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AUIRG4BC30S-S](#)

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# International Rectifier

INSULATED GATE BIPOLAR TRANSISTOR

**AUTOMOTIVE GRADE**

PD - 96340

**AUIRG4BC30S-S**

**AUIRG4BC30S-SL**

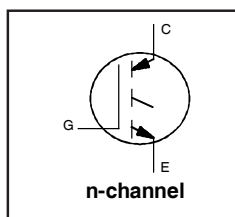
Standard Speed IGBT

### Features

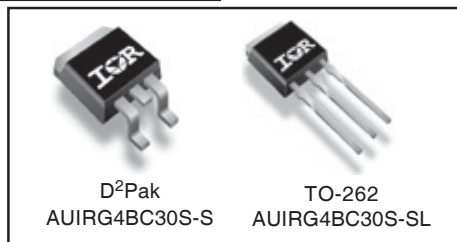
- Standard: optimized for minimum saturation voltage and low operating frequencies (< 1kHz)
- Lead-Free, RoHS Compliant
- Automotive Qualified \*

### Benefits

- Typical Applications: PTC Heater, Discharge Switch & Relay Replacements



$V_{CES} = 600V$
$V_{CE(on)} \text{ typ.} = 1.4V$
@ $V_{GE} = 15V, I_C = 18A$



<b>G</b>	<b>C</b>	<b>E</b>
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	34	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	18	
$I_{CM}$	Pulsed Collector Current ①	68	
$I_{LM}$	Clamped Inductive Load Current ②	68	
$V_{GE}$	Gate-to-Emitter Voltage	$\pm 20$	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	
$T_J$	Operating Junction and	-55 to +150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (0.063 in. (1.6mm) from case )	

### Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.2	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	40	
Wt	Weight	1.44	—	g (oz)

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

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## 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	—	0.75	—	$V/^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.40	1.6	V	$I_C = 18A, V_{GE} = 15V$ See Fig. 2, 5
		—	1.84	—		
		—	1.45	—		
$V_{GE(th)}$	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	—	-11	—	$mV/^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$
$g_{fe}$	Forward Transconductance ⑤	6.0	11	—	S	$V_{CE} = 100V, I_C = 18A$
$I_{CES}$	Zero Gate Voltage Collector Current	—	—	250	$\mu A$	$V_{GE} = 0V, V_{CE} = 600V$
		—	—	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	—	—	$\pm 100$	nA	$V_{GE} = \pm 20V$

## 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	$I_C = 18A, V_{CC} = 400V, V_{GE} = 15V$ See Fig. 8
$Q_{ge}$	Gate - Emitter Charge (turn-on)	—	7.3	11		
$Q_{gc}$	Gate - Collector Charge (turn-on)	—	17	26		
$t_{d(on)}$	Turn-On Delay Time	—	22	—	ns	$T_J = 25^\circ\text{C}, I_C = 18A, V_{CC} = 480V, V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" See Fig. 9, 10, 14
$t_r$	Rise Time	—	18	—		
$t_{d(off)}$	Turn-Off Delay Time	—	540	810		
$t_f$	Fall Time	—	390	590	mJ	$T_J = 150^\circ\text{C}, I_C = 18A, V_{CC} = 480V, V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" See Fig. 11, 14
$E_{on}$	Turn-On Switching Loss	—	0.26	—		
$E_{off}$	Turn-Off Switching Loss	—	3.45	—		
$E_{ts}$	Total Switching Loss	—	3.71	5.6	ns	Measured 5mm from package
$t_{d(on)}$	Turn-On Delay Time	—	21	—		
$t_r$	Rise Time	—	19	—		
$t_{d(off)}$	Turn-Off Delay Time	—	790	—	pF	$V_{GE} = 0V, V_{CC} = 30V, f = 1.0MHz$ See Fig. 7
$t_f$	Fall Time	—	760	—		
$E_{ts}$	Total Switching Loss	—	6.55	—		
$L_E$	Internal Emitter Inductance	—	7.5	—	nH	
$C_{ies}$	Input Capacitance	—	1100	—	pF	$V_{GE} = 0V, V_{CC} = 30V, f = 1.0MHz$ See Fig. 7
$C_{oes}$	Output Capacitance	—	72	—		
$C_{res}$	Reverse Transfer Capacitance	—	13	—		

