



THE DATASHEET OF AUIRGS30B60KTRL



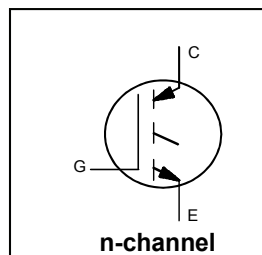
INSULATED GATE BIPOLAR TRANSISTOR

Features

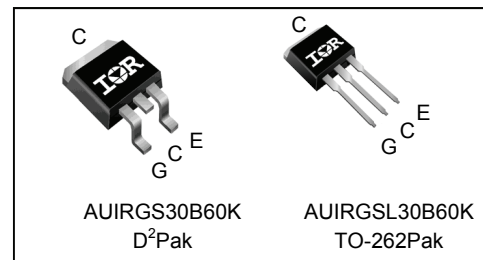
- Low $V_{CE(on)}$ Non Punch Through IGBT Technology
- 10 μ s Short Circuit Capability
- Square RBSOA
- Positive $V_{CE(on)}$ Temperature Coefficient.
- Maximum Junction Temperature rated at 175°C
- Lead-Free, RoHS Compliant
- Automotive Qualified **

Benefits

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



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



| | | |
|------|-----------|---------|
| G | C | E |
| Gate | Collector | Emitter |

| Base Part Number | Package Type | Standard Pack | | Orderable Part Number |
|------------------|--------------------|---------------------|----------|-----------------------|
| | | Form | Quantity | |
| AUIRGL30B60K | TO-262 | Tube | 50 | AUIRGL30B60K |
| AUIRGS30B60K | D ² Pak | Tube | 50 | AUIRGS30B60K |
| | | Tape and Reel Left | 800 | AUIRGS30B60KTRL |
| | | Tape and Reel Right | 800 | AUIRGS30B60KTRR |

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} | Continuous Gate-to-Emitter Voltage | ± 20 | |
| $P_D @ T_C = 25^\circ C$ | Maximum Power Dissipation | 370 | W |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation | 180 | |
| T_J | Operating Junction and | -55 to +175 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 sec. | 300 (0.063 in.(1.6mm) from case) | |

Thermal Resistance

| | Parameter | Min. | Typ. | Max. | Units |
|------------------------|--|------|------|-------|-------|
| $R_{\theta JC}$ (IGBT) | Thermal Resistance Junction-to-Case (IGBT) | — | — | 0.41* | °C/W |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink (flat, greased surface) | — | 0.50 | — | |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (typical socket mount) | — | — | 40 | |
| Wt | Weight | — | 1.44 | — | g |

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

** Qualification standards can be found at www.infineon.com

Electrical Characteristics @ T_J = 25°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 = 500μA | |
| ΔV _{(BR)CES} /ΔT _J | Temperature Coeff. of Breakdown Voltage | — | 0.40 | — | V/°C | V _{GE} = 0V, I _C = 1mA (25°C-150°C) | |
| V _{CE(on)} | Collector-to-Emitter Saturation Voltage | — | 1.95 | 2.35 | V | I _C = 30A, V _{GE} = 15V, T _J = 25°C | 5,6,7 |
| | | — | 2.40 | 2.75 | | I _C = 30A, V _{GE} = 15V, T _J = 150°C | 8,9,10 |
| | | — | 2.6 | 2.95 | | I _C = 30A, V _{GE} = 15V, T _J = 175°C | |
| V _{GE(th)} | Gate Threshold Voltage | 3.5 | 4.5 | 5.5 | V | I _C = 250μA | 8,9,10, |
| ΔV _{GE(th)} /ΔT _J | Threshold Voltage temp. coefficient | — | -10 | — | mV/°C | V _{CE} = V _{GE} , I _C = 1.0mA (25°C-150°C) | 11 |
| g _{fe} | Forward Transconductance | — | 18 | — | S | V _{CE} = 50V, I _C = 50A, PW = 80μs | |
| I _{CES} | Collector-to-Emitter Leakage Current | — | 5.0 | 250 | μA | V _{GE} = 0V, V _{CE} = 600V | |
| | | | 1000 | 2000 | | V _{GE} = 0V, V _{CE} = 600V, T _J = 150°C | |
| | | — | 1830 | 3000 | | V _{GE} = 0V, V _{CE} = 600V, T _J = 175°C | |
| I _{GES} | Gate-to-Emitter Leakage Current | — | — | ±100 | nA | V _{GE} = ±20V, V _{CE} = 0V | |

