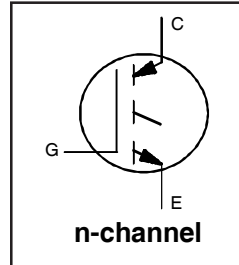


# AUIRGS30B60K AUIRGL30B60K

## INSULATED GATE BIPOLAR TRANSISTOR

### Features

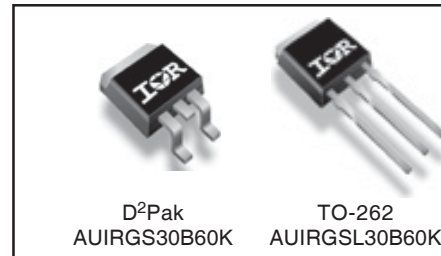
- Low  $V_{CE(on)}$  Non Punch Through IGBT Technology
- 10 $\mu$ s Short Circuit Capability
- Square RBSOA
- Positive  $V_{CE(on)}$  Temperature Coefficient
- Maximum Junction Temperature rated at 175°C
- Lead-Free, RoHS Compliant
- Automotive Qualified \*



$V_{CES} = 600V$   
 $I_C = 50A, T_C = 100^\circ C$   
 at  $T_J = 175^\circ C$   
 $t_{sc} > 10\mu s, T_J = 150^\circ C$   
 $V_{CE(on)} \text{ typ.} = 1.95V$

### Benefits

- Benchmark Efficiency for Motor Control
- Rugged Transient Performance
- Low EMI
- Excellent Current Sharing in Parallel Operation



| 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 Voltage                        | 600                               | V          |
| $I_C @ T_C = 25^\circ C$  | Continuous Collector Current                        | 78                                | A          |
| $I_C @ T_C = 100^\circ C$ | Continuous Collector Current                        | 50                                |            |
| $I_{CM}$                  | Pulse Collector Current (Ref.Fig.C.T.5)             | 120                               |            |
| $I_{LM}$                  | Clamped Inductive Load current ①                    | 120                               |            |
| $V_{ISOL}$                | RMS Isolation Voltage, Terminal to Case, $t=1$ min. | 2500                              | V          |
| $V_{GE}$                  | Gate-to-Emitter Voltage                             | $\pm 20$                          | W          |
| $P_D @ T_C = 25^\circ C$  | Maximum Power Dissipation                           | 370                               |            |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation                           | 180                               |            |
| $T_J$                     | Operating Junction and                              | -55 to +175                       | $^\circ C$ |
| $T_{STG}$                 | Storage Temperature Range                           |                                   |            |
|                           | Soldering Temperature, for 10 sec.                  | 300 (0.063 in. (1.6mm) from case) |            |

### Thermal / Mechanical Characteristics

|                 | Parameter                                      | Min. | Typ. | Max.  | Units        |
|-----------------|------------------------------------------------|------|------|-------|--------------|
| $R_{\theta JC}$ | Junction-to-Case- IGBT                         | —    | —    | 0.41* | $^\circ C/W$ |
| $R_{\theta CS}$ | Case-to-Sink, flat, greased surface            | —    | 0.50 | —     |              |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB Mount, Steady State)② | —    | —    | 40    |              |
| Wt              | Weight                                         | —    | 1.44 | —     | g            |

\*  $R_{\theta JC}$  (end of life) = 0.65 $^\circ C/W$ . This is the maximum measured value after 1000 temperature cycles from -55 to 150 $^\circ C$  and is accounted for by the physical wearout of the die attach medium.

# AUIRGS/SL30B60K

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

|                                 | Parameter                               | Min. | Typ. | Max.      | Units                | Conditions                                                          | Ref.Fig. |
|---------------------------------|-----------------------------------------|------|------|-----------|----------------------|---------------------------------------------------------------------|----------|
| $V_{(BR)CES}$                   | Collector-to-Emitter Breakdown Voltage  | 600  | —    | —         | V                    | $V_{GE} = 0V, I_C = 500\mu A$                                       |          |
| $\Delta V_{(BR)CES}/\Delta T_J$ | Temperature Coeff. of Breakdown Voltage | —    | 0.40 | —         | V/ $^\circ\text{C}$  | $V_{GE} = 0V, I_C = 1mA (25^\circ\text{C}-150^\circ\text{C})$       |          |
| $V_{CE(on)}$                    | Collector-to-Emitter Voltage            | —    | 1.95 | 2.35      | V                    | $I_C = 30A, V_{GE} = 15V, T_J = 25^\circ\text{C}$                   | 5,6,7    |
|                                 |                                         | —    | 2.40 | 2.75      |                      | $I_C = 30A, V_{GE} = 15V, T_J = 150^\circ\text{C}$                  | 8,9,10   |
|                                 |                                         | —    | 2.6  | 2.95      |                      | $I_C = 30A, V_{GE} = 15V, T_J = 175^\circ\text{C}$                  |          |
| $V_{GE(th)}$                    | Gate Threshold Voltage                  | 3.5  | 4.5  | 5.5       | V                    | $V_{CE} = V_{GE}, I_C = 250\mu A$                                   | 8,9,10   |
| $\Delta V_{GE(th)}/\Delta T_J$  | Threshold Voltage temp. coefficient     | —    | -10  | —         | mV/ $^\circ\text{C}$ | $V_{CE} = V_{GE}, I_C = 1.0mA (25^\circ\text{C}-150^\circ\text{C})$ | 11       |
| $g_{fe}$                        | Forward Transconductance                | —    | 18   | —         | S                    | $V_{CE} = 50V, I_C = 50A, PW = 80\mu s$                             |          |
| $I_{CES}$                       | Zero Gate Voltage Collector Current     | —    | 5.0  | 250       | $\mu A$              | $V_{GE} = 0V, V_{CE} = 600V$                                        |          |
|                                 |                                         | —    | 1000 | 2000      |                      | $V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$               |          |
|                                 |                                         | —    | 1830 | 3000      |                      | $V_{GE} = 0V, V_{CE} = 600V, T_J = 175^\circ\text{C}$               |          |
| $I_{GES}$                       | Gate-to-Emitter Leakage Current         | —    | —    | $\pm 100$ | nA                   | $V_{GE} = \pm 20V, V_{CE} = 0V$                                     |          |