### 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.

## AUIRG4BC30S-S/SL

### Qualification Information<sup>†</sup>

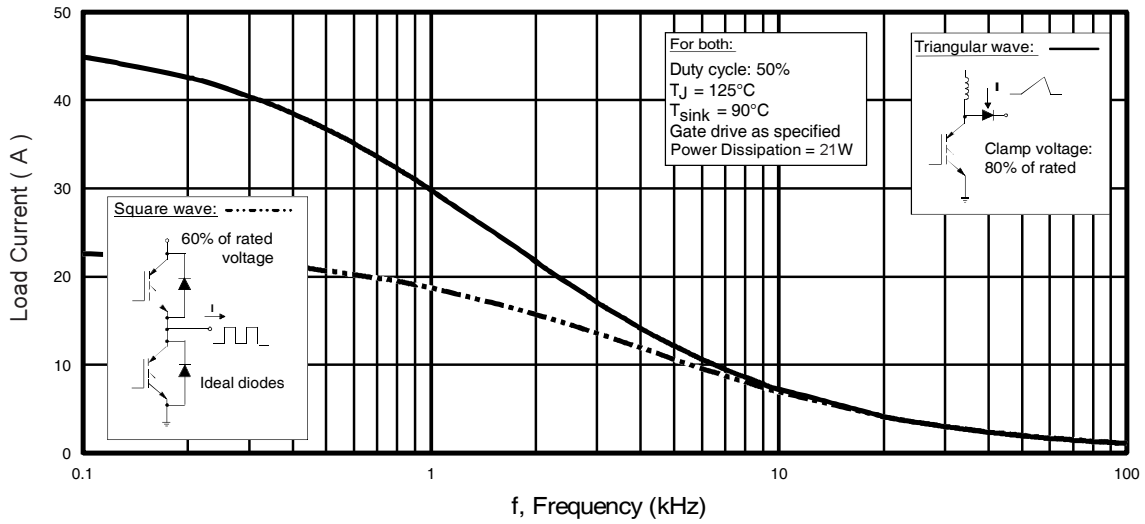
<b>Qualification Level</b>		Automotive (per AEC-Q101) <sup>††</sup>	
		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
<b>Moisture Sensitivity Level</b>		D <sup>2</sup> PAK	MSL1 <sup>†††</sup> (per IPC/JEDEC J-STD-020)
		TO-262	N/A
<b>ESD</b>	Machine Model	Class M4 (400V) AEC-Q101-002	
	Human Body Model	Class H1C (2000V) AEC-Q101-001	
	Charged Device Model	Class C5 (1000V) AEC-Q101-005	
<b>RoHS Compliant</b>		Yes	

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

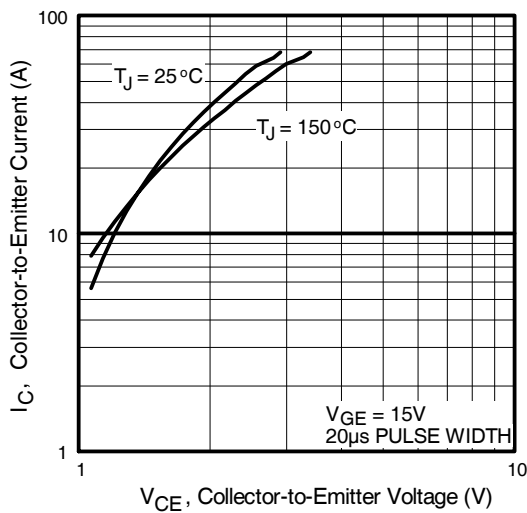
†† Exceptions to AEC-Q101 requirements are noted in the qualification report.

