



THE DATASHEET OF AUIRG4BC30U-S



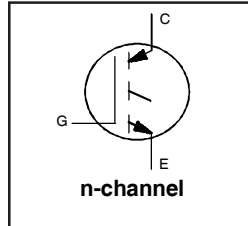
INSULATED GATE BIPOLAR TRANSISTOR

Features

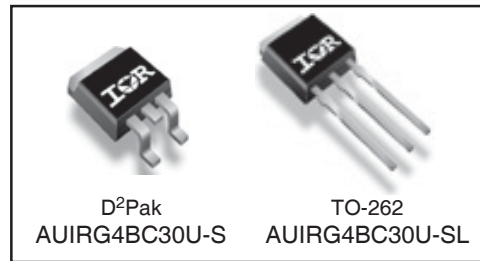
- UltraFast: Optimized for high operating frequencies 8-40 kHz in hard switching, >200 kHz in resonant mode
- Industry standard D²Pak & TO-262 package
- Lead-Free, RoHS Compliant
- Automotive Qualified *

Benefits

- Typical Applications: SMPS, PFC



$V_{CES} = 600V$
$V_{CE(on) typ.} = 1.95V$
@ $V_{GE} = 15V, I_C = 12A$



G	C	E
Gate	Collector	Emitter

Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (T_A) is 25°C, unless otherwise specified

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	23	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	12	
I_{CM}	Pulsed Collector Current ①	92	
I_{LM}	Clamped Inductive Load Current ②	92	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	10	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	100	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	42	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient, (PCB Mounted, steady-state)**	—	40	

* * When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.

* Qualification standards can be found at <http://www.irf.com/>

Dynamic Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	$V_{GE} = 0V, I_C = 250\mu A$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ^④	18	—	—	V	$V_{GE} = 0V, I_C = 1.0A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.63	—	V/°C	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.95	2.1	V	$I_C = 12A, V_{GE} = 15V$
		—	2.52	—		$I_C = 23A$ See Fig.2, 5
		—	2.09	—		$I_C = 12A, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		$V_{CE} = V_{GE}, I_C = 250\mu A$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-13	—	mV/°C	$V_{CE} = V_{GE}, I_C = 250\mu A$
g_{fe}	Forward Transconductance ^⑤	3.1	8.6	—	S	$V_{CE} = 100V, I_C = 12A$
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	$V_{GE} = 0V, V_{CE} = 600V$
		—	—	2.0		$V_{GE} = 0V, V_{CE} = 10V, T_J = 25^\circ\text{C}$
		—	—	1000		$V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
I_{GES}	Gate-to-Emitter Leakage Current	—	—	± 100	nA	$V_{GE} = \pm 20V$

Static or Switching Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	50	75	nC	$I_C = 12A$ $V_{CC} = 400V$ See Fig.8 $V_{GE} = 15V$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	8.1	12		
Q_{gc}	Gate - Collector Charge (turn-on)	—	18	27		
$t_{d(on)}$	Turn-On Delay Time	—	17	—	ns	$T_J = 25^\circ\text{C}$ $I_C = 12A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" See Fig. 10, 11, 13, 14
t_r	Rise Time	—	9.6	—		
$t_{d(off)}$	Turn-Off Delay Time	—	78	120		
t_f	Fall Time	—	97	150		
E_{on}	Turn-On Switching Loss	—	0.16	—	mJ	See Fig. 13, 14
E_{off}	Turn-Off Switching Loss	—	0.20	—		
E_{ts}	Total Switching Loss	—	0.36	0.50		
$t_{d(on)}$	Turn-On Delay Time	—	20	—	ns	$T_J = 150^\circ\text{C}$, $I_C = 12A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" See Fig. 13, 14
t_r	Rise Time	—	13	—		
$t_{d(off)}$	Turn-Off Delay Time	—	180	—		
t_f	Fall Time	—	140	—		
E_{ts}	Total Switching Loss	—	0.73	—	mJ	
L_E	Internal Source Inductance	—	7.5	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	1100	—	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ See Fig.7 $f = 1.0MHz$
C_{oes}	Output Capacitance	—	73	—		
C_{res}	Reverse Transfer Capacitance	—	14	—		

Notes:

- ① Repetitive rating; $V_{GE} = 20V$, pulse width limited by max. junction temperature. (See fig. 13b)
- ② $V_{CC} = 80\%(V_{CES})$, $V_{GE} = 20V$, $L = 10\mu H$, $R_G = 23\Omega$, (See fig. 13a)
- ③ Repetitive rating; pulse width limited by maximum junction temperature.
- ④ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ⑤ Pulse width $5.0\mu s$, single shot.

