

AUIPS7081(R)(S)

INTELLIGENT POWER HIGH SIDE SWITCH

Features

- Over temperature shutdown (with auto-restart)
- Short circuit protection (current limit)
- Active clamp
- Open load detection
- Logic ground isolated from power ground
- ESD protection
- Ground loss protection
- Status feedback

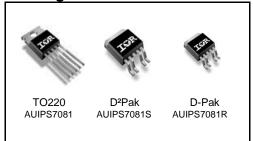
Description

The AUIPS7081(R)(S) is a five terminal Intelligent Power Switch (IPS) with built in short circuit, over-temperature, ESD protection, inductive load capability and diagnostic feedback. The output current is limited at Ilim value. Current limitation is activated until the thermal protection acts. The over-temperature protection turns off the device if the junction temperature exceeds Tshutdown. It will automatically restart after the junction has cooled 7°C below Tshutdown. A diagnostic pin is provided for status feedback of short circuit, over-temperature and open load detection. The double level shifter circuitry allows large offsets between the logic ground and the load.

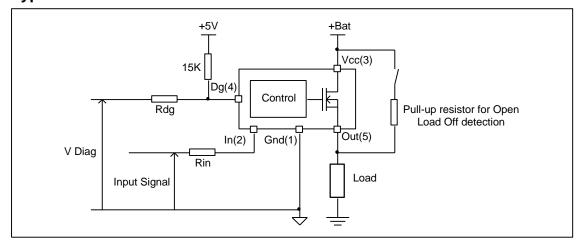
Product Summary

 $\begin{array}{ll} \text{Rds(on)} & 70\text{m}\Omega\,\text{max.} \\ \text{Vclamp} & 70\text{V} \\ \text{I Limit} & 5\text{A (typ.)} \\ \text{Open load} & 3\text{V} \end{array}$

Package



Typical Connection





Qualification Information[†]

			_		
		Automotive (per AEC-Q100)			
Qualification	on Level		passed an Automotive qualification. IR's		
		higher Automotive level.	ion level is granted by extension of the		
		D2PAK-5L	MSL1, 260°C (per IPC/JEDEC J-STD-020)		
Moisture S	Sensitivity Level	TO-220	Not applicable (non-surface mount package style)		
		DPAK-5L MSL1, 260°C (per IPC/JEDEC J-STD-02)			
	Machine Model		Class M2 (+/-200V) (per AEC-Q100-003)		
ESD	Human Body Model	_	H2 (+/-4000V) EC-Q100-002)		
Charged Device Model		Class C4 (+/-1000V) (per AEC-Q100-011)			
IC Latch-Up Test		Class II, Level A (per AEC-Q100-004)			
RoHS Com	npliant	Yes			

Qualification standards can be found at International Rectifier's web site http://www.irf.com/



Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters

are referenced to Ground lead. Tj= -40°C..150°C, Vcc=6..35V (unless otherwise specified).

Symbol	Parameter	Min.	Max.	Units
Vout	Maximum output voltage	Vcc-63	Vcc+0.3	
Voffset	Maximum logic ground to load ground offset	Vcc-63	Vcc+0.3	
Vin	Maximum input voltage	-0.3	5.5	V
Vcc max.	Maximum Vcc voltage	_	60	V
Vcc cont.	Maximum continuous Vcc voltage	_	35	
Vcc sc	Maximum Vcc voltage with short circuit protection	_	24	
lin max.	Maximum IN current -1 1		10	A
ldg max.	Maximum diagnostic output current	-1	10	mA
Vdg	Maximum diagnostic output voltage	-0.3	5.5	V
Pd	Maximum power dissipation (internally limited by thermal protection) Rth=50°C/W		2.5	W
Isd cont.	Maximum continuous diode current (Rth=50°C/W)	_	2.2	Α
ESD1	Electrostatic discharge voltage (Human body) 100pF, 1500Ω		4	L//
ESD2	Electrostatic discharge voltage (Machine Model) C=200pF,R=0Ω,L=10μH — 0.5		0.5	kV
Tj max.	Max. storage & operating temperature junction temperature	-40	+150	°C

Thermal Characteristics

Symbol	Parameter	Тур.	Max.	Units
Rth1	Thermal resistance junction to ambient D-Pak std. footprint	70	_	
Rth2	Thermal resistance junction to ambient D-Pak 1" sqrt. footprint 50		_	°C/W
Rth3	Thermal resistance junction to case D-Pak / TO220 / D2Pak		_	C/VV
Rth1	Thermal resistance junction to ambient TO220 free air	60	_	

Recommended Operating Conditions

These values are given for a quick design. For operation outside these conditions, please consult the application notes.

