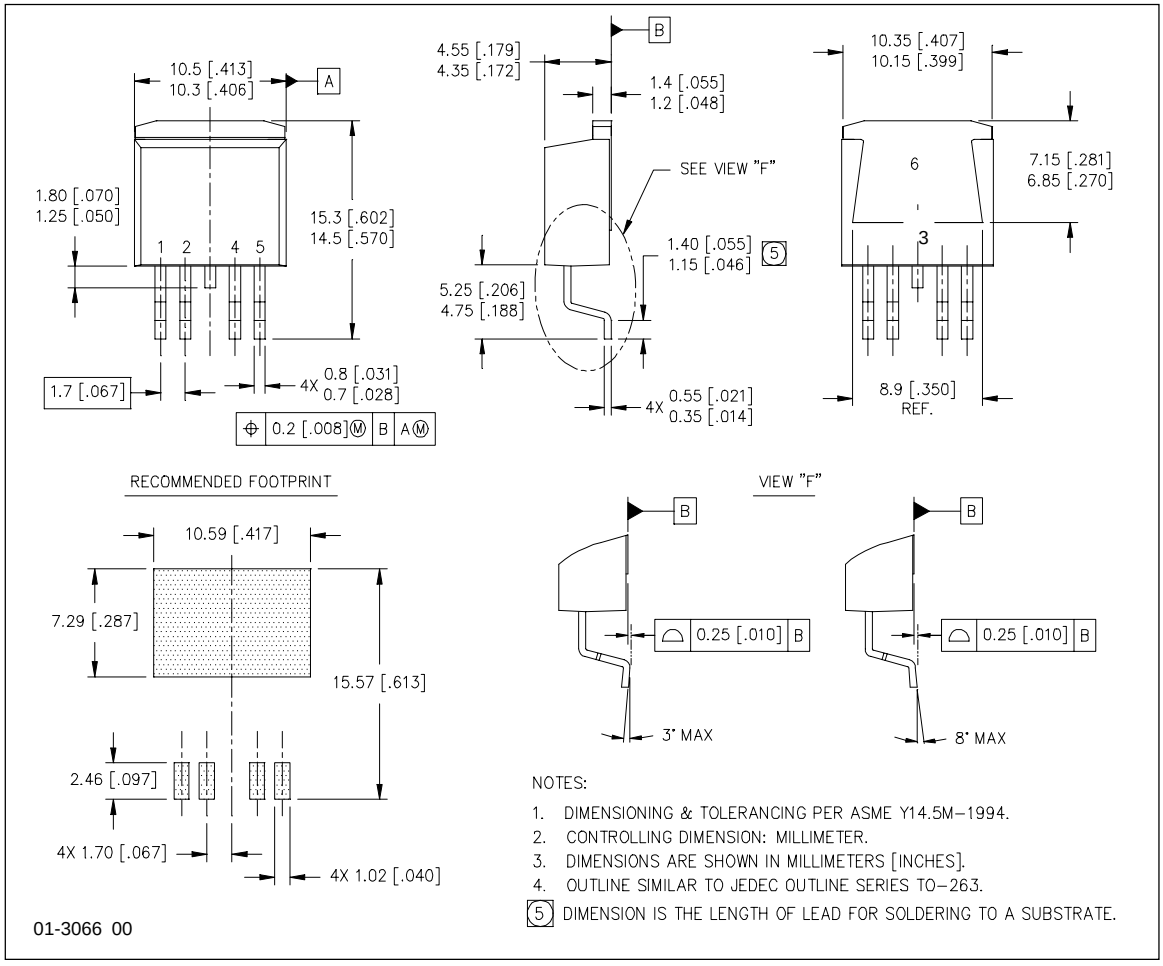
Tape & Reel 5 Lead - D²PAK (SMD220)



NOTES:
1. OUTLINE CONFORMS TO EIA–481 & EIA–541.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

01-3071 00 / 01-3072 00

Case Outline 5 Lead - SMD220 (D^2PAK)



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4. OUTLINE SIMILAR TO JEDEC OUTLINE SERIES TO–263.

(5) DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245 Tel: (310) 252-7105
IR EUROPEAN REGIONAL CENTRE: 439/445 Godstone Rd, Whyteleafe, Surrey CR3 0BL, United Kingdom
Tel: ++44 (0) 20 8645 8000
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo, Japan 171-0021 Tel: 81 (0) 33 983 0086
IR HONG KONG: Unit 308, #F, New East Ocean Centre, No. 9 Science Museum Road, Tsimshatsui East, Kowloon, Hong Kong Tel: (852) 2803-7380

Data and specifications subject to change without notice. 2/26/2000

Note: For the most current drawings please refer to the IR website at:
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