Qualification Information[†]

Qualification Level		Automotive (per AEC-Q101) ^{††}	
		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
Moisture Sensitivity Level		D ² PAK	MSL1
		TO-262	N/A
ESD	Machine Model	Class M4 (+/-450V) AEC-Q101-002	
	Human Body Model	Class H1C (+/-1750V) AEC-Q101-001	
	Charged Device Model	Class C5 (+/-1000V) AEC-Q101-005	
RoHS Compliant		Yes	

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

†† Exceptions to AEC-Q101 requirements are noted in the qualification report.

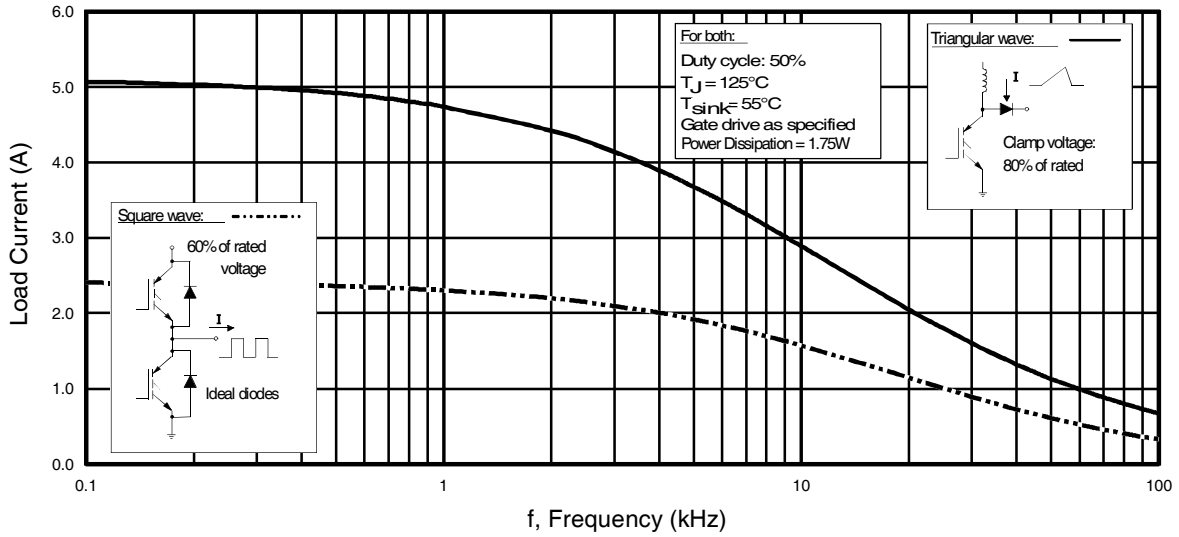


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

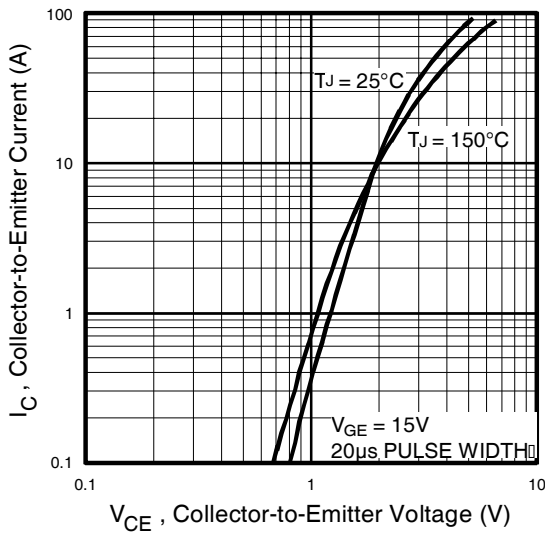


Fig. 2 - Typical Output Characteristics

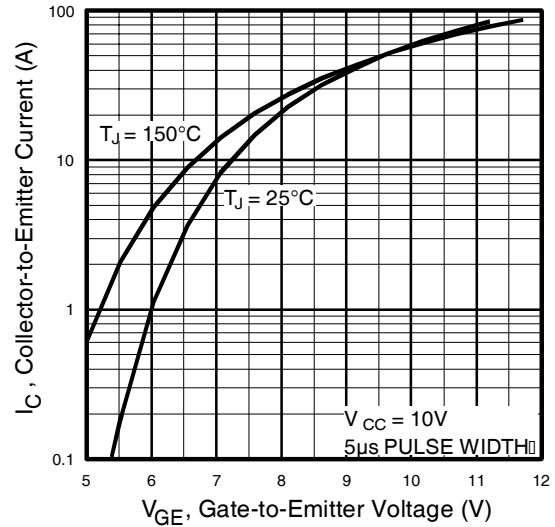


Fig. 3 - Typical Transfer Characteristics

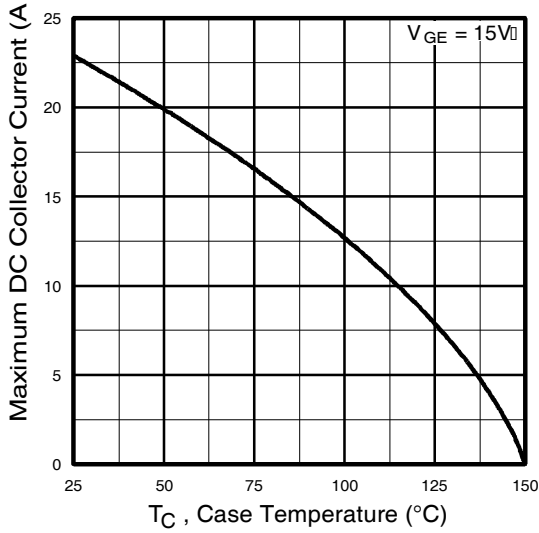


Fig. 4 - Maximum Collector Current vs. Case Temperature

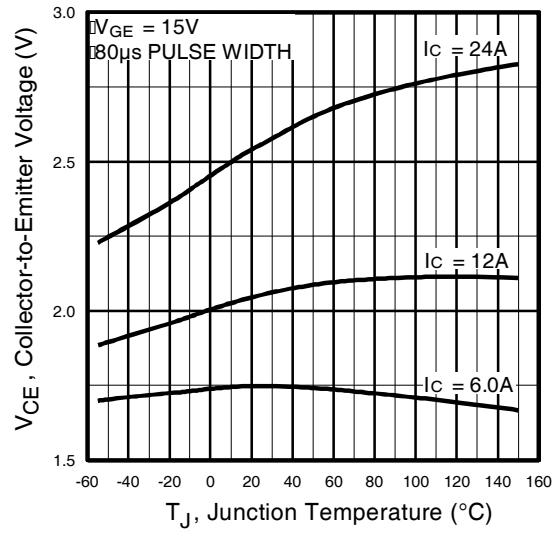


