

INTELLIGENT POWER LOW SIDE SWITCH

Features

- Over temperature shutdown
- Over current shutdown
- Active clamp
- Low current & logic level input
- ESD protection
- Optimized Turn On/Off for EMI
- Diagnostic on the input current

Description

The AUIPS2041(R)(L) is a three terminal Intelligent Power Switch (IPS) that features a low side MOSFET with over-current, over-temperature, ESD protection and drain to source active clamp. This device offers protections and the high reliability required in harsh environments. The switch provides efficient protection by turning OFF the power MOSFET when the temperature exceeds 165°C or when the drain current reaches 5A. The device restarts once the input is cycled. A serial resistance connected to the input provides the diagnostic. The avalanche capability is significantly enhanced by the active clamp and covers most inductive load demagnetizations.

Product Summary

Rds(on)	130mΩ (max.)
Vclamp	68V
Ishutdown	5A (typ.)

Packages

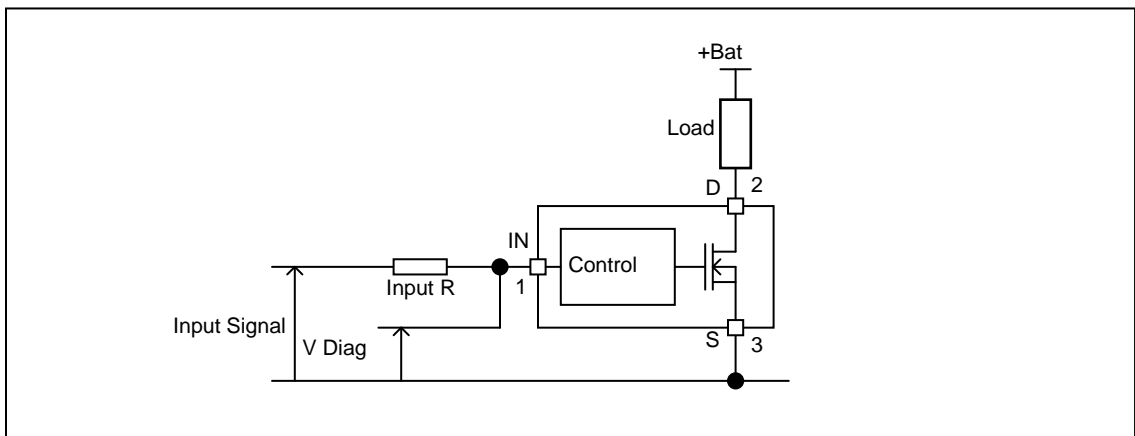


DPak
AUIPS2041R



SOT223
AUIPS2041L

Typical Connection



Qualification Information†

Qualification Level		Automotive (per AEC-Q100 ^{††})	
		Comments: This family of ICs has passed an Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
Moisture Sensitivity Level		DPAK-3L	MSL1, 260°C (per IPC/JEDEC J-STD-020)
		SOT223-3L	MSL2, 260°C ^{†††} (per IPC/JEDEC J-STD-020)
ESD	Machine Model	Class M4 (+/-450V) (per AEC-Q100-003)	
	Human Body Model	Class H3A (+/4500V) (per AEC-Q100-002)	
	Charged Device Model	Class C4 (+/-900V) (per AEC-Q100-011)	
IC Latch-Up Test		ClassII, Level A (per AEC-Q100-004)	
RoHS Compliant		Yes	

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

†† Exceptions to AEC-Q100 requirements are noted in the qualification report.

††† Higher MSL ratings may be available for the specific package types listed here. Please contact your International Rectifier sales representative for further information.

Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. (Tj= -40°C..150°C, Vcc=6..50V unless otherwise specified).

Symbol	Parameter	Min.	Max.	Units
Vds	Maximum drain to source voltage	-0.3	60	V
Vin	Maximum input voltage	-0.3	6	V
Isd cont.	Max diode continuous current (limited by thermal dissipation) Rth=125°C/W	—	1.4	A
Pd	Maximum power dissipation (internally limited by thermal protection) Rth=125°C/W	—	1	W
Tj max.	Max. storage & operating temperature junction temperature	-40	150	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
Rth1	Thermal resistance junction to ambient IPS2041L	100	—	°C/W
Rth2	Thermal resistance junction to ambient with 1" square footprint	50	—	
Rth1	Thermal resistance junction to ambient IPS2041R D-Pak std. footprint	70	—	
Rth2	Thermal resistance junction to ambient IPS2041R D-Pak 1" sqr. footprint	50	—	
Rth3	Thermal resistance junction to case IPS2041R D-Pak	4	—	