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

|                | Parameter                            | Min.        | Typ. | Max. | Units   | Conditions                                                  | Ref.Fig. |
|----------------|--------------------------------------|-------------|------|------|---------|-------------------------------------------------------------|----------|
| $Q_g$          | Total Gate Charge (turn-on)          | —           | 102  | 153  | nC      | $I_C = 30A$                                                 | 17       |
| $Q_{ge}$       | Gate-to-Emitter Charge (turn-on)     | —           | 14   | 21   |         | $V_{CC} = 400V$                                             | CT1      |
| $Q_{gc}$       | Gate-to-Collector Charge (turn-on)   | —           | 44   | 66   |         | $V_{GE} = 15V$                                              |          |
| $E_{on}$       | Turn-On Switching Loss               | —           | 350  | 620  | $\mu J$ | $I_C = 30A, V_{CC} = 400V$                                  | CT4      |
| $E_{off}$      | Turn-Off Switching Loss              | —           | 825  | 955  |         | $V_{GE} = 15V, R_G = 10\Omega, L = 200\mu H$                |          |
| $E_{tot}$      | Total Switching Loss                 | —           | 1175 | 1575 |         | $T_J = 25^\circ\text{C}$ ③                                  |          |
| $t_{d(on)}$    | Turn-On delay time                   | —           | 46   | 60   | ns      | $I_C = 30A, V_{CC} = 400V$                                  | CT4      |
| $t_r$          | Rise time                            | —           | 28   | 39   |         | $V_{GE} = 15V, R_G = 10\Omega, L = 200\mu H$                |          |
| $t_{d(off)}$   | Turn-Off delay time                  | —           | 185  | 200  |         | $T_J = 25^\circ\text{C}$                                    |          |
| $t_f$          | Fall time                            | —           | 31   | 40   | $\mu J$ | $I_C = 30A, V_{CC} = 400V$                                  | CT4      |
| $E_{on}$       | Turn-On Switching Loss               | —           | 635  | 1085 |         | $V_{GE} = 15V, R_G = 10\Omega, L = 200\mu H$                | 12,14    |
| $E_{off}$      | Turn-Off Switching Loss              | —           | 1150 | 1350 |         | $T_J = 150^\circ\text{C}$ ③                                 | WF1,WF2  |
| $E_{tot}$      | Total Switching Loss                 | —           | 1785 | 2435 | ns      | $I_C = 30A, V_{CC} = 400V$                                  | 13,15    |
| $t_{d(on)}$    | Turn-On delay time                   | —           | 46   | 60   |         | $V_{GE} = 15V, R_G = 10\Omega, L = 200\mu H$                | CT4      |
| $t_r$          | Rise time                            | —           | 28   | 39   |         | $T_J = 150^\circ\text{C}$                                   | WF1      |
| $t_{d(off)}$   | Turn-Off delay time                  | —           | 205  | 235  | nH      |                                                             | WF2      |
| $t_f$          | Fall time                            | —           | 32   | 42   |         |                                                             |          |
| $L_E$          | Internal Emitter Inductance          | —           | 7.5  | —    |         | Measured 5mm from package                                   |          |
| $C_{ies}$      | Input Capacitance                    | —           | 1750 | —    | pF      | $V_{GE} = 0V$                                               | 16       |
| $C_{oes}$      | Output Capacitance                   | —           | 160  | —    |         | $V_{CC} = 30V$                                              |          |
| $C_{res}$      | Reverse Transfer Capacitance         | —           | 60   | —    |         | $f = 1.0MHz$                                                |          |
| RBSOA          | Reverse Bias Safe Operating Area     | FULL SQUARE |      |      |         | $T_J = 150^\circ\text{C}, I_C = 120A, V_p = 600V$           | 4        |
| SCSOA          | Short Circuit Safe Operating Area    | 10          | —    | —    | $\mu s$ | $V_{CC}=500V, V_{GE} = +15V \text{ to } 0V, R_G = 10\Omega$ | CT2      |
|                |                                      |             |      |      |         | $T_J = 150^\circ\text{C}, V_p = 600V, R_G = 10\Omega$       | CT3      |
| $I_{SC(Peak)}$ | Peak Short Circuit Collector Current | —           | 200  | —    | A       | $V_{CC}=360V, V_{GE} = +15V \text{ to } 0V$                 | WF3      |

### Notes:

- $V_{CC} = 80\% (V_{CES}), V_{GE} = 20V, L = 28\mu H, R_G = 22\Omega$ .
- This is applied to D<sup>2</sup>Pak, when mounted on 1" square PCB (FR-4 or G-10 Material).  
For recommended footprint and soldering techniques refer to application note #AN-994.
- Energy losses include "tail" and diode reverse recovery.

# AUIRGS/SL30B60K

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

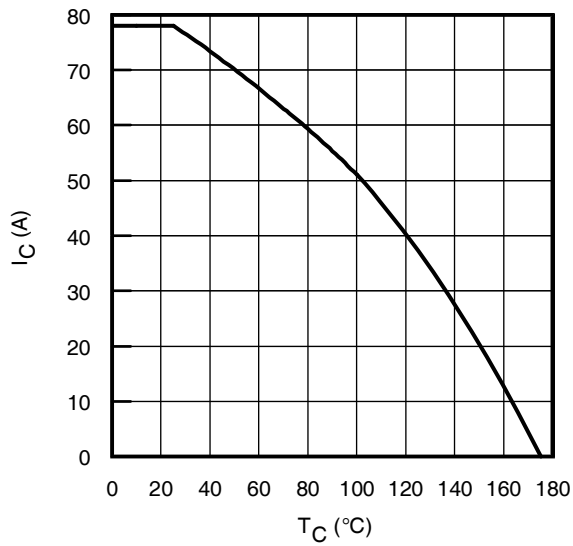
|                                   |                      |                                                                                                                                                                         |                                                  |
|-----------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| <b>Qualification Level</b>        |                      | Automotive<br>(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><br>(per IPC/JEDEC J-STD-020) |
|                                   |                      | TO-262                                                                                                                                                                  | N/A                                              |
| <b>ESD</b>                        | Machine Model        | Class M4 (400V)<br>AEC-Q101-002                                                                                                                                         |                                                  |
|                                   | Human Body Model     | Class H2 (4000V)<br>AEC-Q101-001                                                                                                                                        |                                                  |
|                                   | Charged Device Model | Class C4 (1000V)<br>AEC-Q101-005                                                                                                                                        |                                                  |
| <b>RoHS Compliant</b>             |                      | Yes                                                                                                                                                                     |                                                  |