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

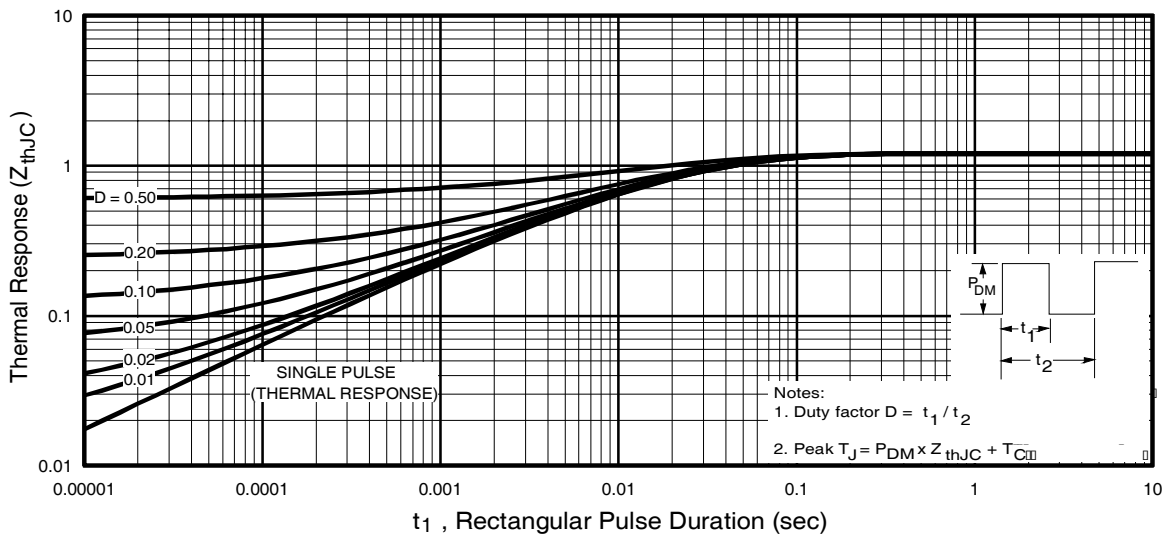


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

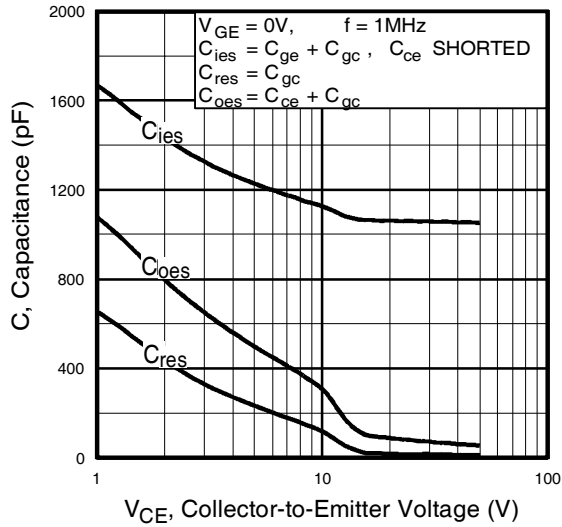


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

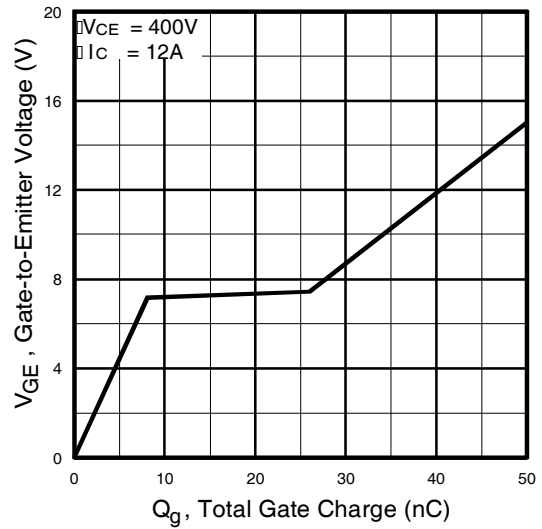


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

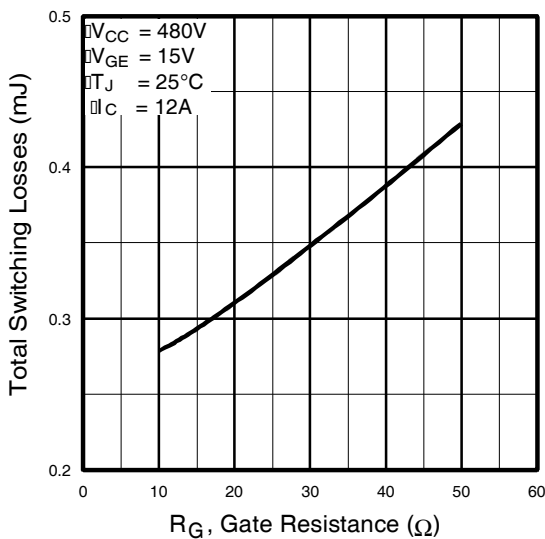


Fig. 9 - Typical Switching Losses vs. Gate Resistance