Recommended Operating Conditions

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

Symbol	Parameter	Min.	Max.	Units
VIH	High level input voltage	4	5.5	
VIL	Low level input voltage	0	0.5	
Ids	Continuous drain current, Tambient=85°C, Tj=125°C, Vin=5V, Rth=100°C/W	—	1.4	A
Rin	Recommended resistor in series with IN pin to generate a diagnostic	0.5	5	kΩ
Max L	Max recommended load inductance (including line inductance) (1)	—	10	mH
Max. t rise	Max. input rising time	—	1	μs

(1) Higher inductance is possible if maximum load current is limited - see figure 11

Static Electrical Characteristics

T_J = -40..150°C, V_{CC}=14V (unless otherwise specified), typical value are given for T_J=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R _{ds(on)}	ON state resistance T _J =25°C	—	100	130	mΩ	V _{in} =5V, I _{ds} =1A
	ON state resistance T _J =150°C(2)	—	180	240		
I _{dss1}	Drain to source leakage current	—	0.01	1	μA	V _{CC} =14V, T _J =25°C
I _{dss2}	Drain to source leakage current	—	0.04	2		V _{CC} =50V, T _J =25°C
V _{clamp1}	Drain to source clamp voltage 1	63	68	—	V	I _d =20mA See fig. 3 & 4
V _{clamp2}	Drain to source clamp voltage 2	—	68	75		
V _{in clamp}	IN to source pin clamp voltage	5.5	6.2	7.5		
V _{th}	Input threshold voltage	1.1	2	2.8		
I _{in, on}	ON state IN positive current	10	40	80	μA	V _{in} =5V
I _{in, off}	OFF state IN positive current (after protection latched)	120	250	350		

Switching Electrical Characteristics

T_J = -40..150°C, V_{CC}=14V, Resistive load=10Ω, R_{input}=50Ω, V_{in}=5V, typical value are given for T_J=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
T _{don}	Turn-on delay time to 20%	0.25	1.3	4	μs	See figure 2
T _r	Rise time 20% to 80%	0.1	0.9	2		
T _{doff}	Turn-off delay time to 80%	1	3	8		
T _f	Fall time 80% to 20%	0.1	0.6	3		
E _{on} + E _{off}	Turn on and off energy	—	12	—	μJ	

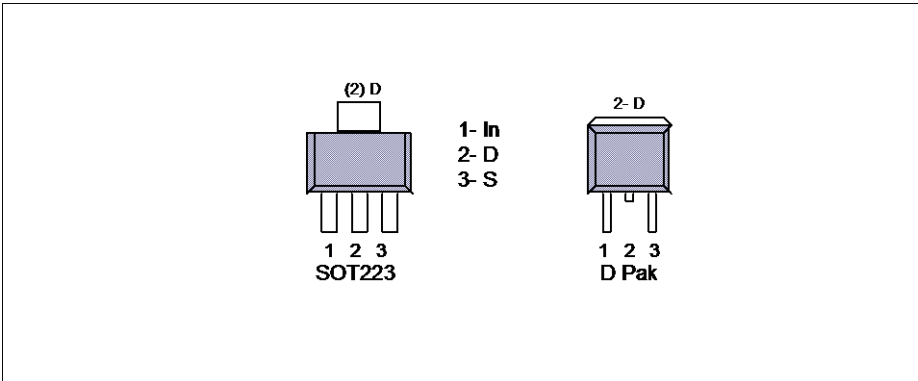
Protection Characteristics

T_J = -40..150°C, V_{CC}=14V (unless otherwise specified), typical value are given for T_J=25°C

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
T _{sd}	Over temperature threshold	150(2)	165	—	°C	See figure 1
I _{sd}	Over current threshold	4	5.5	7.5	A	T _J =25..150°C see fig 1
		3.6	6	8		T _J = -40°C
V _{reset}	IN protection reset threshold	0.9	1.6	2	V	
T _{reset}	Time to reset protection	15	50	500	μs	V _{in} =0V