Symbol	Parameter		Max.	Units
VIH	High level input voltage	4	5.5	\/
VIL	Low level input voltage	-0.3	0.9	V
lout	Continuous drain current, Tamb=85°C, Tj=125°C, Vin=5V, Rth=50°C/W	_	2.3	Α
Rin	Recommended resistor in series with IN pin	4	10	
Rdgs	Recommended resistor in series with DG pin	10	20	kΩ
Rol	Recommended pull-up resistor for open load detection	5	100	



Static Electrical Characteristics

Tj=-40..150°C, Vcc=6..35V (unless otherwise specified), typical values are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Тур.	Max.	Units	Test Conditions
	ON state resistance Tj=25°C	_	55	70		Vin=5V, lout=2A
Rds(on)	ON state resistance Tj=150°C	_	100	130	mΩ	Vin=5V, lout=2A
	ON state resistance Tj=25°C, Vcc=6.5V	_	60	80		Vin=5V, lout=2A
Vcc op.	Operating voltage range	6	_	35		
V clamp	Vcc to Out clamp voltage	63	70	_	V	lout=30mA (see Fig. 1)
Vf	Body diode forward voltage	_	1	1.4		lout= 2.5A
Icc Off	Supply current when Off Tj=25°C	_	2.5	10	μΑ	Vin=0V, Vout=0V
Icc On	Supply current when On	_	2.5	4	mA	Vin=5V, Vcc=14V
lout@0V	Output leakage current	_	2.5	10		Vout=0V
lout@6V	Output leakage current	_	20	_	μΑ	Vout=6V
ldg leakage	Diagnostic output leakage current	_	_	10		Vdg=5.5V
Vdgl	Low level diagnostic output voltage	_	0.1	0.3		ldg=1.6mA
Vih	Input high threshold voltage	_	2.5	3.5		
Vil	Input low threshold voltage	1	2	_		
In hys	Input hysteresis	0.05	0.5	1	V	
UV high	Under voltage high threshold voltage	_	5	6.2		
UV low	Under voltage low threshold voltage	3	4.5	5.9		
UV hys	Under voltage hysteresis	0.1	0.5	1.5		
lin On	Input current when device is On	_	40	80	μA	Vin=5V

Switching Electrical Characteristics

Vcc=14V. Resistive load=6Ω. Vin=5V. Ti=-40°C..150°C. typical values are given for Ti=25°C

Symbol	Parameter	Min.	Тур.	Max.	Units	Test Conditions
Tdon	Turn-on delay time	_	16	45		
Tr1	Rise time to Vout=Vcc-5V	_	10	50	μs	
Tr2	Rise time to Vout=0.9 x Vcc	_	20	100	-	
dV/dt (On)	Turn On dV/dt	_	0.8	3	V/µs	
EOn	Turn On energy	_	100	_	μJ	See Fig. 3
Tdoff	Turn-off delay time	_	25	50	110	
Tf	Fall time to Vout=0.1 x Vcc	_	7.5	25	μs	
dV/dt (Off)	Turn Off dV/dt	_	1.6	3.5	V/µs	
EOff	Turn Off energy	_	25	_	μJ	
Tdiag	Vout to Vdiag propagation delay	_	15	_	μs	See Fig. 4 and Fig. 12



Protection Characteristics

Tj=-40..150°C, Vcc=6..35V (unless otherwise specified), typical values are given for Vcc=14V and Tj=25°C