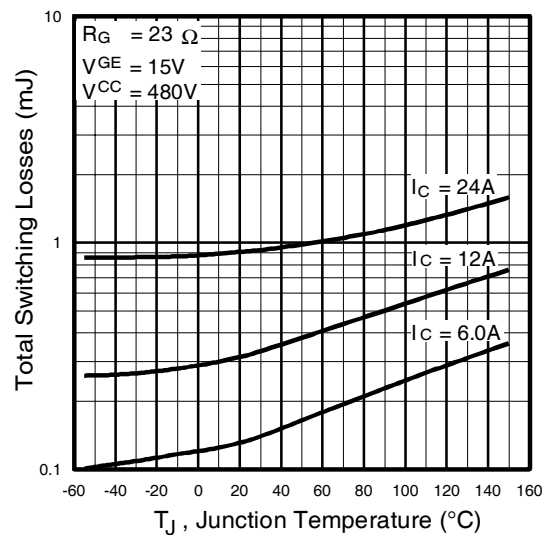


Fig. 10 - Typical Switching Losses vs. Junction Temperature

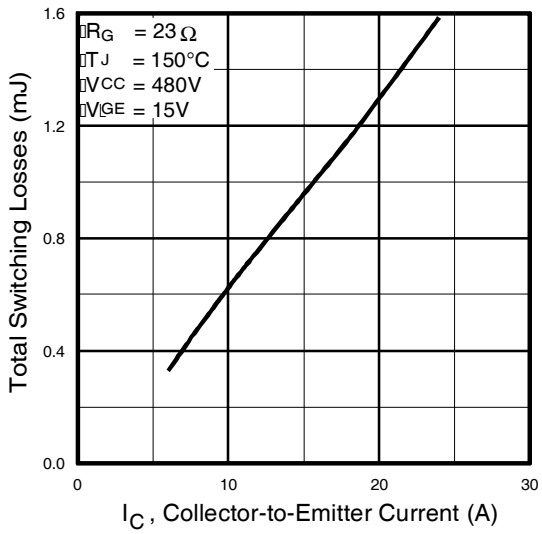


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

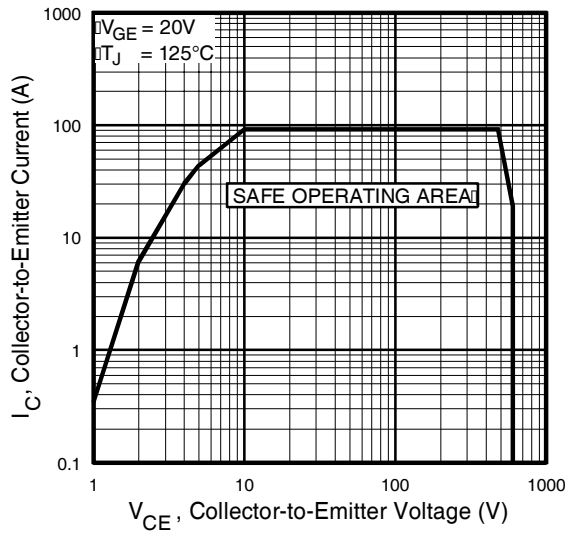
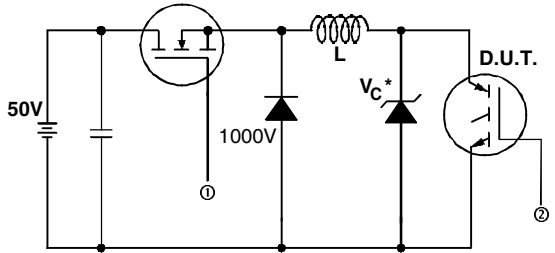


Fig. 12 - Turn-Off SOA



* Driver same type as D.U.T.; $V_c = 80\%$ of $V_{ce(max)}$
 * Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated I_d .