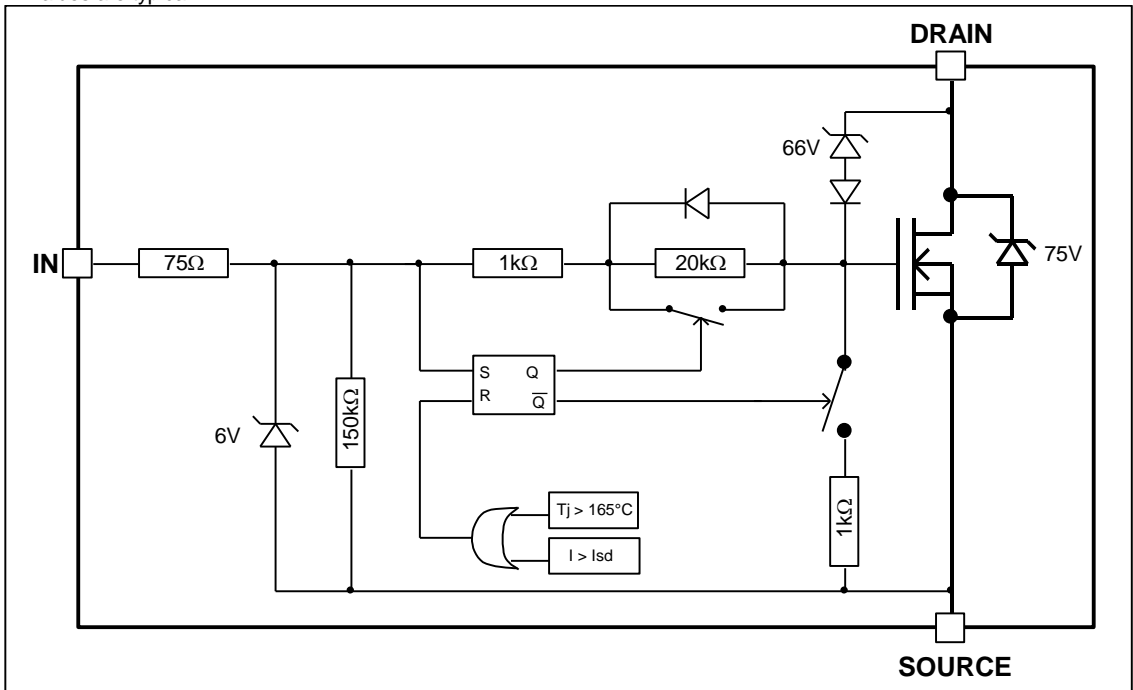
(2) Guaranteed by design

Lead Assignments



Functional Block Diagram

All values are typical



All curves are typical values. Operating in the shaded area is not recommended.