Symbol	Parameter	Min.	Тур.	Max.	Units	Test Conditions
llim	Internal current limit	2	5	13.5	Α	Vout=0V, Tj=25°C
Tsd+	Over temperature high threshold	150 ⁽¹⁾	165	_	°C	See Fig. 2
Tsd-	Over temperature low threshold	_	158	_	٥	See Fig. 2
Vsc	Short-circuit detection voltage (2)	2	3	4	\/	
Vopen load	Open load detection threshold	2	3	4	V	

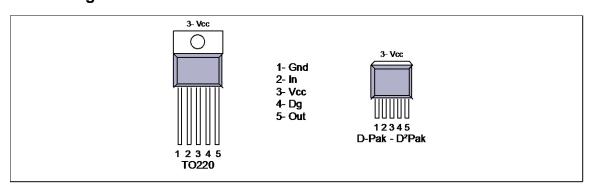
⁽¹⁾ Guaranteed by design (2) Reference to Vcc

Truth Table

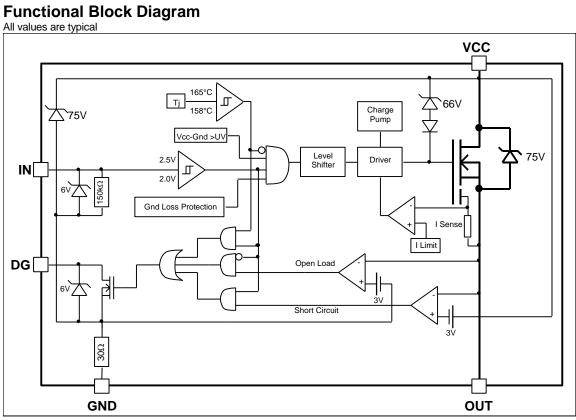
Operating Conditions	IN	OUT	DG pin
Normal	Н	Н	Н
Normal	L	L	L
Open Load	Н	Н	Н
Open Load (3)	L	Н	Н
Short circuit to Gnd	Н	L (limiting)	L
Short circuit to Gnd	Ĺ	L	L
Over-temperature	Н	L (cycling)	L
Over-temperature	L	L	L

⁽³⁾ With a pull-up resistor connected between the output and Vcc.

Lead Assignments

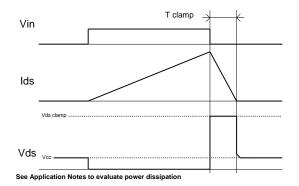






International **TOR** Rectifier

AUIPS7081(R)(S)



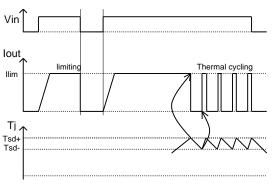
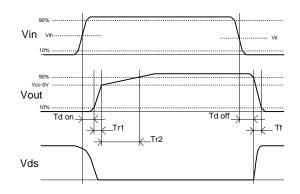


Figure 1 - Active clamp waveforms

Figure 2 - Protection timing diagram





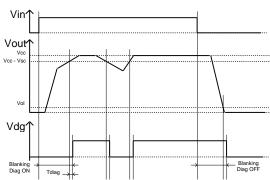
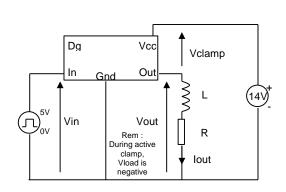


Figure 4 - Diagnostic delay definition



0.1 0.1 1E+2 1E+3 1E+4 1E+5 1E+6 Load inductance (µH)

Figure 5 - Active clamp test circuit

Figure 6 – Max. Output current (A) Vs Load inductance (µH)

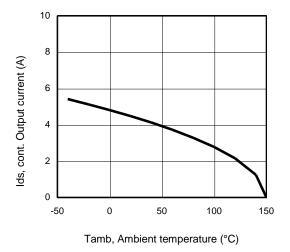


Figure 7 – Max. ouput current (A)
Vs Ambient temperature (°C) Rth=50°C/W

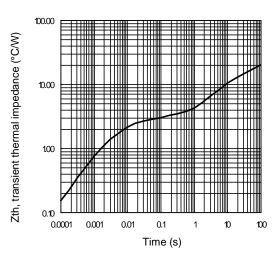
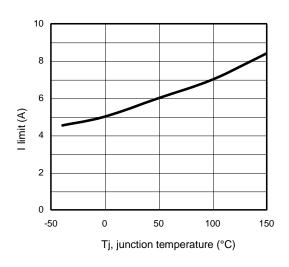