Fig. 13a - Clamped Inductive Load Test Circuit

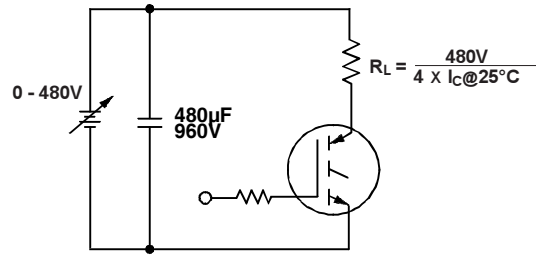


Fig. 13b - Pulsed Collector Current Test Circuit

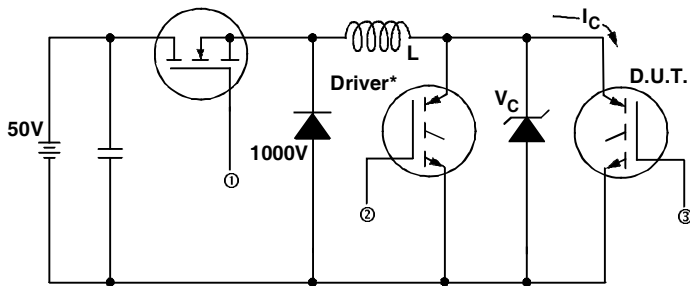


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., $V_C = 480V$

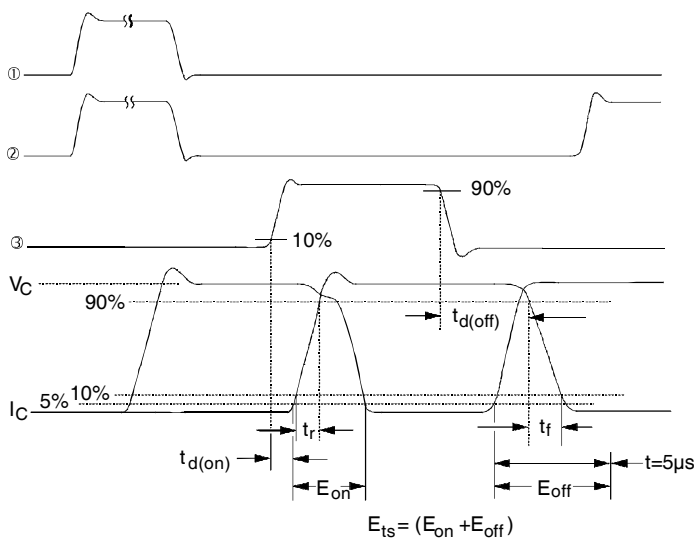
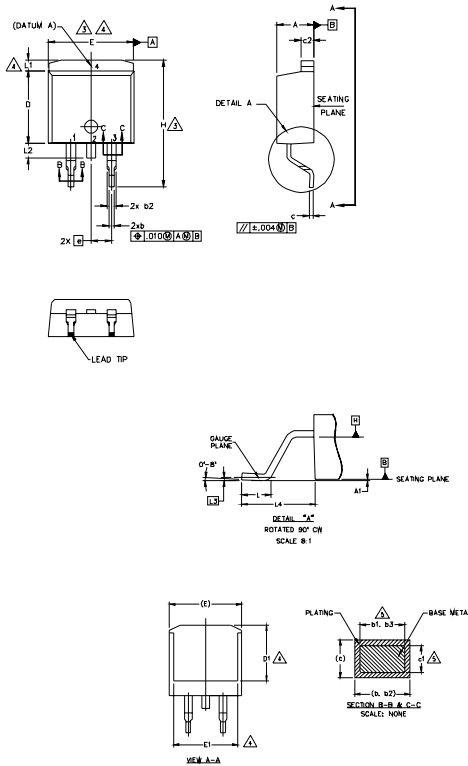