Switching Characteristics @ T_J = 25°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 V _{GE} = 15V V _{CC} = 400V | 17 |
| Q _{ge} | Gate-to-Emitter Charge (turn-on) | — | 14 | 21 | | | CT1 |
| Q _{gc} | Gate-to-Collector Charge (turn-on) | — | 44 | 66 | | | |
| E _{on} | Turn-On Switching Loss | — | 350 | 620 | μJ | I _C = 30A, V _{CC} = 400V, V _{GE} = +15V, R _G = 10Ω, L = 200μH, T _J = 25°C ③ | CT4 |
| E _{off} | Turn-Off Switching Loss | — | 825 | 955 | | | |
| E _{total} | Total Switching Loss | — | 1175 | 1575 | | | |
| t _{d(on)} | Turn-On delay time | — | 46 | 60 | ns | I _C = 30A, V _{CC} = 400V, V _{GE} = +15V, R _G = 10Ω, L = 200μH, T _J = 150°C | 12,14, CT4 WF1,WF2 |
| t _r | Rise time | — | 28 | 39 | | | |
| t _{d(off)} | Turn-Off delay time | — | 185 | 200 | | | |
| t _f | Fall time | — | 31 | 40 | | | |
| E _{on} | Turn-On Switching Loss | — | 635 | 1085 | μJ | I _C = 30A, V _{CC} = 400V, V _{GE} = +15V, R _G = 10Ω, L = 200μH, T _J = 150°C | 13,15 CT4 WF1 WF2 |
| E _{off} | Turn-Off Switching Loss | — | 1150 | 1350 | | | |
| E _{total} | Total Switching Loss | — | 1785 | 2435 | | | |
| t _{d(on)} | Turn-On delay time | — | 46 | 60 | ns | I _C = 30A, V _{CC} = 400V, V _{GE} = +15V, R _G = 10Ω, L = 200μH, T _J = 150°C | 13,15 CT4 WF1 WF2 |
| t _r | Rise time | — | 28 | 39 | | | |
| t _{d(off)} | Turn-Off delay time | — | 205 | 235 | | | |
| t _f | Fall time | — | 32 | 42 | | | |
| L _E | Internal Emitter Inductance | — | 7.5 | — | nH | Measured 5mm from package | |
| C _{ies} | Input Capacitance | — | 1750 | — | pF | V _{GE} = 0V V _{CC} = 30V f = 1.0Mhz | 16 |
| C _{oes} | Output Capacitance | — | 160 | — | | | |
| C _{res} | Reverse Transfer Capacitance | — | 60 | — | | | |
| RBSOA | Reverse Bias Safe Operating Area | FULL SQUARE | | | | T _J = 150°C, I _C = 120A, V _p = 600V V _{CC} = 500V, V _{GE} = +15V to 0V R _G = 10Ω | 4 CT2 |
| SCSOA | Short Circuit Safe Operating Area | 10 | — | — | μS | T _J = 150°C, V _p = 600V, R _G = 10Ω V _{CC} = 360V, V _{GE} = +15V to 0V | CT3 WF3 |
| I _{SC (Peak)} | Peak Short Circuit Collector Current | — | 200 | — | A | | WF3 |

Notes:

- ① V_{CC} = 80% (V_{CES}), V_{GE} = 20V, L = 28μH, R_G = 22Ω.
- ② This is applied to D2Pak, when mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ③ Energy losses include "tail" and diode reverse recovery.