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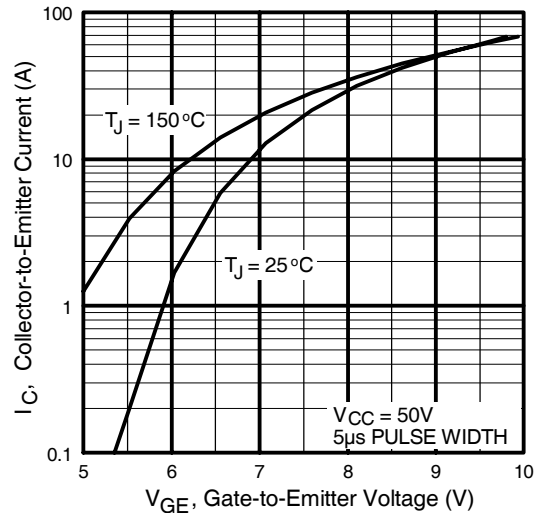
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**Fig. 1** - Typical Load Current vs. Frequency  
 (Load Current =  $I_{RMS}$  of fundamental)



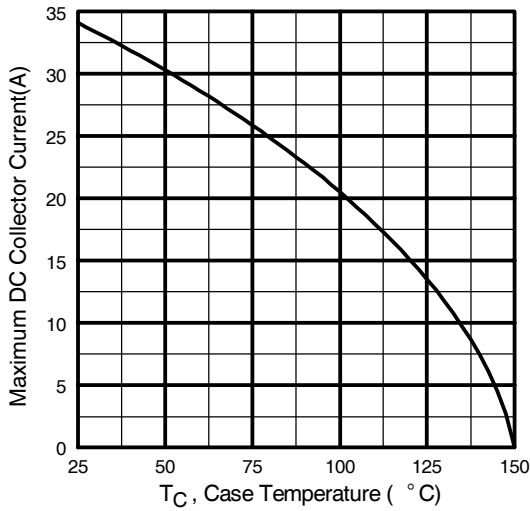
**Fig. 2** - Typical Output Characteristics



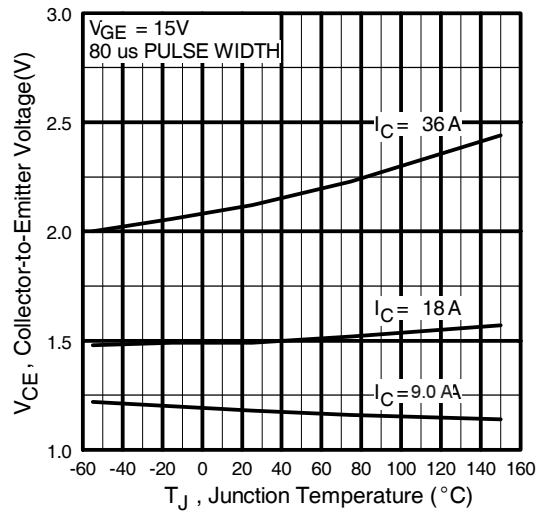
**Fig. 3** - Typical Transfer Characteristics

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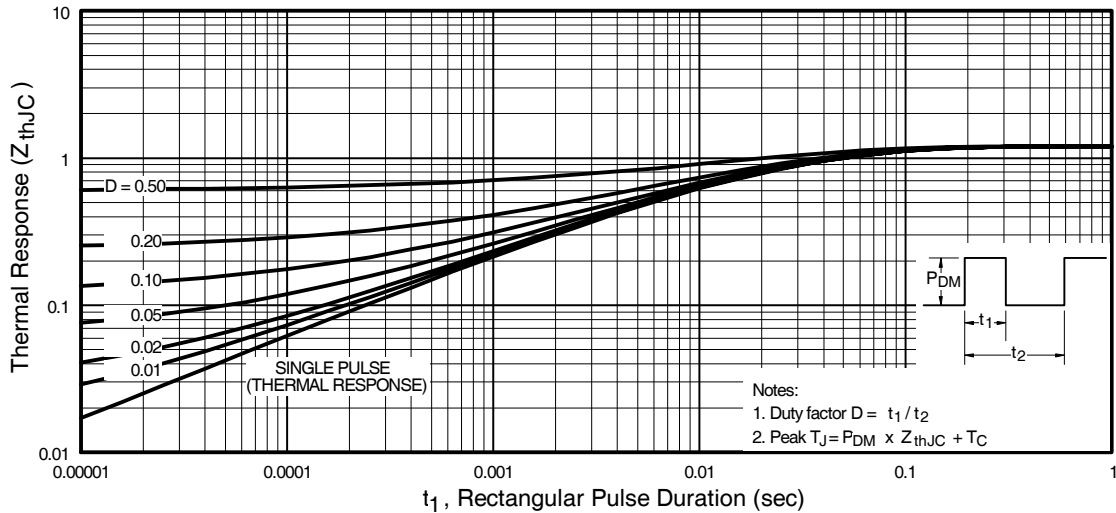
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**Fig. 4 - Maximum Collector Current vs. Case Temperature**