Fig. 14b - Switching Loss Waveforms

D²Pak (TO-263AB) Package Outline

Dimensions are shown in millimeters (inches)



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
 4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
 5. DIMENSION b1 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-263AB.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.85	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	-	1.65	-	.066	
L2	1.27	1.78	-	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

LEAD ASSIGNMENTS

HEXFET

- 1.- GATE
- 2, 4.- DRAIN
- 3.- SOURCE

IGBTs, CoPACK

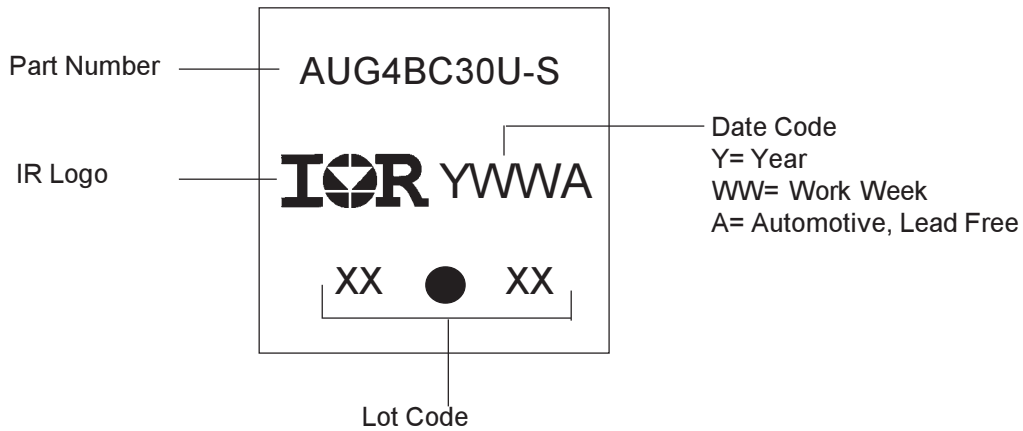
- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

DIODES

- 1.- ANODE *
- 2, 4.- CATHODE
- 3.- ANODE

* PART DEPENDENT.

D²Pak (TO-263AB) Part Marking Information



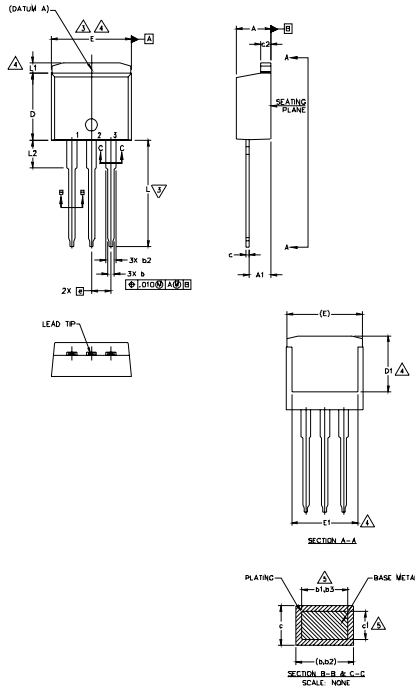
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>
www.irf.com

AUIRG4BC30U-S/SL



TO-262 Package Outline

Dimensions are shown in millimeters (inches)



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
 4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
 5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
 6. CONTROLLING DIMENSION: INCH.
 7. OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		
L	13.46	14.10	.530	.555	
L1	-	1.65	-	.065	
L2	3.56	3.71	.140	.146	