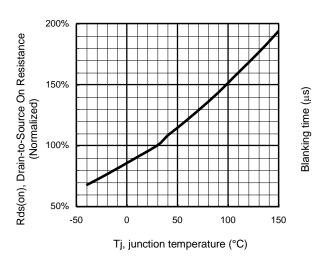
Figure 8 – Transient thermal impedance (°C/W)
Vs time (s)



1500 (PT) 1000 Eon Eon Eoff For Eoff Fo

Figure 9 –I limit (A)
Vs junction temperature (°C)

Figure 10 – Switching energy (µJ) Vs Output current (A)



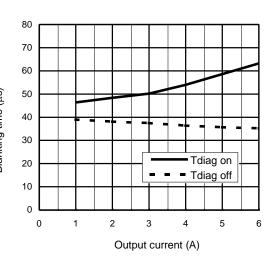
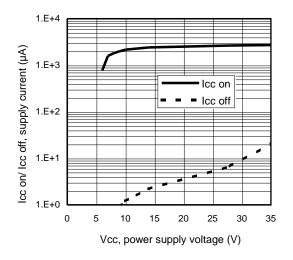


Figure 11 - Normalized Rds(on) (%) Vs Tj (°C)

Figure 12 – Diagnostic Blanking time (μs) Vs Output current (A)



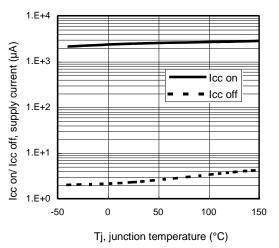
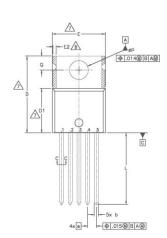
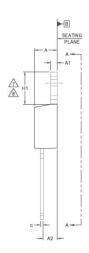


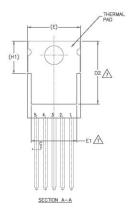
Figure 13 - Icc on/ Icc off (µA) Vs Vcc (V)

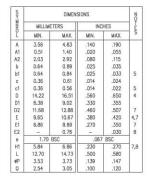
Figure 14 - Icc on/ Icc off (µA) Vs Tj (°C)

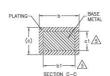
Case outline - TO220 - 5 leads











- NOTES

 1.— DIENSIONIG AND TOLERANCING AS PER ASME Y14.5 M— 1994.
 2.— DIENSIONS ARE STRIME IN INCHES [MILLIMETERS].
 3.— LEAD DIENSIONS ARE INSTRUMENT INCONTROLLED IN L1.
 4.— DIENSION D, DI & E DO NOT INCLIDE MOLD FLASH MOLD FLASH SHALL NOT DIEDED ADDS (10.72) PER SIDE. THESE DIMENSIONS ARE MACAJIRED AT THE OUTERWIST ENTREUES OF THE PLASTIC BODY.

 DIENSION DI & et al PREY TO DESE METAL OLD.
 6.— CONTROLLING DIENSION: INCHES.
 7.— THERMAR PAD CONTIGUR OFFICIAL WITHIN DIMENSIONS EJH, D.2 & E1

 AND SHIGLAND INFOCULDARL WITHIN DIMENSIONS EJH, D.2 & E1

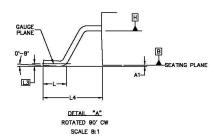
 AND SHIGLAND INFOCULDARL WITHIN DIMENSIONS EJH, D.2 & E1

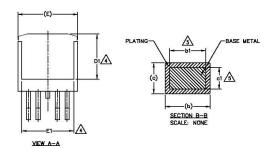
 AND SHIGLAND INFOCULDARLES ARE ALLOWED.
 9.— OUTLINE DIMENSIONS ARE DIEDED TO THE CENTRAL CRIES.