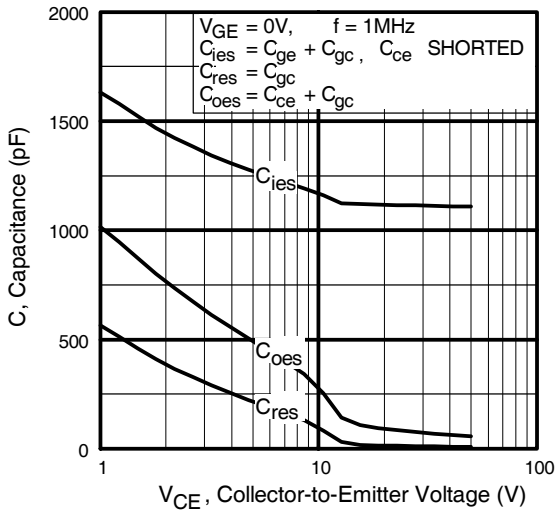
**Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature**



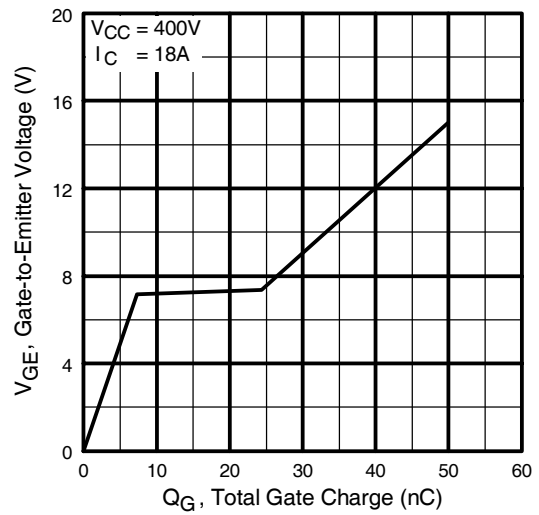
**Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**

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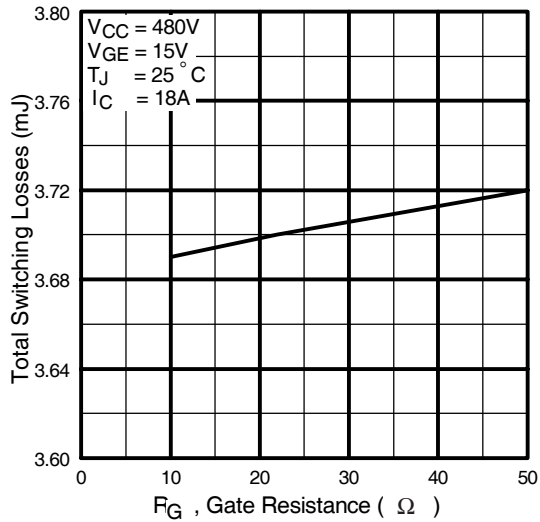
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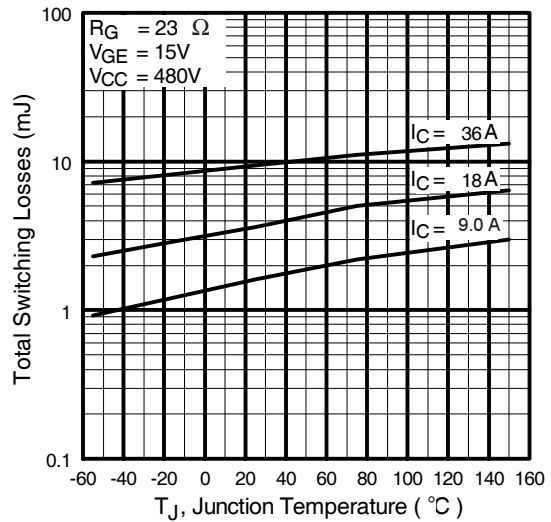
**Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage**