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

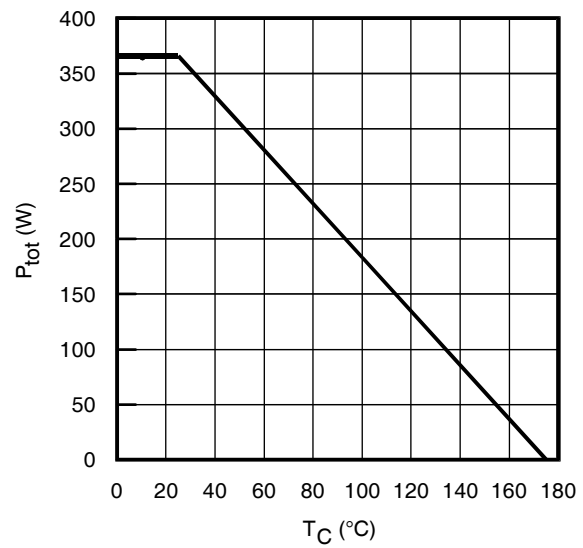
<sup>††</sup> Exceptions to AEC-Q101 requirements are noted in the qualification report.

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

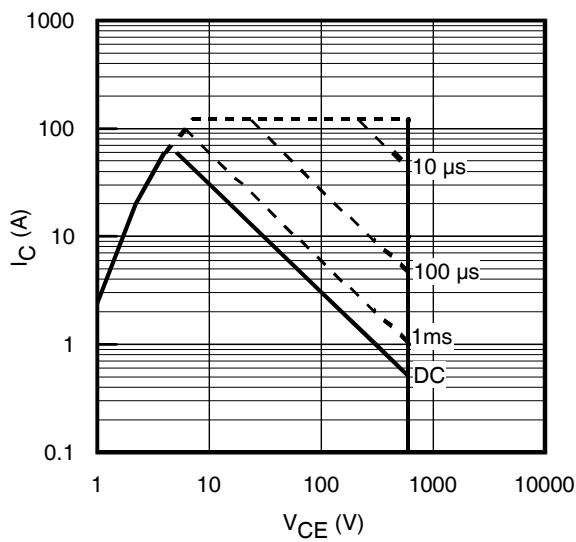
# AUIRGS/SL30B60K



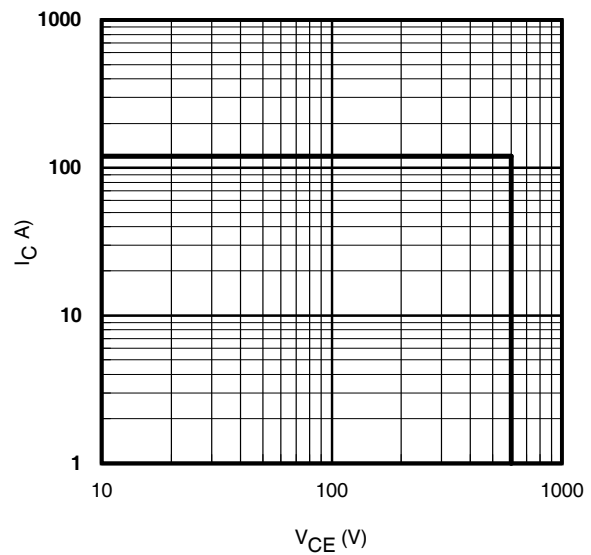
**Fig. 1** - Maximum DC Collector Current vs. Case Temperature