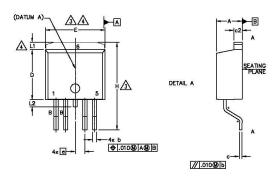
 WIEHE DIMENSIONS ARE DIEDED TO THE METALLA PACKAGE OUTLINE.

10.- LEADS AND DRAIN ARE PLATED WITH 100% Sn

Case Outline - D2pak - 5 leads







NOTES:

- 1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M-1994
- 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- △\$\timension d & E dd not include mold flash. Mold flash shall not exceed 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.

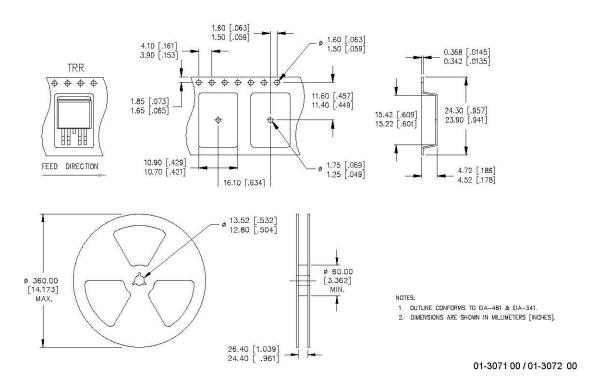
ATHERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.

5 DIMENSION 61 AND c1 APPLY TO BASE METAL ONLY.

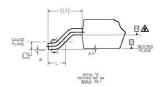
- 6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 7. CONTROLLING DIMENSION: INCH.
- 8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263BA.
- 9 LEADS AND DRAIN ARE PLATED : 100% Sn

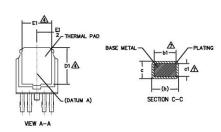
S Y M		DIMEN	SIONS		N
	MILLIMETERS		INC	O T E S	
B O L	MIN.	MAX.	MIN.	MAX.	Š
Α	4.06	4.83	.160	.190	
A1	-	0.254	=	.010	
ь	0.51	0.99	.020	.039	4
b1	0.51	0.89	.020	.035	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	
E	9.65	10.67	.380	.420	3
E1	6.22	-	.245	-	
e	1.70	BSC	.067	BSC	
Н	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	-	1.68	-	.066	
L2	1	1.78	-	.070	
L3	0.25	BSC	.010	BSC	
L4	4.78	5.2B	.188	.208	

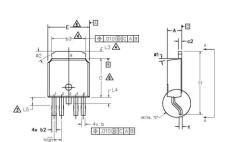
Tape and Reel - D2Pak - 5 leads



Case Outline - Dpak - 5 leads





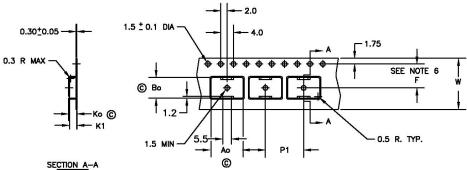


YY		DIMEN	ISIONS		2
M B O	MILLIM	IILLIMETERS INCHE		HES	N O T
L	MIN.	MAX.	MIN.	MAX.	Ė
Α	2.18	2.39	.086	.094	
A1	-	0.13	_	.005	
ь	0.51	0.89	.020	.035	
ь1	.051	0.84	.020	.033	2
ь3	4.95	5.46	.195	.215	2
С	0.46	0.61	.018	.024	
c1	0.41	0.56	.016	.022	2
c2	0.46	0.89	.018	.035	
D	5.97	6.22	.235	.245	3
D1	5.21	-	.205	-	
E	6.35	6.73	.250	.265	3
E1	4.32	-	.170	-	
е	1.14	1.14 BSC		BSC	
Н	9.40	10.41	.370	.410	r I
L	1.40	1.78	.055	.070	
L1	2.74	BSC	.108	REF.	
L2	0.51	BSC	.020	BSC	
L3	0.89	1.27	.035	.050	
L4	-	1.02	-	.040	
L5	1.14	1.52	.045	.060	
ø	0.	10*	0,	10°	
ø1	0.	15*	0.	15*	
ø2	28*	32'	28*	32*	