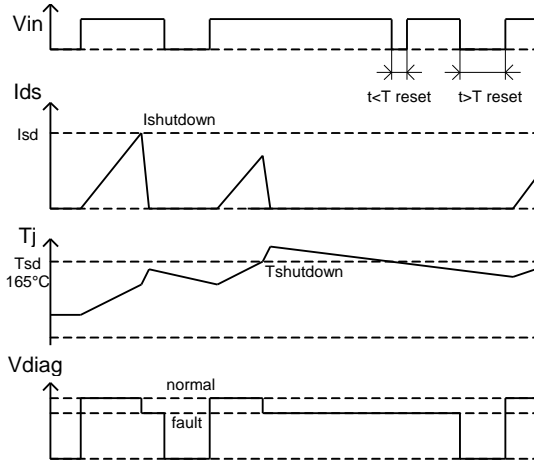


Figure 1 – Timing diagram

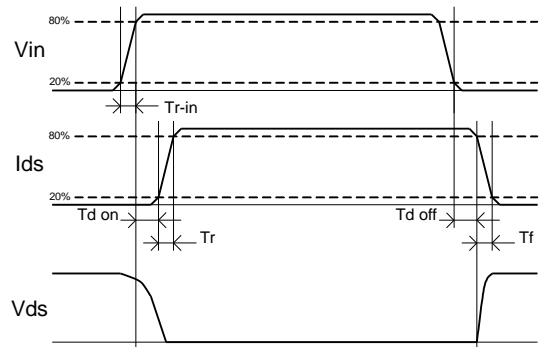


Figure 2 – IN rise time & switching definitions

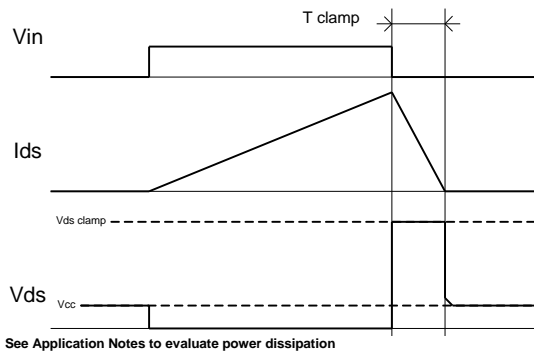


Figure 3 – Active clamp waveforms

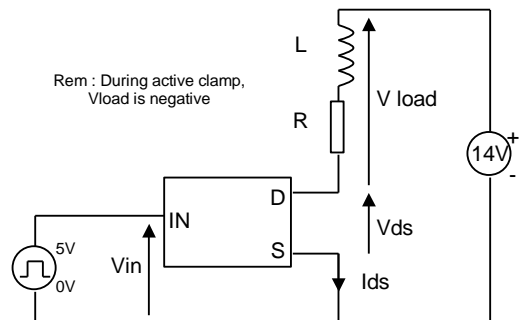


Figure 4 – Active clamp test circuit

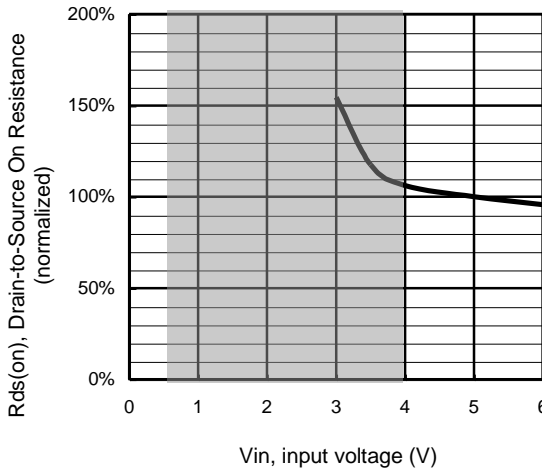


Figure 5 – Normalized Rds(on) (%) Vs Input voltage (V)

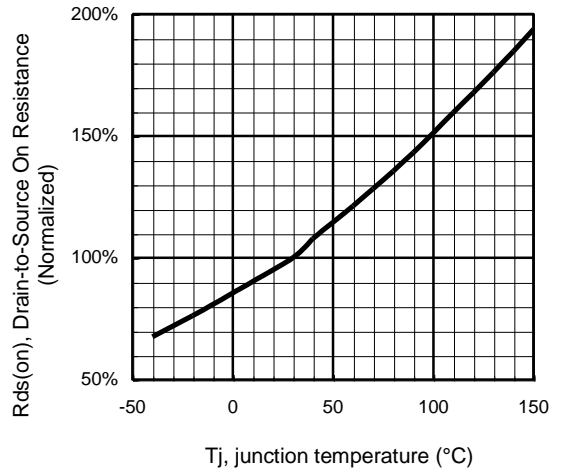


Figure 6 - Normalized Rds(on) (%) Vs Tj (°C)

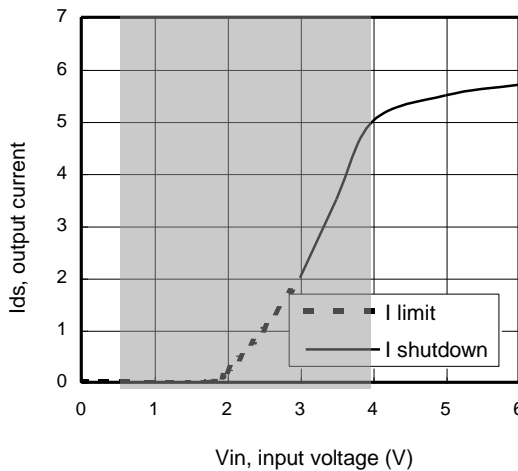


Figure 7 – Current limitation and current shutdown Vs Input voltage (V)

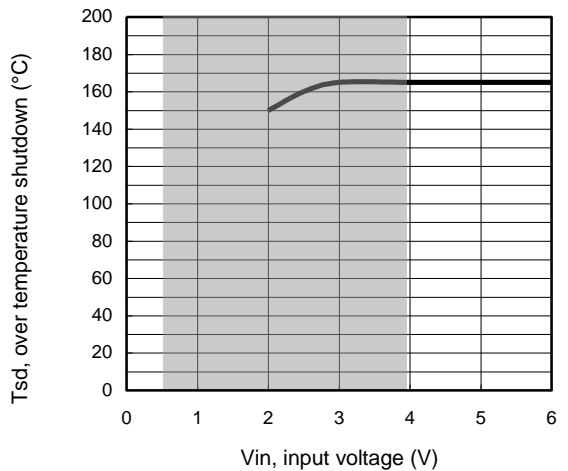


Figure 8 – Over temperature shutdown (°C) Vs input voltage (V)