**Fig. 2** - Power Dissipation vs. Case Temperature

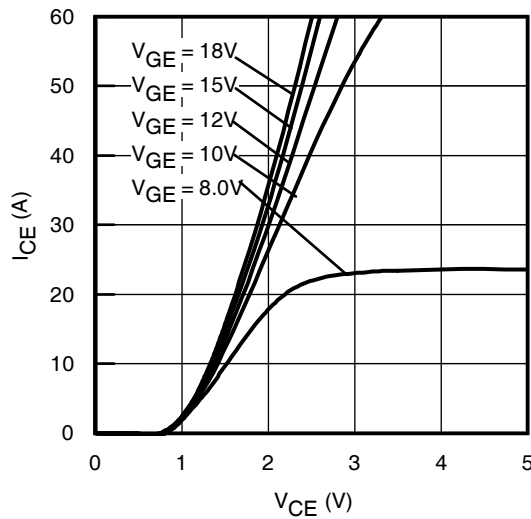


**Fig. 3** - Forward SOA  
 $T_C = 25^{\circ}\text{C}$ ;  $T_J \leq 150^{\circ}\text{C}$

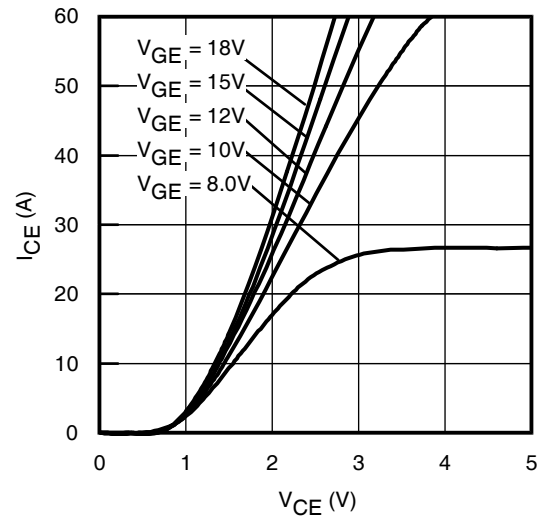


**Fig. 4** - Reverse Bias SOA  
 $T_J = 150^{\circ}\text{C}$ ;  $V_{GE} = 15\text{V}$

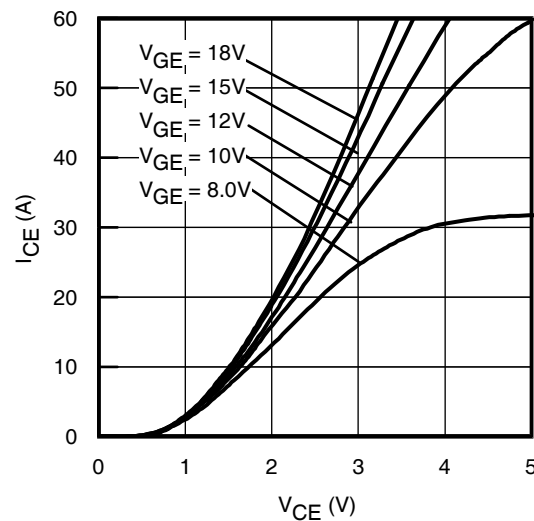
# AUIRGS/SL30B60K



**Fig. 5** - Typ. IGBT Output Characteristics  
 $T_J = -40^\circ\text{C}$ ;  $t_p = 80\mu\text{s}$

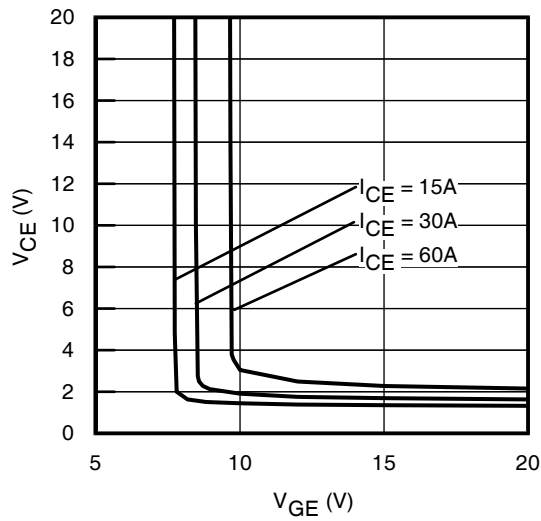


**Fig. 6** - Typ. IGBT Output Characteristics  
 $T_J = 25^\circ\text{C}$ ;  $t_p = 80\mu\text{s}$

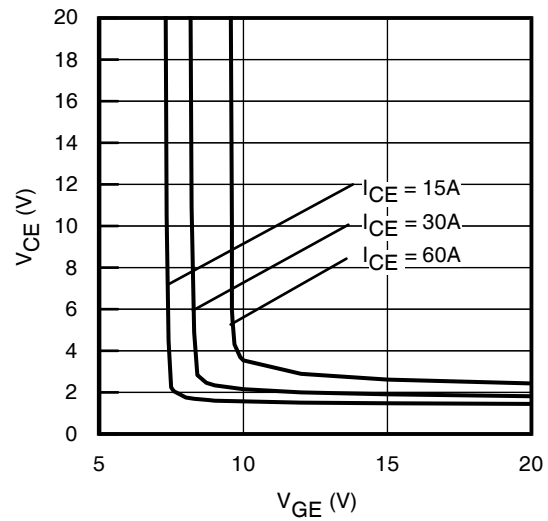


**Fig. 7** - Typ. IGBT Output Characteristics  
 $T_J = 150^\circ\text{C}$ ;  $t_p = 80\mu\text{s}$

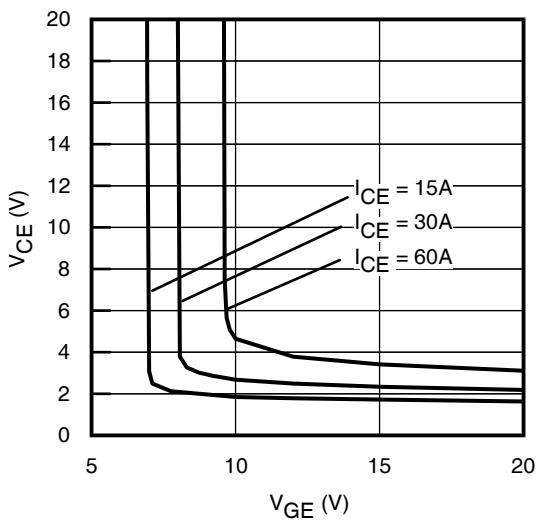
# AUIRGS/SL30B60K



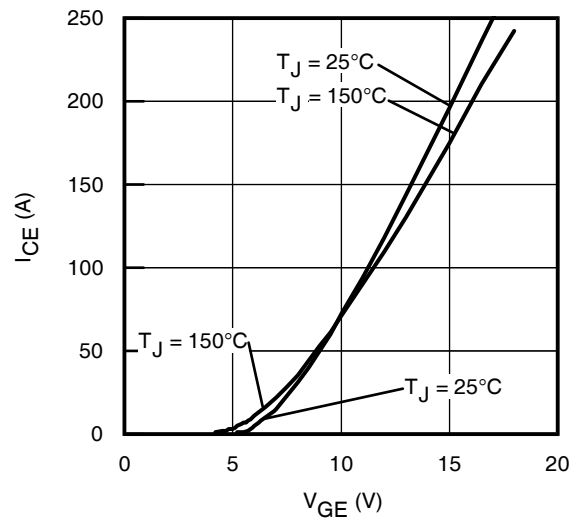
**Fig. 8** - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = -40^{\circ}\text{C}$