LEAD ASSIGNMENTS

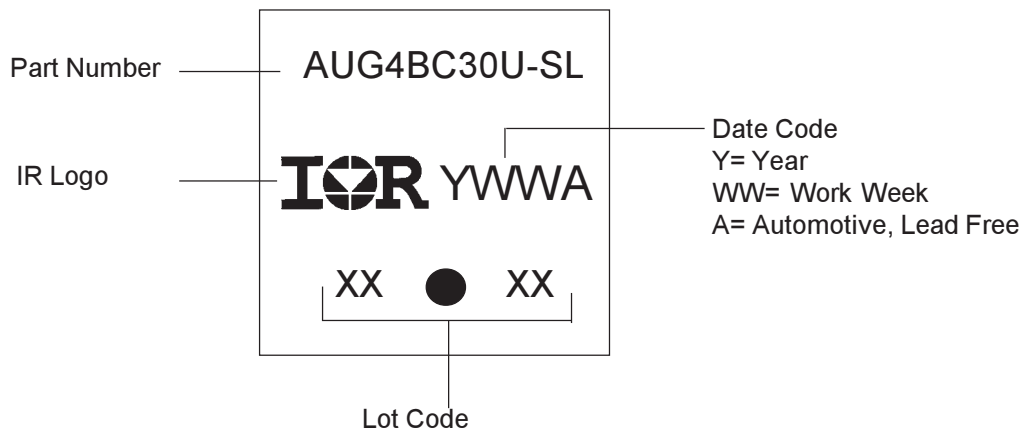
HEXFET

1. - GATE
2. - DRAIN
3. - SOURCE
4. - DRAIN

IGBTs, CoPACK

1. - GATE
2. - COLLECTOR
3. - EMITTER
4. - COLLECTOR

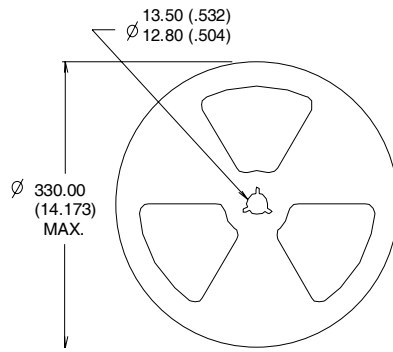
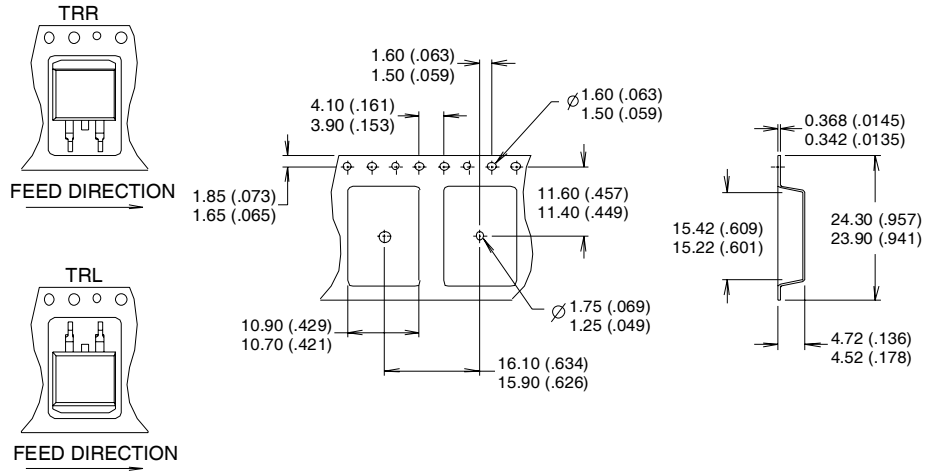
TO-262 Part Marking Information



Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

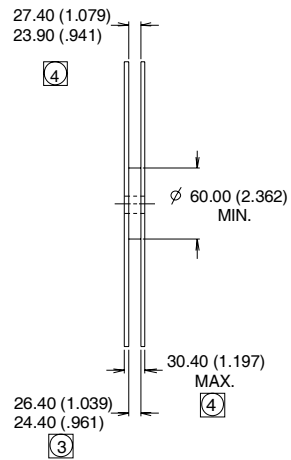
D²Pak (TO-263AB) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :

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



AUIRG4BC30U-S/SL

International
IR Rectifier

Ordering Information

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRG4BC30U-SL	TO-262	Tube	50	AUIRG4BC30U-SL
AUIRG4BC30U-S	D2Pak	Tube	50	AUIRG4BC30U-S
		Tape and Reel Left	800	AUIRG4BC30USTRL
		Tape and Reel Right	800	AUIRG4BC30USTRR

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

WORLD HEADQUARTERS:

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Tel: (310) 252-7105

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-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management