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



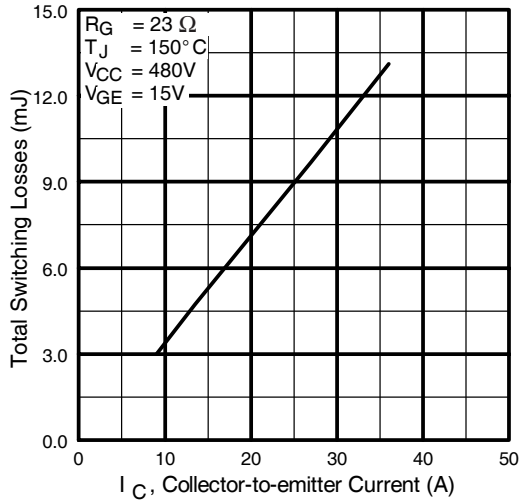
**Fig. 9 - Typical Switching Losses vs. Gate Resistance**



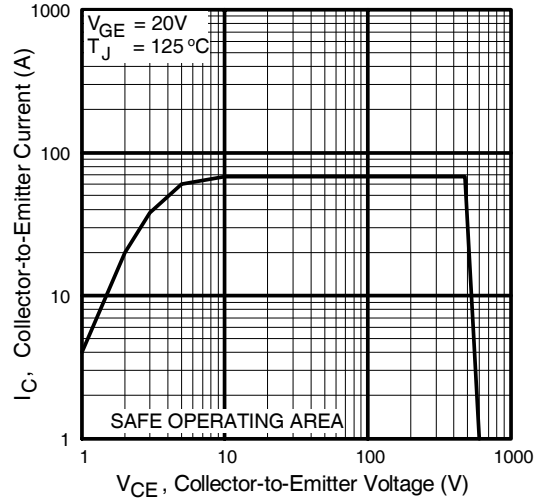
**Fig. 10 - Typical Switching Losses vs. Junction Temperature**

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

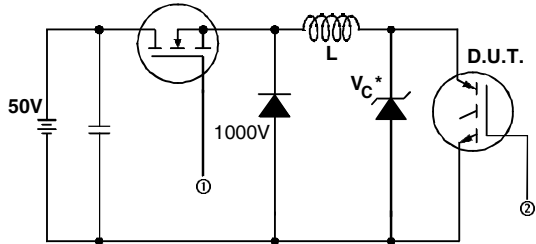


**Fig. 12** - Turn-Off SOA



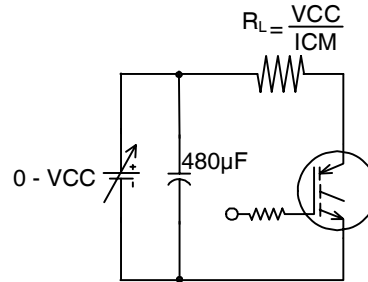
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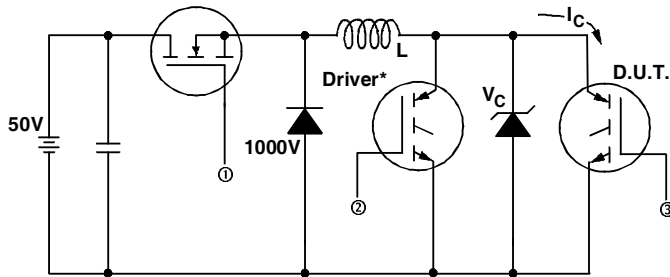


\* Driver same type as D.U.T.;  $V_c = 80\%$  of  $V_{ce(max)}$   
 \* Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated Id.