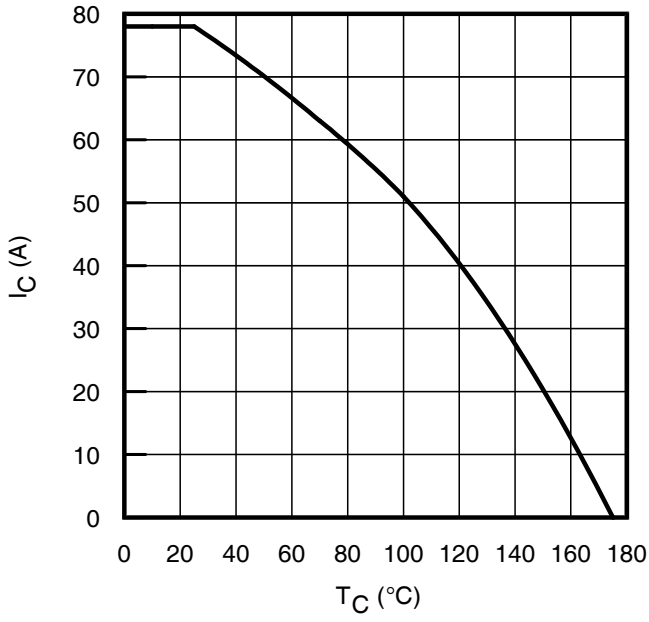


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

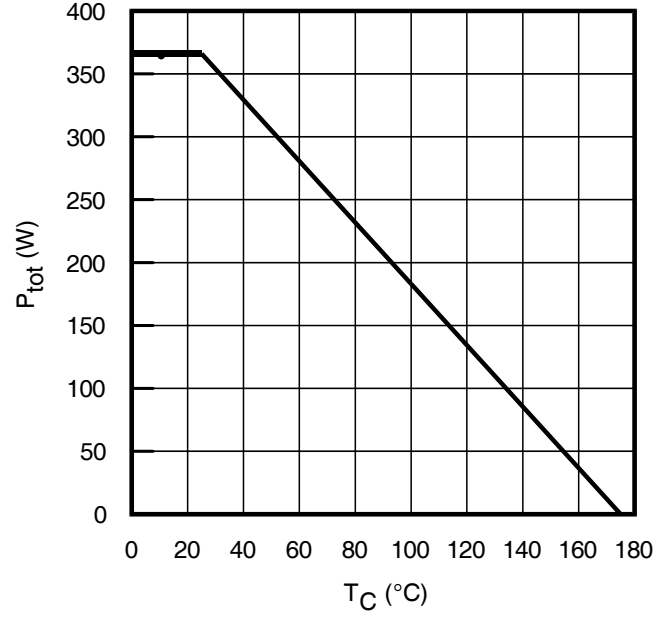


Fig. 2 - Power Dissipation vs. Case Temperature

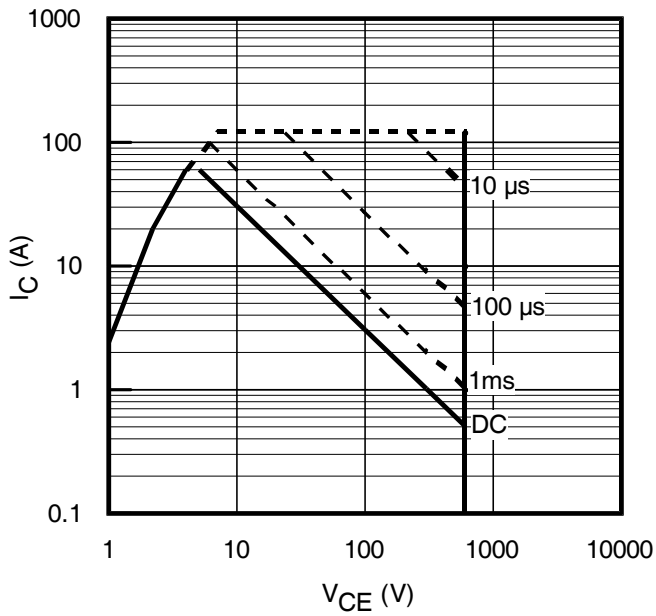


Fig. 3 - Forward SOA
 $T_C = 25^\circ\text{C}$, $T_J \leq 150^\circ\text{C}$

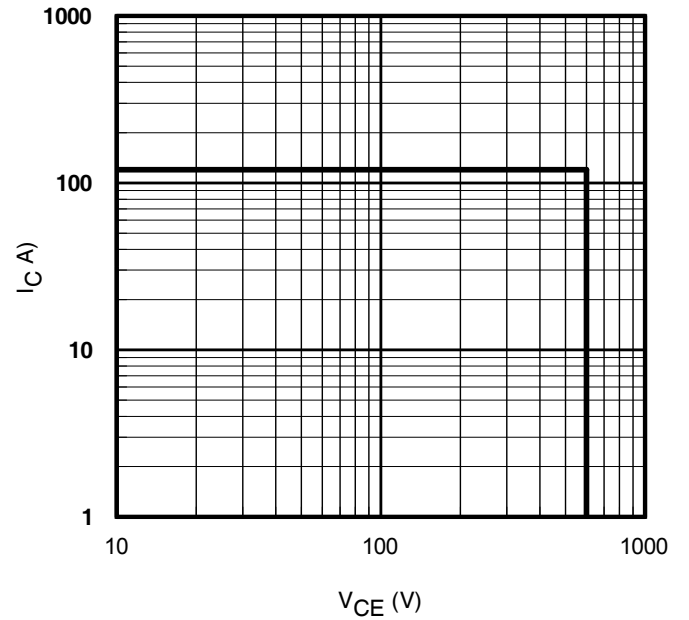