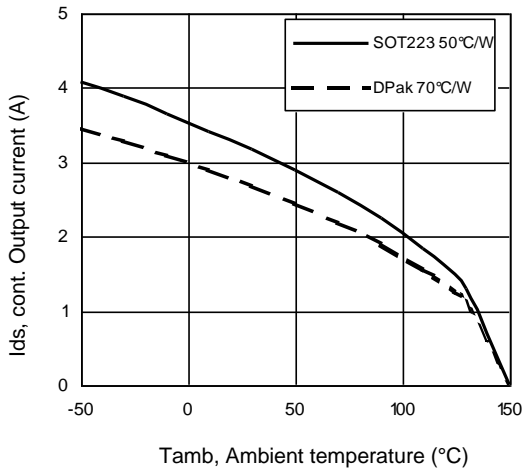


Figure 9 – Max. continuous output current (A) Vs Ambient temperature (°C)

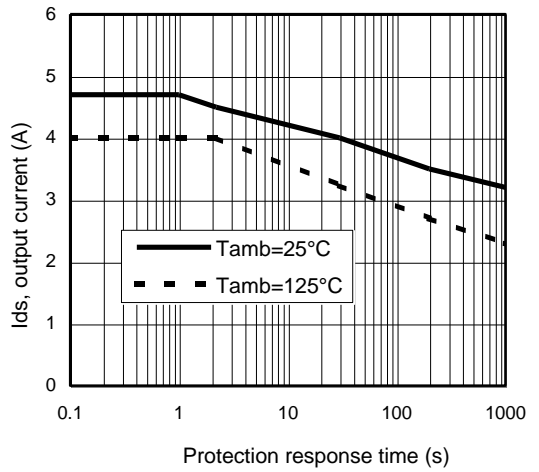


Figure 10 – Ids (A) Vs over temperature protection response time (s)

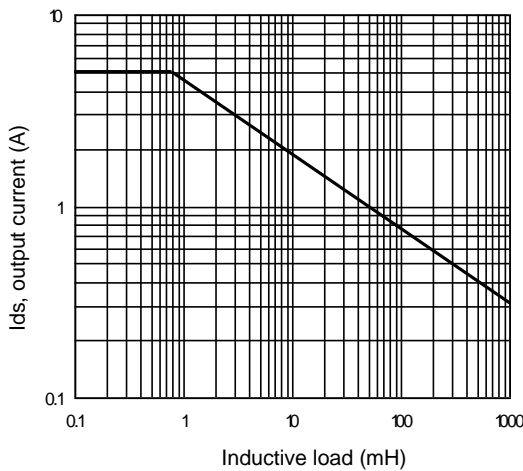


Figure 11 – Max. output current (A) Vs Inductive load (mH)

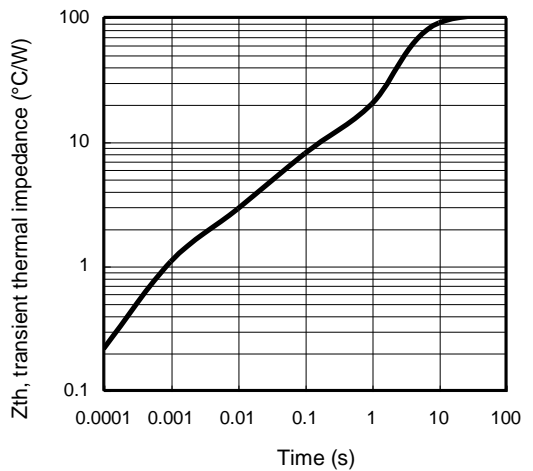
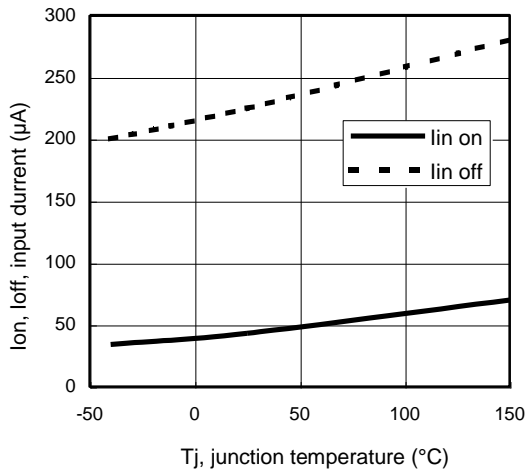
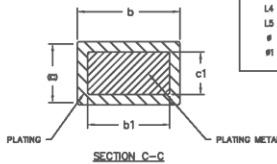
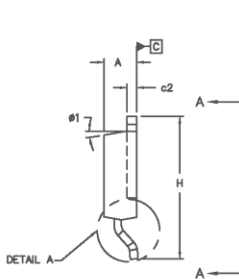
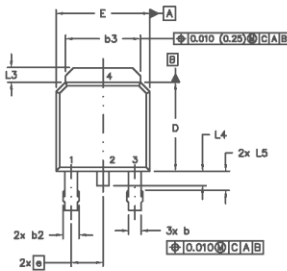
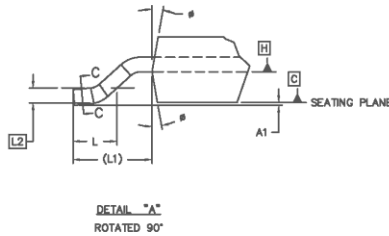
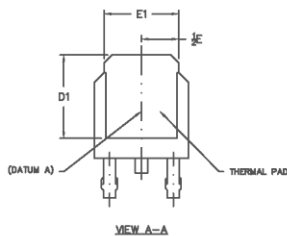