NOTES:

- 1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M-1994
- 2.- DIMENSION ARE SHOWN IN INCHES [MILLIMETERS].
- LEAD DIMENSION UNCONTROLLED IN L5.
- A- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
- 5.- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
- DIMENSION D & E DO NOT INCLUDE MOLD FLASH, MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
- 8.- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 9.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252.
- 10. LEADS AND DRAIN ARE PLATED WITH 100% Sn

Tape & Reel - Dpak - 5 leads



Ao = 10.5 mm Bo = 7.0 mm Ko = 2.8 mm K1 = 2.4 mm F = 7.5 mm P1 = 12.0 mm

16.0 ± .3 mm

NOTES:

- 5.
- 10 SPROCKET HOLE PUNCH CUMULATIVE TOLERANCE ±.02
 CAMBER NOT TO EXCEED 1mm IN 100mm
 MATERIAL: CONDUCTIVE BLACK POLYSTYRENE
 AC AND BO MEASURED ON A PLANE 0.3mm ABOVE THE
 BOTTOM OF THE POCKET
 KO MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE
 POCKET TO THE TOP SURFACE OF THE CARRIER
 POCKET POSITION RELATIVE TO THE SPROCKET HOLE MEASURED AS
 TRUE POSITION OF POCKET, NOT POCKET HOLE

- TRUE POSITION OF POCKET, NOT POCKET HOLE

 VENDOR: (OPTIONAL)

 MUST ALSO MEET REQUIREMENTS OF EIA STANDARD #EIA-481A,
 TAPING OF SURFACE-MOUNT COMPONENTS FOR AUTOMATIC
 PLACEMENT.

 TOLERANCE TO BE MANUFACTURER STANDARD

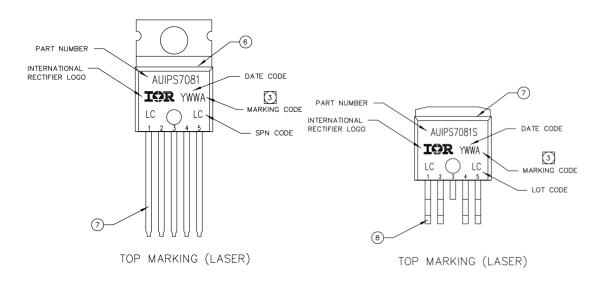
 SURFACE RESISTIVITY OF MOLDED MATL: MUST MEASURE

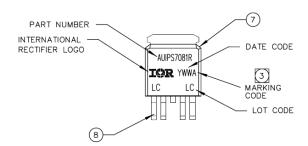
 LESS THAN OR EQUAL TO 10* OHMS PER SQUARE. MEASURED
 IN ACCORDANCE TO PROCEDURE GIVEN IN ASTM D-257 &
 ASTM D-991 (REF. C-9000 SPEC.)

 TOTAL LENGTH PER REEL MUST BE 79 METERS

 (**CORTICAL DIMENSION**)
- 12. C CRITICAL DIMENSION

Part Marking Information





TOP MARKING (LASER)



Ordering Information

Base Part Number		Standard Pack		
base Fait Number	Package Type	Form	Quantity	Complete Part Number
AUIPS7081	TO220-5-Leads	Tube	50	AUIPS7081
ALUD070040	DO Dale E Landa	Tube	50	AUIPS7081S
AUIPS7081S	D2-Pak-5-Leads	Tape and reel left	800	AUIPS7081STRL
AUIPS7081R	D-Pak-5-Leads	Tube	75	AUIPS7081R
AUIPS/06TR	D-Pak-5-Leads	Tape and reel left	3000	AUIPS7081RTRL



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Revision History

Revision	Date	
		Notes/Changes
A1	October 2011	First release
В	March 2012	Remove the preliminary mention
С	October 18, 2012	Remove the PbF mention
D	June, 16 th 2014	Update minimum value of Ilim
		Remove TRR and TR packing option
Е	July 17, 2014	Remove Pbf suffix in the 1 st page

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