Fig. 4 - Reverse Bias SOA
 $T_J = 150^\circ\text{C}$; $V_{GE} = 15\text{V}$

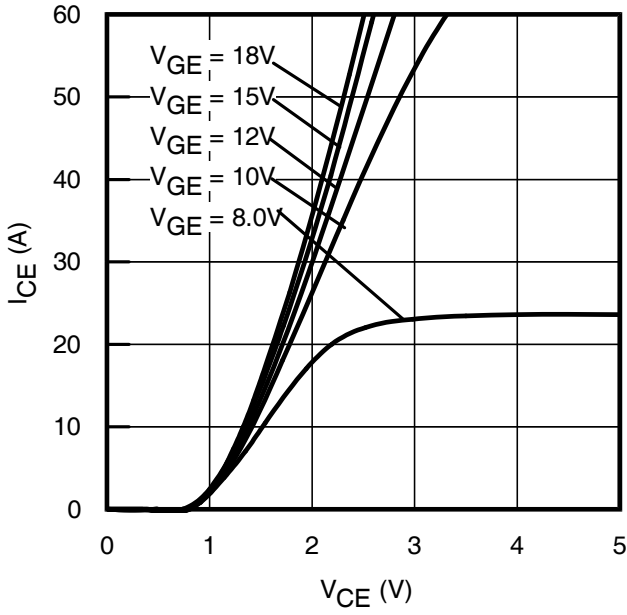


Fig. 5 - Typ. IGBT Output Characteristics
 $T_J = -40^\circ\text{C}$; $t_p = 80\mu\text{s}$

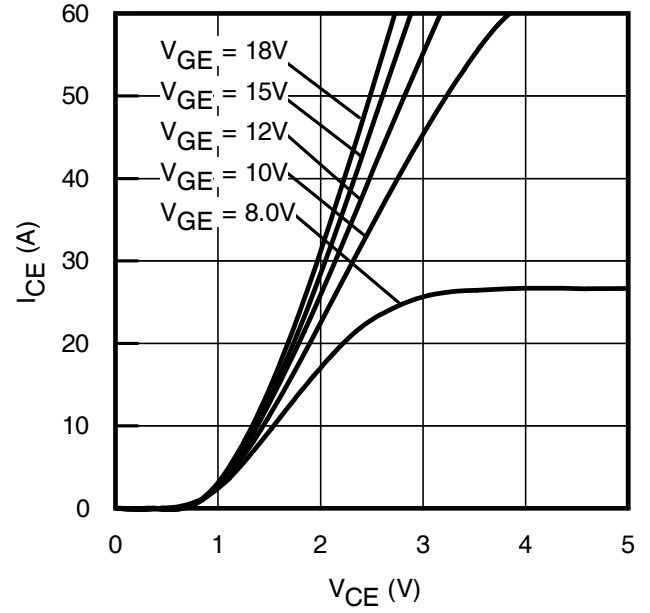


Fig. 6 - Typ. IGBT Output Characteristics
 $T_J = 25^\circ\text{C}$; $t_p = 80\mu\text{s}$