Figure 12 – Transient thermal impedance (°C/W) Vs time (s)



**Figure 13 – Input current (µA) On and Off
Vs junction temperature (°C)**

Case outline – Dpak - Automotive Q100 PbF MSL1 qualified



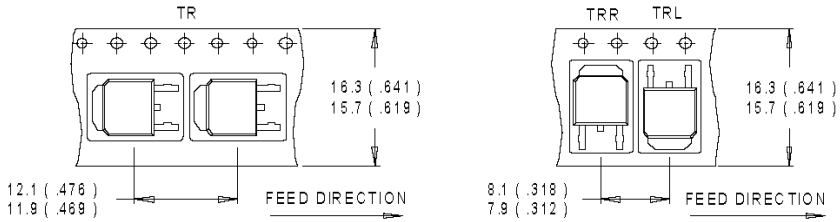
SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	.088	.094	
A1		0.13		.005	
b	0.64	0.69	.025	.030	5
b1	0.64	0.76	.025	0.030	5
b2	0.78	1.14	.030	.045	
b3	4.65	5.46	.185	.215	
c	0.48	0.61	.018	.024	5
c1	0.41	0.56	.016	.022	5
c2	.048	0.69	.018	.035	5
D	5.97	6.22	.235	.245	6
D1	3.21	-	.205	-	4
E	6.35	6.73	.250	.265	6
E1	4.32	-	.170	-	4
e	2.28		.090 BSC		
H	6.40	10.41	.270	.410	
L	1.40	1.76	.055	.070	
L1	2.74 REF.		.108 REF.		
L2	0.91 BSC		.030 BSC		
L3	0.89	1.27	.035	.050	
L4		1.02		.040	
L5	1.14	1.52	.045	.060	
#	0"	10"	0"	10"	3
#1	0"	15"	0"	15"	

NOTES:

- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2.0 DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]
- 3.0 LEAD DIMENSION UNCONTROLLED IN L5
- 4.0 DIMENSION D1 AND E1 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
- 5.0 SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 [0.127] AND .010 [0.2540] FROM THE LEAD TIP.
- 6.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 7.0 OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.
- 8.0 LEADS AND DRAIN ARE PLATED WITH 100% Sn

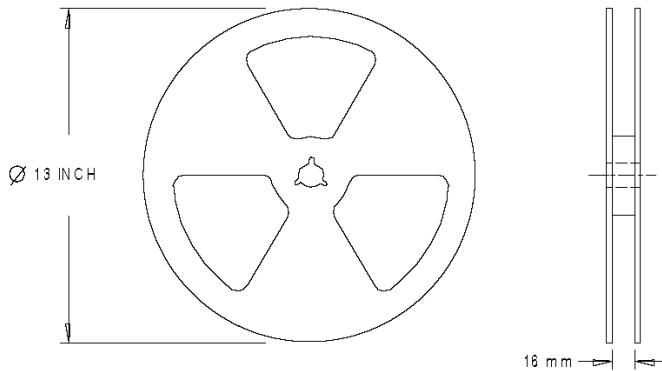
Tape & Reel – Dpak

Dimensions are shown in millimeters (inches)



NOTES :

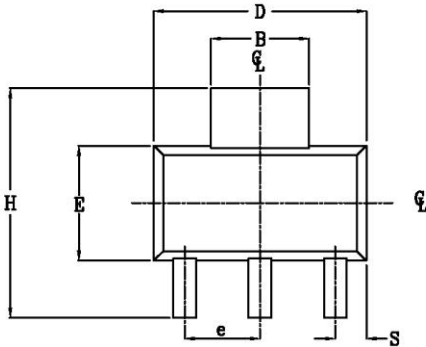
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