**Fig. 9** - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 25^{\circ}\text{C}$

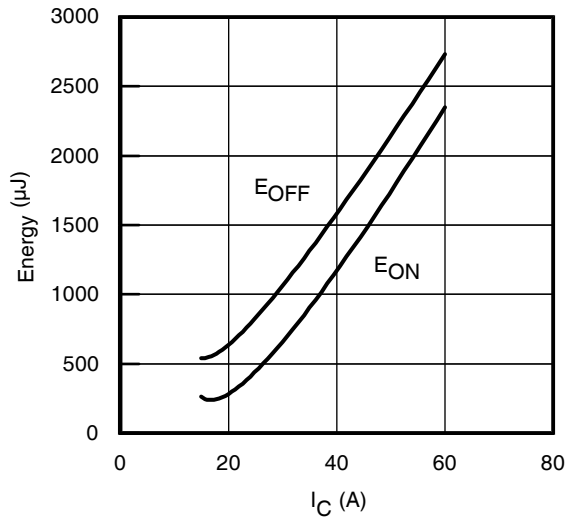


**Fig. 10** - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 150^{\circ}\text{C}$

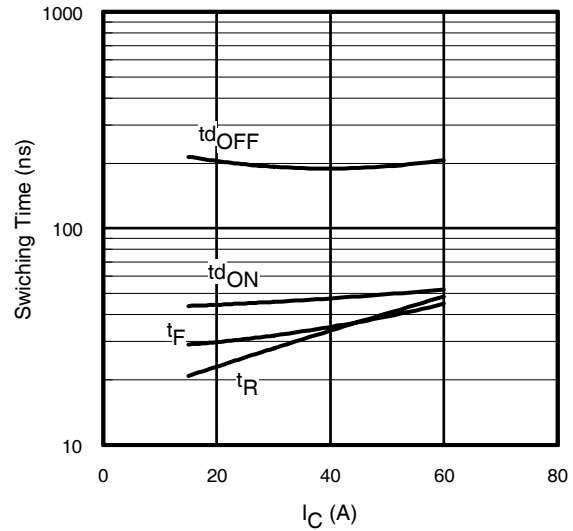


**Fig. 11** - Typ. Transfer Characteristics  
 $V_{CE} = 50\text{V}$ ;  $t_p = 10\mu\text{s}$

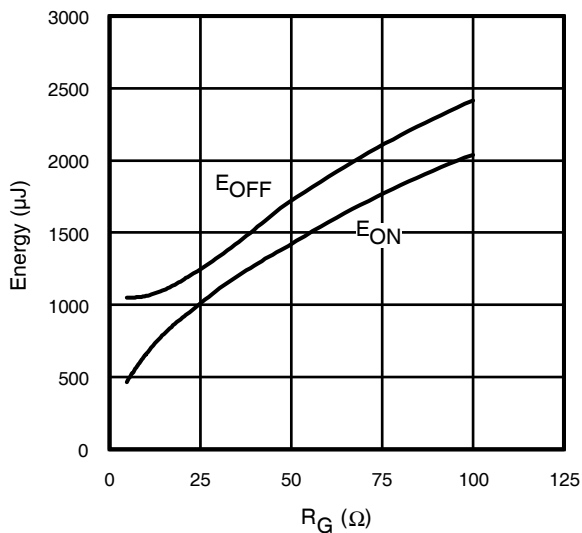
# AUIRGS/SL30B60K



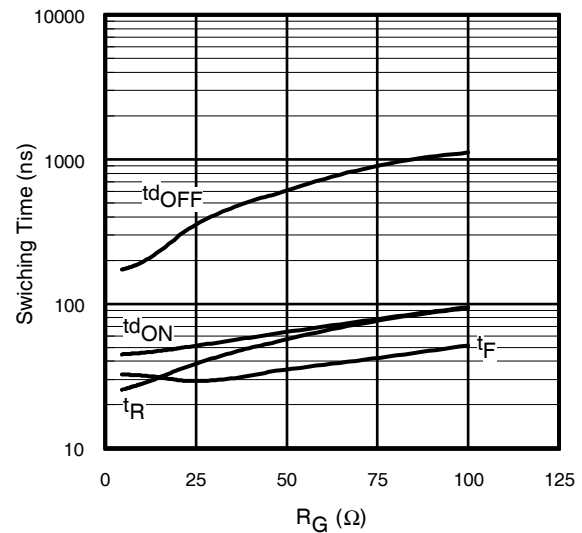
**Fig. 12** - Typ. Energy Loss vs.  $I_C$   
 $T_J = 150^\circ\text{C}$ ;  $L=200\mu\text{H}$ ;  $V_{CE}=400\text{V}$ ,  
 $R_G=10\Omega$ ;  $V_{GE}=15\text{V}$



**Fig. 13** - Typ. Switching Time vs.  $I_C$   
 $T_J = 150^\circ\text{C}$ ;  $L=200\mu\text{H}$ ;  $V_{CE}=400\text{V}$   
 $R_G=10\Omega$ ;  $V_{GE}=15\text{V}$

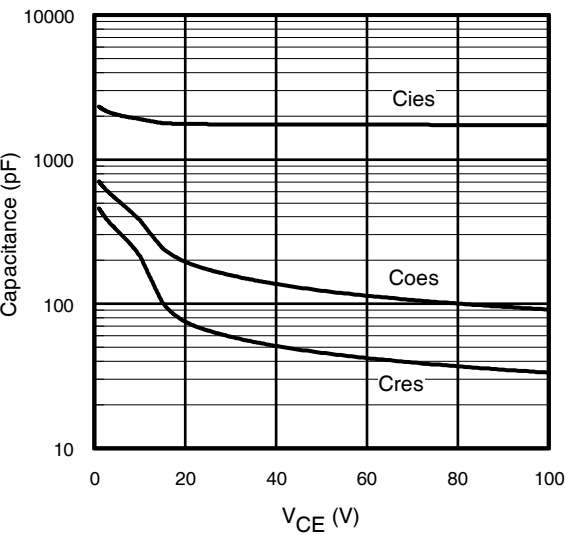


**Fig. 14** - Typ. Energy Loss vs.  $R_G$   
 $T_J = 150^\circ\text{C}$ ;  $L=200\mu\text{H}$ ;  $V_{CE}=400\text{V}$   
 $I_{CE}=30\text{A}$ ;  $V_{GE}=15\text{V}$

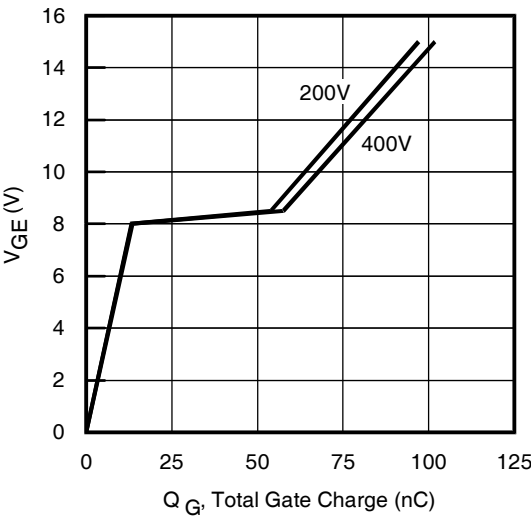


**Fig. 15** - Typ. Switching Time vs.  $R_G$   
 $T_J = 150^\circ\text{C}$ ;  $L=200\mu\text{H}$ ;  $V_{CE}=400\text{V}$   
 $I_{CE}=30\text{A}$ ;  $V_{GE}=15\text{V}$