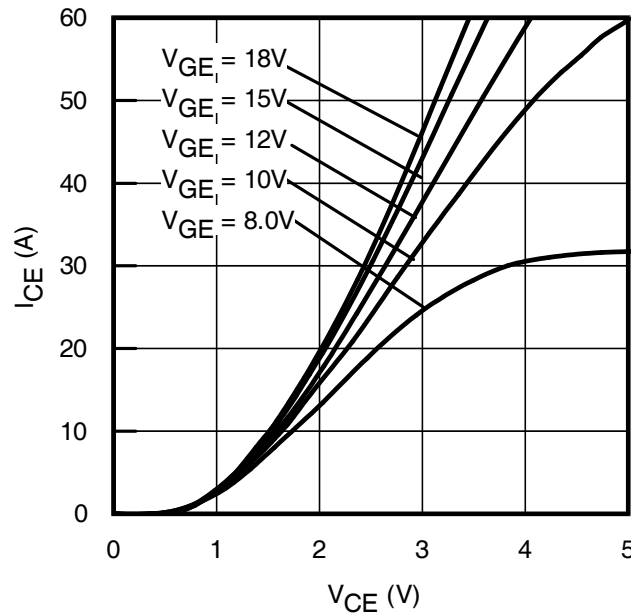


Fig. 7 - Typ. IGBT Output Characteristics
 $T_J = 150^\circ\text{C}$; $t_p = 80\mu\text{s}$