**Fig. 13a** - Clamped Inductive Load Test Circuit

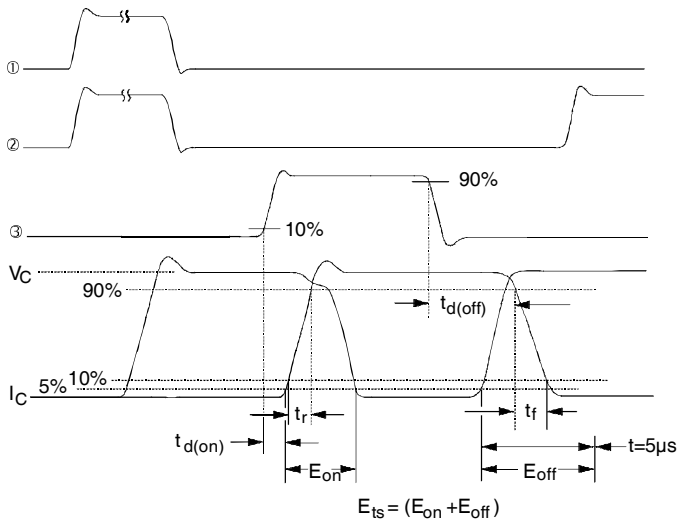


**Fig. 13b** - Pulsed Collector Current Test Circuit



**Fig. 14a** - Switching Loss Test Circuit

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



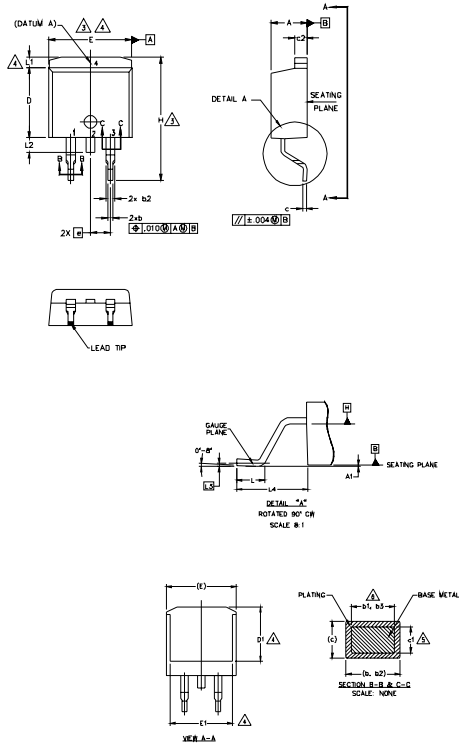
**Fig. 14b** - Switching Loss Waveforms

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## D<sup>2</sup>Pak (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	9.65	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	4
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**

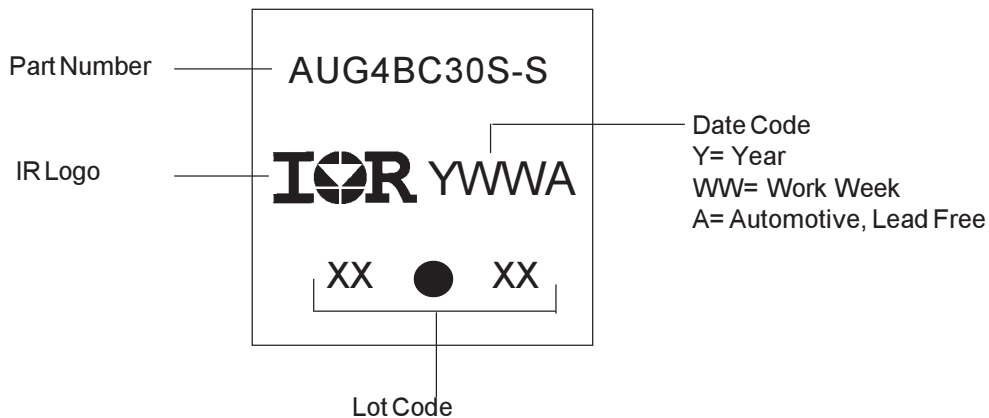
- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

**DIODES**

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

\* PART DEPENDENT.