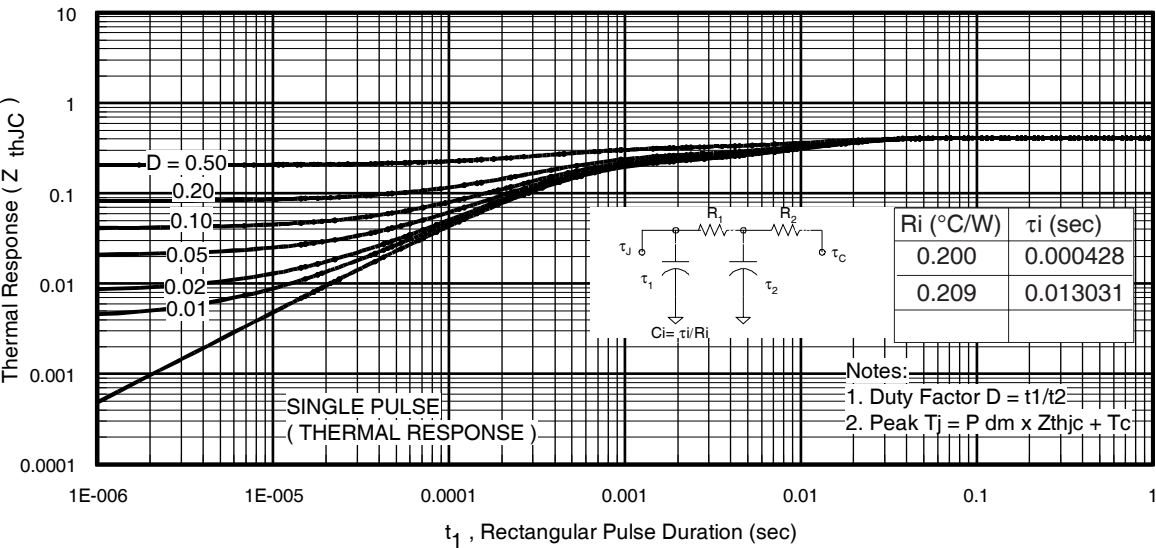
# AUIRGS/SL30B60K



**Fig. 16-** Typ. Capacitance vs.  $V_{CE}$   
 $V_{GE}=0V$ ;  $f=1MHz$



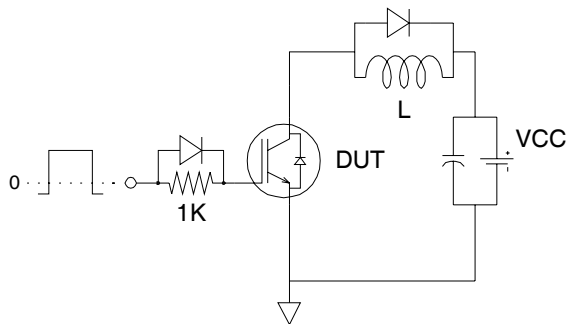
**Fig. 17 -** Typical Gate Charge vs.  $V_{GE}$   
 $I_{CE}=30A$ ;  $L=600\mu H$



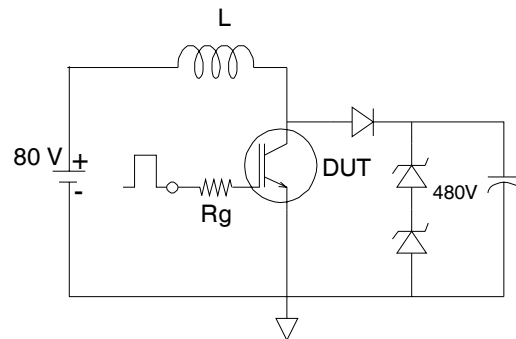
**Fig 18.** Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)



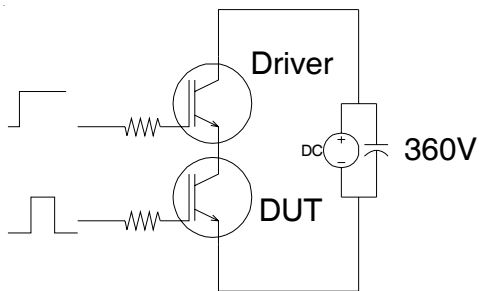
# AUIRGS/SL30B60K



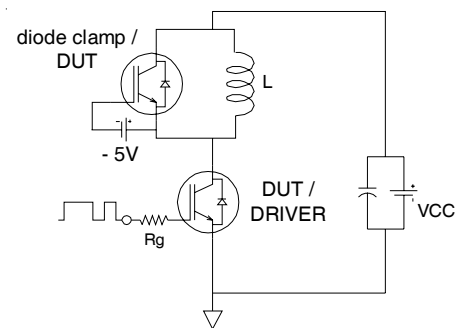
**Fig.C.T.1** - Gate Charge Circuit (turn-off)



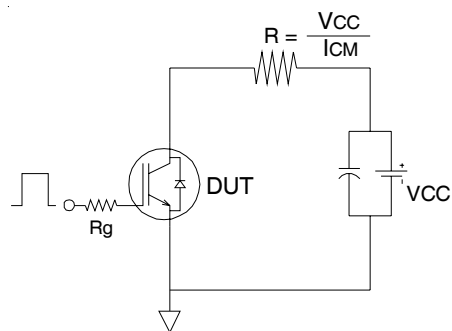
**Fig.C.T.2** - RBSOA Circuit



**Fig.C.T.3** - S.C.SOA Circuit



**Fig.C.T.4** - Switching Loss Circuit



**Fig.C.T.5** - Resistive Load Circuit

# AUIRGS/SL30B60K

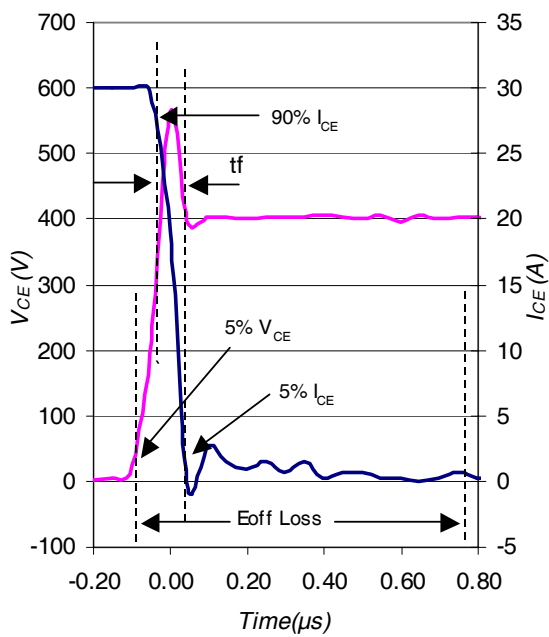


Fig. WF1- Typ. Turn-off Loss Waveform  
@  $T_J = 150^{\circ}\text{C}$  using Fig. CT.4