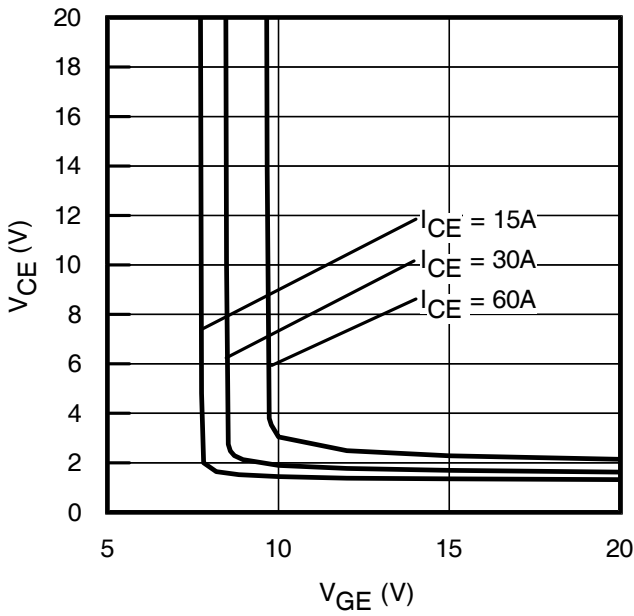


Fig. 8 - Typical V_{CE} vs. V_{GE}
 $T_J = -40^\circ\text{C}$

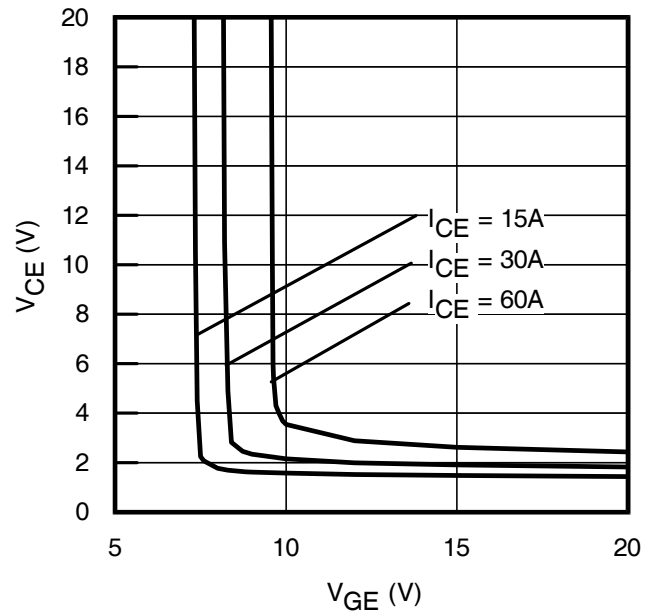


Fig. 9 - Typical V_{CE} vs. V_{GE}
 $T_J = 25^\circ\text{C}$

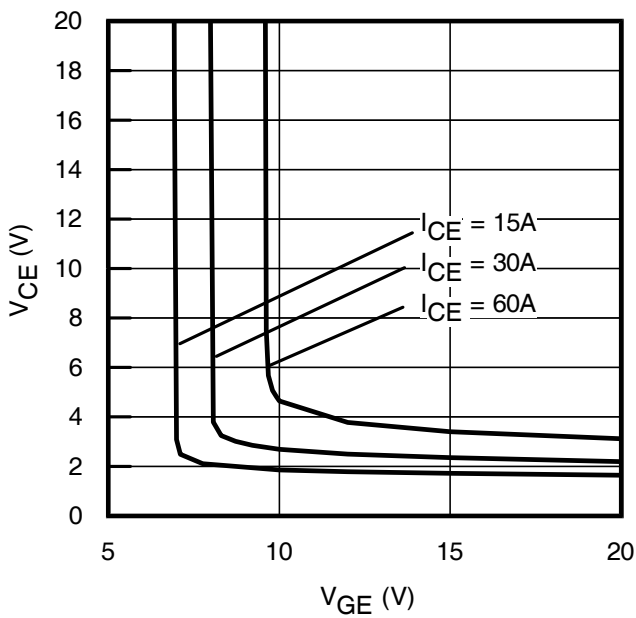