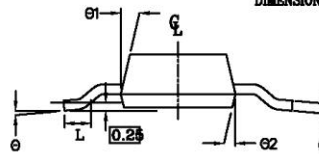
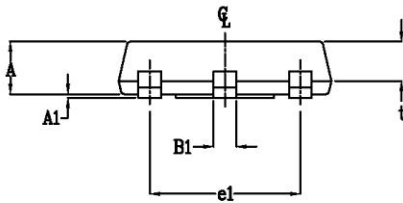
NOTES :

1. OUTLINE CONFORMS TO EIA-481.

Case Outline - SOT-223 - Automotive Q100 PbF MSL2 qualified



POS	MILLIMETERS		INCHES	
	MAX	MIN	MAX	MIN
A	1.70	1.50	.067	.060
A1	0.10	0.02	.004	.0008
B	3.15	2.95	.124	.116
B1	0.85	0.65	.033	.026
C	0.35	0.25	.014	.010
D	6.70	6.30	.264	.248
e	2.30 NOM		.0905 NOM	
e1	4.60 NOM		.181 NOM	
E	3.70	3.30	.146	.130
H	7.30	6.70	.287	.264
S	1.05	0.85	.041	.033
t	1.30	1.10	.051	.043
Θ	10° MAX		10° MAX	
$\Theta 1$	16°	10°	16°	10°
$\Theta 2$	16°	10°	16°	10°
L	0.75 MIN		0.0295 MIN	

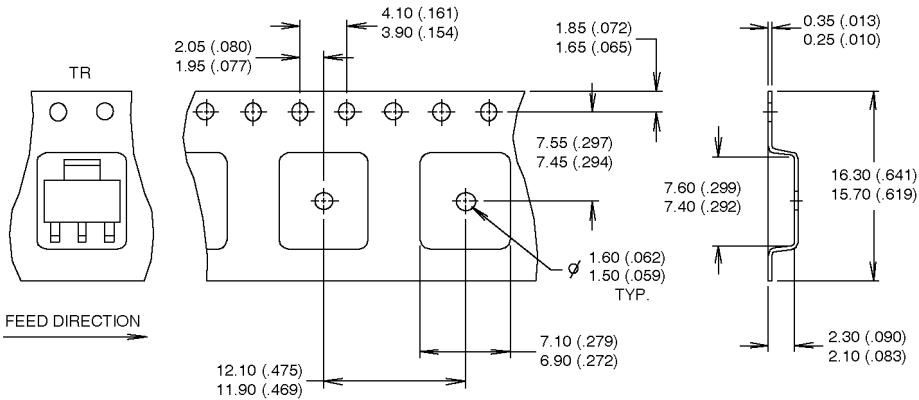


NOTE:
 1. PACKAGE OUTLINE EXCLUSIVE OF ANY MOLD FLASHES DIMENSION.
 2. PACKAGE OUTLINE EXCLUSIVE OF BURR DIMENSION.

Leads and drain are plated with 100% Sn

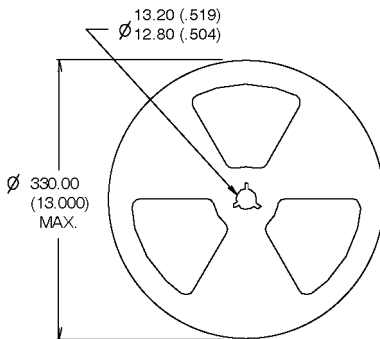
Tape & Reel - SOT-223

Dimensions are shown in millimeters (inches)



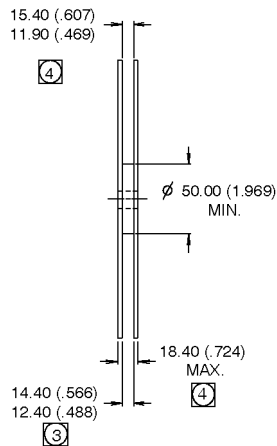
NOTES :

1. CONTROLLING DIMENSION: MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.
3. EACH $\varnothing 330.00$ (13.00) REEL CONTAINS 2,500 DEVICES.