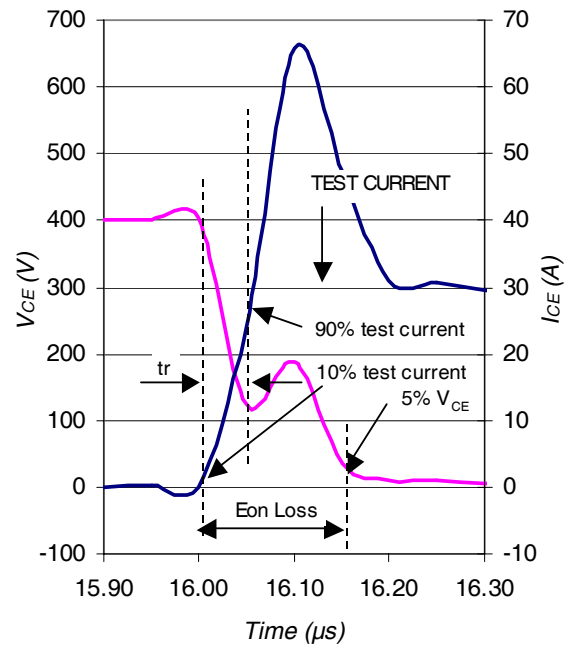


Fig. WF2- Typ. Turn-on Loss Waveform  
@  $T_J = 150^{\circ}\text{C}$  using Fig. CT.4

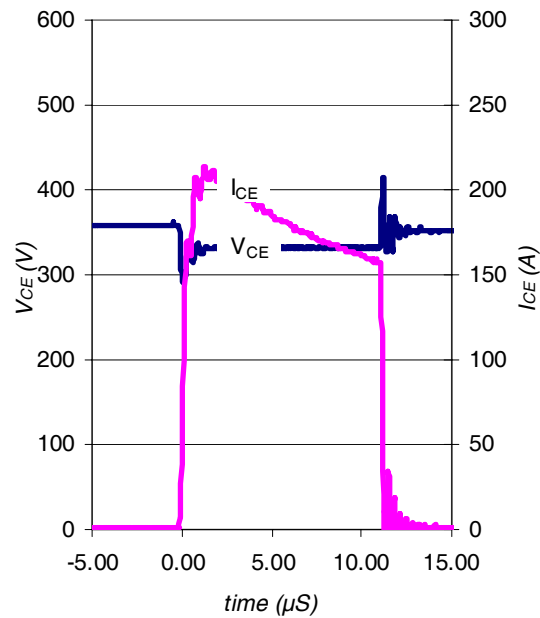
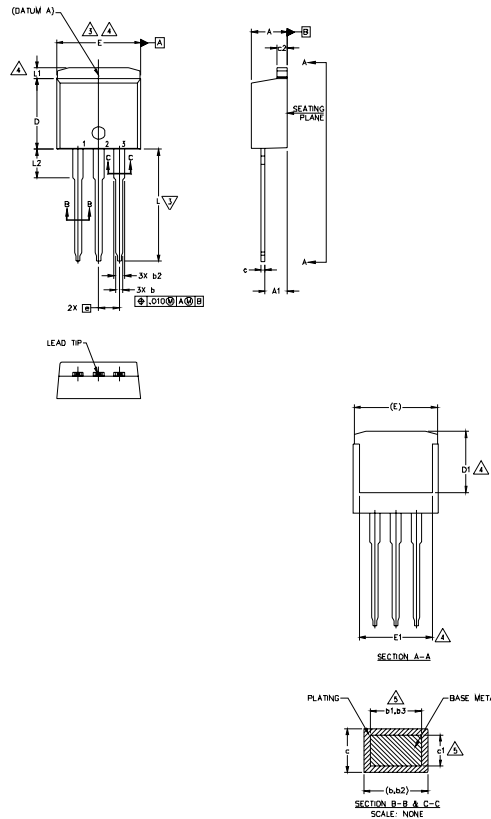


Fig. WF3- Typ. S.C Waveform  
@  $T_C = 150^{\circ}\text{C}$  using Fig. CT.3

# AUIRGS/SL30B60K

## 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 | 5     |
| A1     | 2.03        | 3.02  | .080     | .119 |       |
| b      | 0.51        | 0.99  | .020     | .039 |       |
| b1     | 0.51        | 0.89  | .020     | .035 |       |
| b2     | 1.14        | 1.78  | .045     | .070 |       |
| b3     | 1.14        | 1.73  | .045     | .068 | 5     |
| c      | 0.38        | 0.74  | .015     | .029 | 5     |
| c1     | 0.38        | 0.58  | .015     | .023 |       |
| 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 |      | 4     |
| L      | 13.46       | 14.10 | .530     | .555 |       |
| L1     | —           | 1.65  | —        | .065 |       |
| L2     | 3.56        | 3.71  | .140     | .146 |       |