Fig. 10 - Typical V_{CE} vs. V_{GE}
 $T_J = 150^\circ\text{C}$

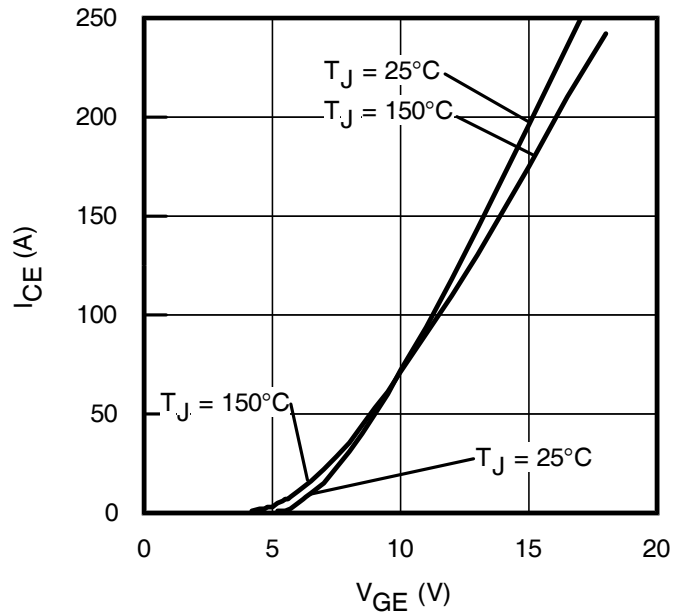
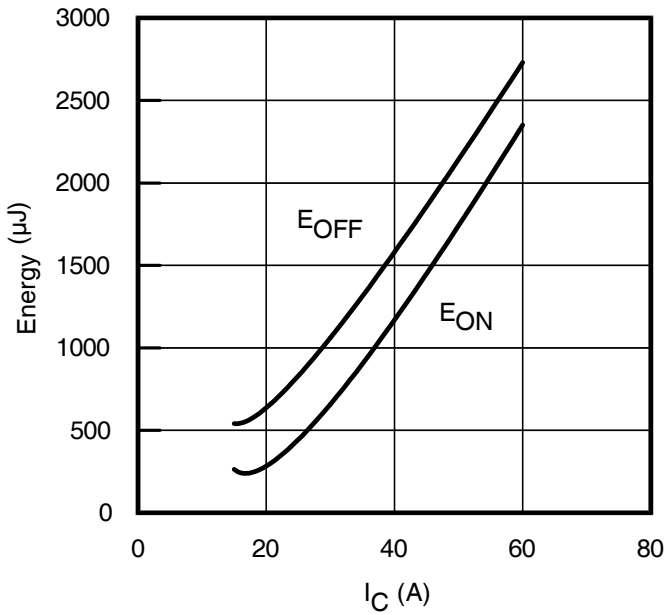
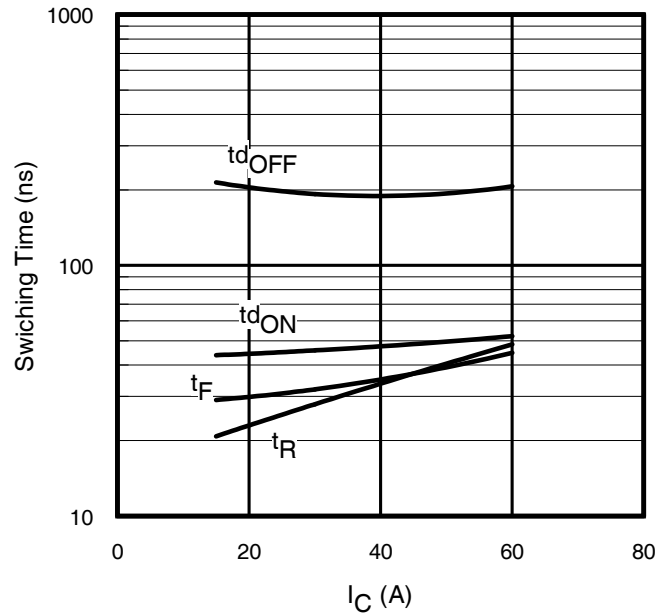
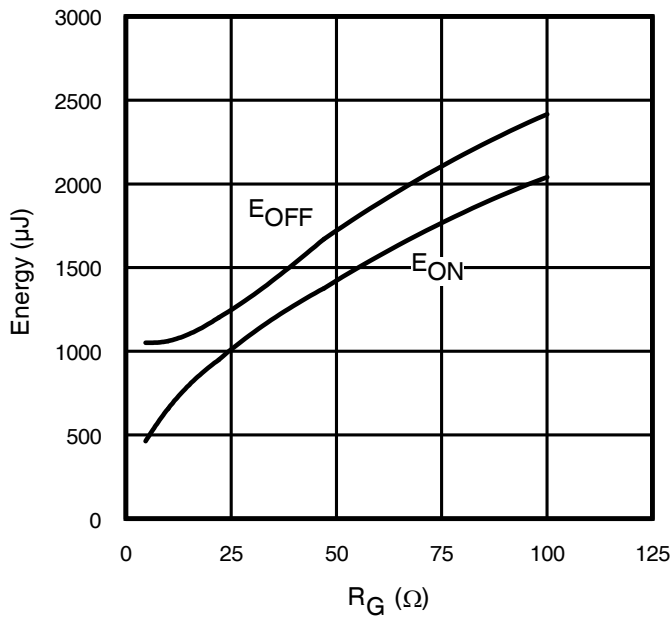
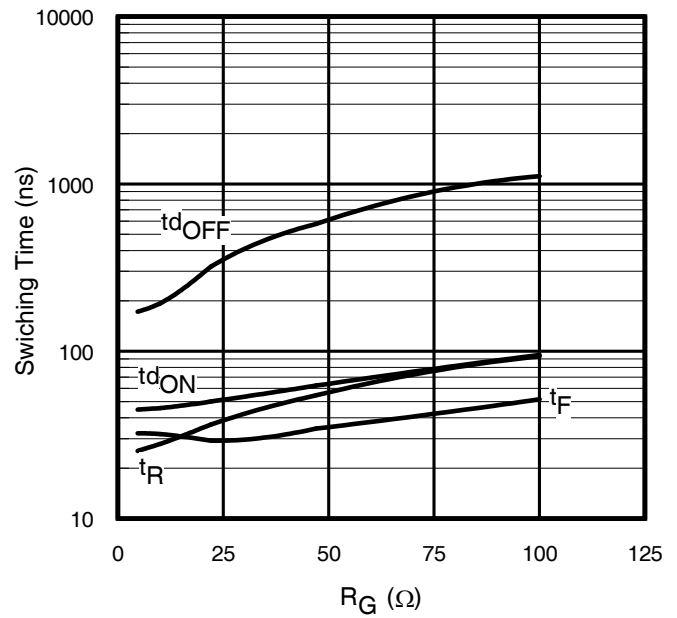