## D<sup>2</sup>Pak (TO-263AB) Part Marking Information



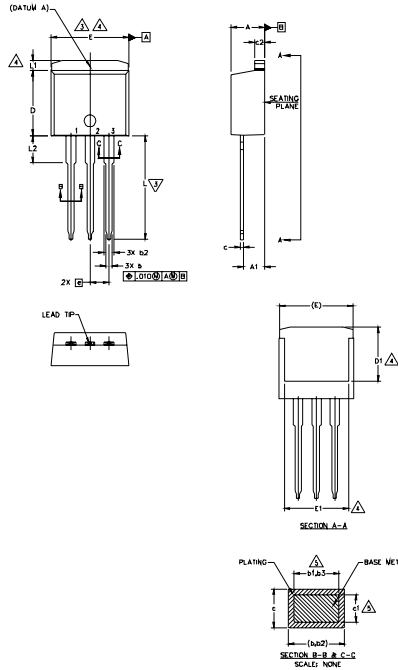
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>  
[www.irf.com](http://www.irf.com)

# AUIRG4BC30S-S/SL

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## 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.), b1(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	4

**LEAD ASSIGNMENTS**

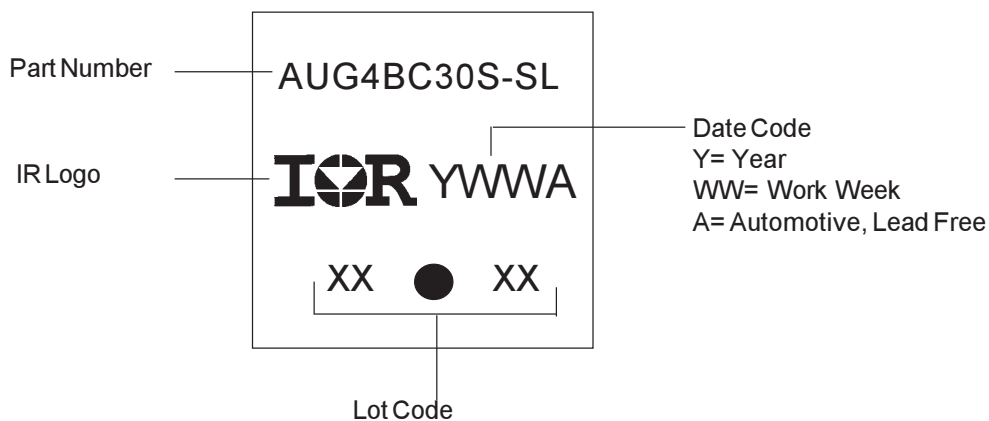
**HEXFET**

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

**IGBTs, CoPACK**

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

## TO-262 Part Marking Information



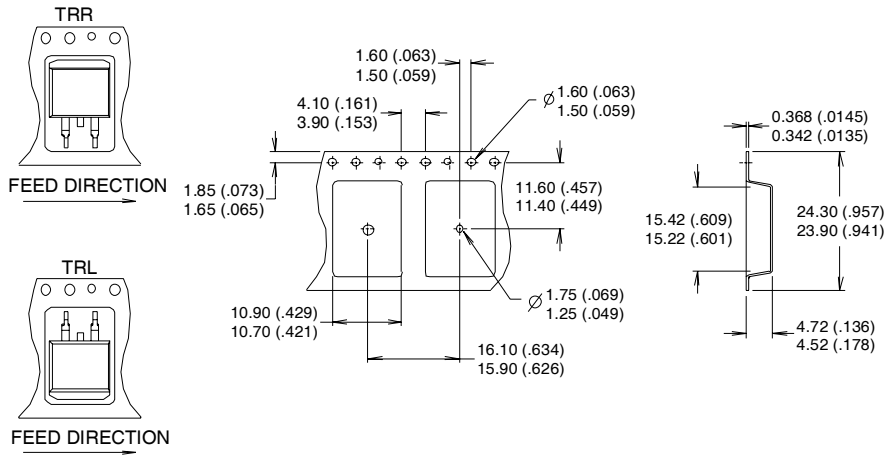
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

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# AUIRG4BC30S-S/SL

## D<sup>2</sup>Pak 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.

# AUIRG4BC30S-S/SL

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## Ordering Information

Base part number	Package	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRG4BC30S-SL	TO-262	Tube	50	AUIRG4BC30S-SL
AUIRG4BC30S-S	D2Pak	Tube	50	AUIRG4BC30S-S
		Tape and Reel Left	800	AUIRG4BC30SSTRL
		Tape and Reel Right	800	AUIRG4BC30SSTRR

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## AUIRG4BC30S-S/SL

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