### LEAD ASSIGNMENTS

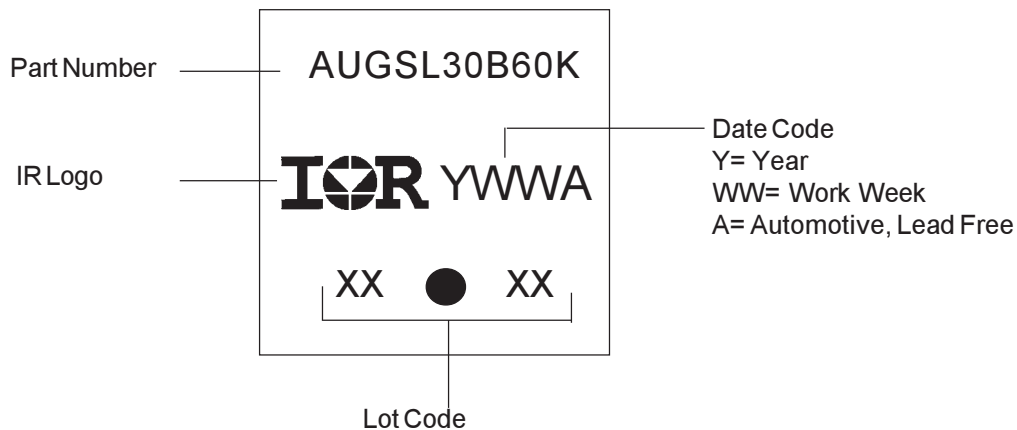
#### HEXFET

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

#### IGBTs, CoPACK

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

## TO-262 Part Marking Information

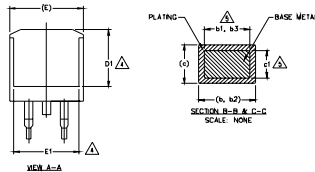
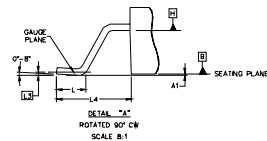
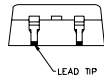
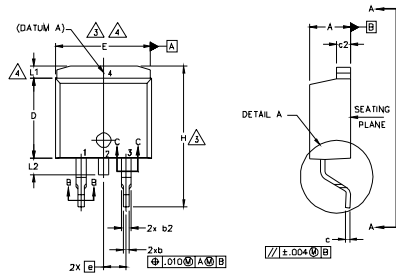


**Note:** For the most current drawing please refer to IR website at <http://www.irf.com/package/>

# AUIRGS/SL30B60K

## 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

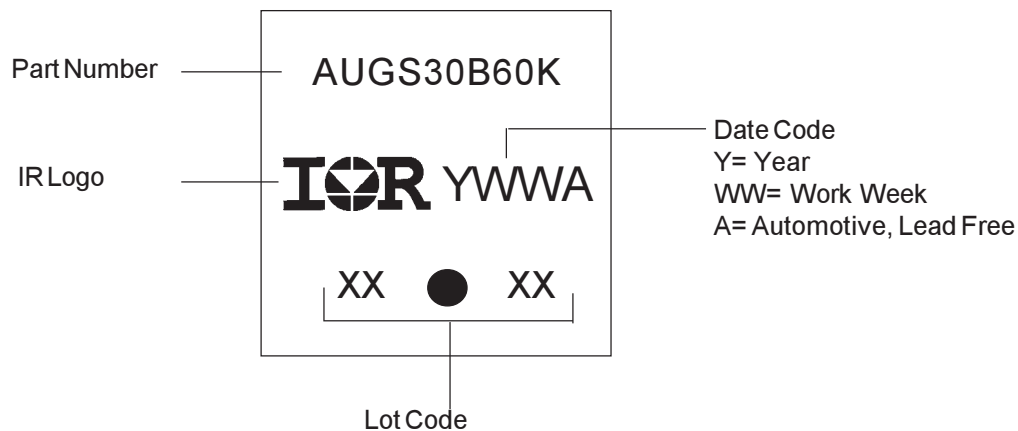
1. - GATE
- 2, 4. - COLLECTOR
3. - EMITTER

#### DIODES

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

\* PART DEPENDENT.

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

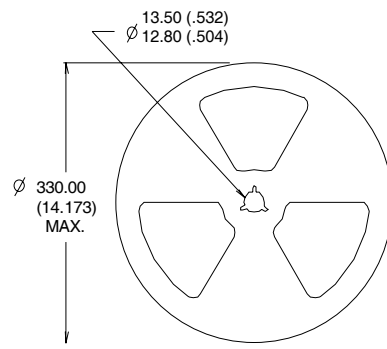
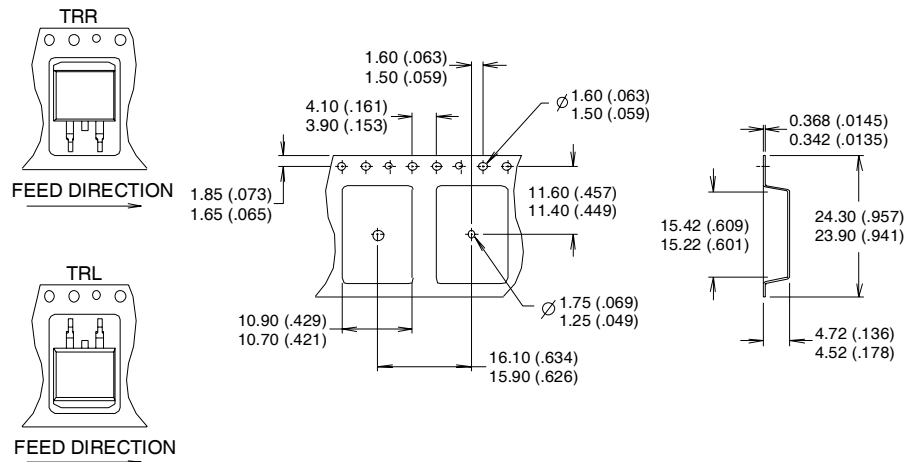


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

# AUIRGS/SL30B60K

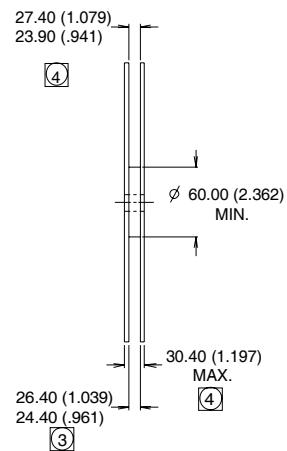
## D<sup>2</sup>Pak (TO-263AB) Tape & Reel Information

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.



# AUIRGS/SL30B60K

## Ordering Information

| Base part number | Package Type | Standard Pack       |          | Complete Part Number |
|------------------|--------------|---------------------|----------|----------------------|
|                  |              | Form                | Quantity |                      |
| AUIRGS�30B60K    | TO-262       | Tube                | 50       | AUIRGS�30B60K        |
| AUIRGS30B60K     | D2Pak        | Tube                | 50       | AUIRGS30B60K         |
|                  |              | Tape and Reel Left  | 800      | AUIRGS30B60KTRL      |
|                  |              | Tape and Reel Right | 800      | AUIRGS30B60KTRR      |

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