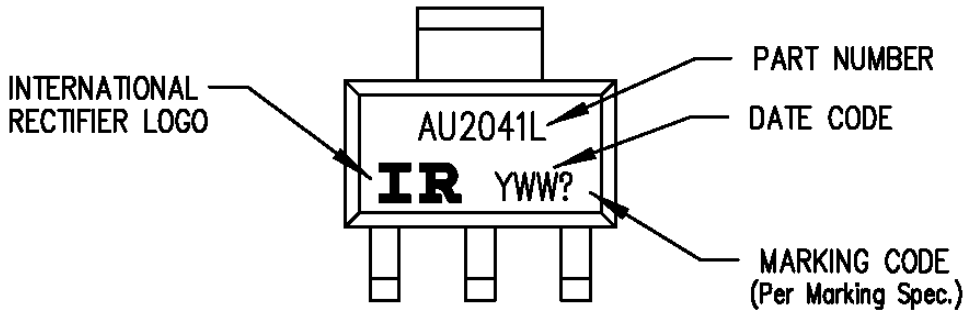
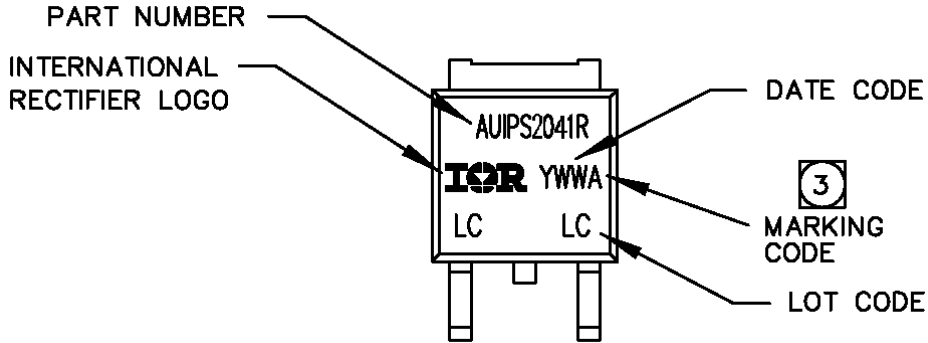


NOTES :

1. OUTLINE CONFORMS TO EIA-418-1.
2. CONTROLLING DIMENSION: MILLIMETER.
- ④ DIMENSION MEASURED @ HUB.
- ③ INCLUDES FLANGE DISTORTION @ OUTER EDGE.



Part Marking Information



Ordering Information

Base Part Number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIPS2041L	D-Pak-5-Lead	Tube	75	AUIPS2041R
		Tape and reel	2000	AUIPS2041RTR
		Tape and reel left	3000	AUIPS2041RTRL
		Tape and reel right	3000	AUIPS2041RTRR
AUIPS2041L	SOT223	Tube	80	AUIPS2041L
		Tape and reel	2500	AUIPS2041LTR

IMPORTANT NOTICE

Unless specifically designated for the automotive market, International Rectifier Corporation and its subsidiaries (IR) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or services without notice. Part numbers designated with the "AU" prefix follow automotive industry and / or customer specific requirements with regards to product discontinuance and process change notification. All products are sold subject to IR's terms and conditions of sale supplied at the time of order acknowledgment.

IR warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with IR's standard warranty. Testing and other quality control techniques are used to the extent IR deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

IR assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using IR components. To minimize the risks with customer products and applications, customers should provide adequate design and operating safeguards.

Reproduction of IR information in IR data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alterations is an unfair and deceptive business practice. IR is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of IR products or serviced with statements different from or beyond the parameters stated by IR for that product or service voids all express and any implied warranties for the associated IR product or service and is an unfair and deceptive business practice. IR is not responsible or liable for any such statements.

IR products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or in other applications intended to support or sustain life, or in any other application in which the failure of the IR product could create a situation where personal injury or death may occur. Should Buyer purchase or use IR products for any such unintended or unauthorized application, Buyer shall indemnify and hold International Rectifier and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that IR was negligent regarding the design or manufacture of the product.

IR products are neither designed nor intended for use in military/aerospace applications or environments unless the IR products are specifically designated by IR as military-grade or "enhanced plastic." Only products designated by IR as military-grade meet military specifications. Buyers acknowledge and agree that any such use of IR products which IR has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

IR products are neither designed nor intended for use in automotive applications or environments unless the specific IR products are designated by IR as compliant with ISO/TS 16949 requirements and bear a part number including the designation "AU". Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, IR will not be responsible for any failure to meet such requirements.

For technical support, please contact IR's Technical Assistance Center

<http://www.irf.com/technical-info/>

WORLD HEADQUARTERS:

101 N Sepulveda Blvd., El Segundo, California 90245

Tel: (310) 252-7105

Revision History

Revision	Date	Notes/Changes
C	26/02/2009	AU number update / OV removed
D	09/12/2010	Final release
E	14/03/2011	Update part marking
F	November, 14 th 2011	Update T&R SOT223
G	May 9 th , 2012	Update the component number of the SOT223 tube



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.