Fig. 11 - Typ. Transfer Characteristics
 $V_{CE} = 50\text{V}$; $t_p = 10\mu\text{s}$


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

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

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

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

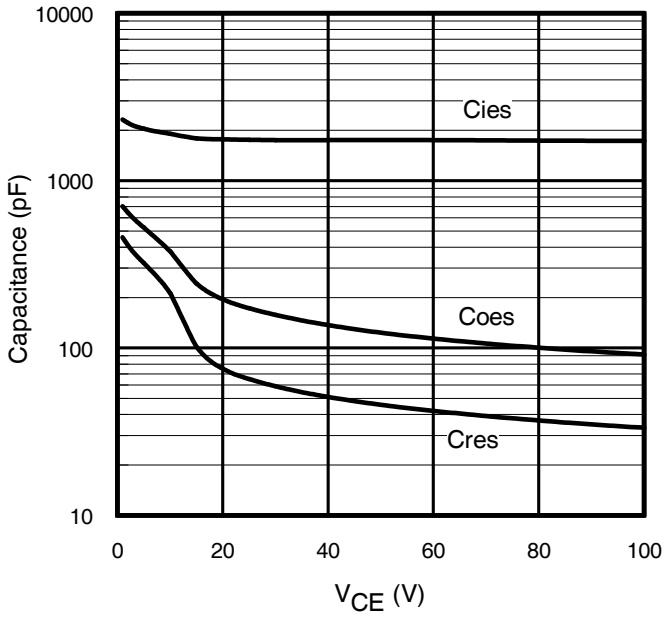


Fig. 16- Typ. Capacitance vs. V_{CE}
 $V_{GE} = 0V$; $f = 1MHz$

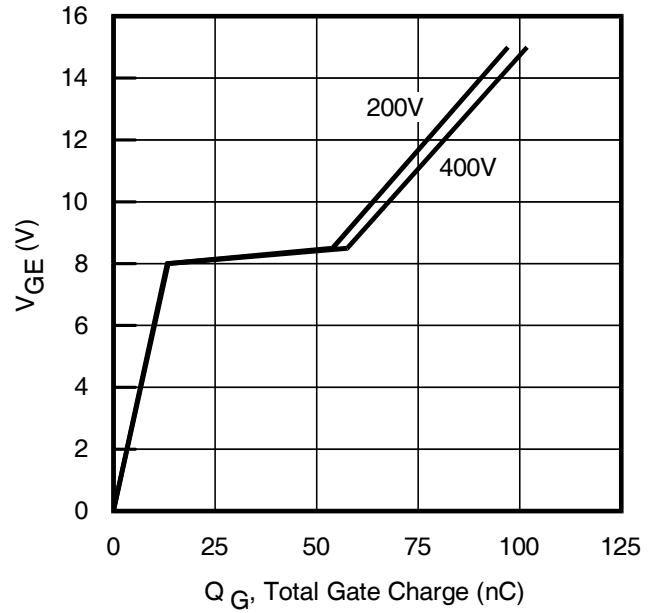


Fig. 17 - Typical Gate Charge vs. V_{GE}
 $I_{CE} = 30A$; $L = 600\mu H$

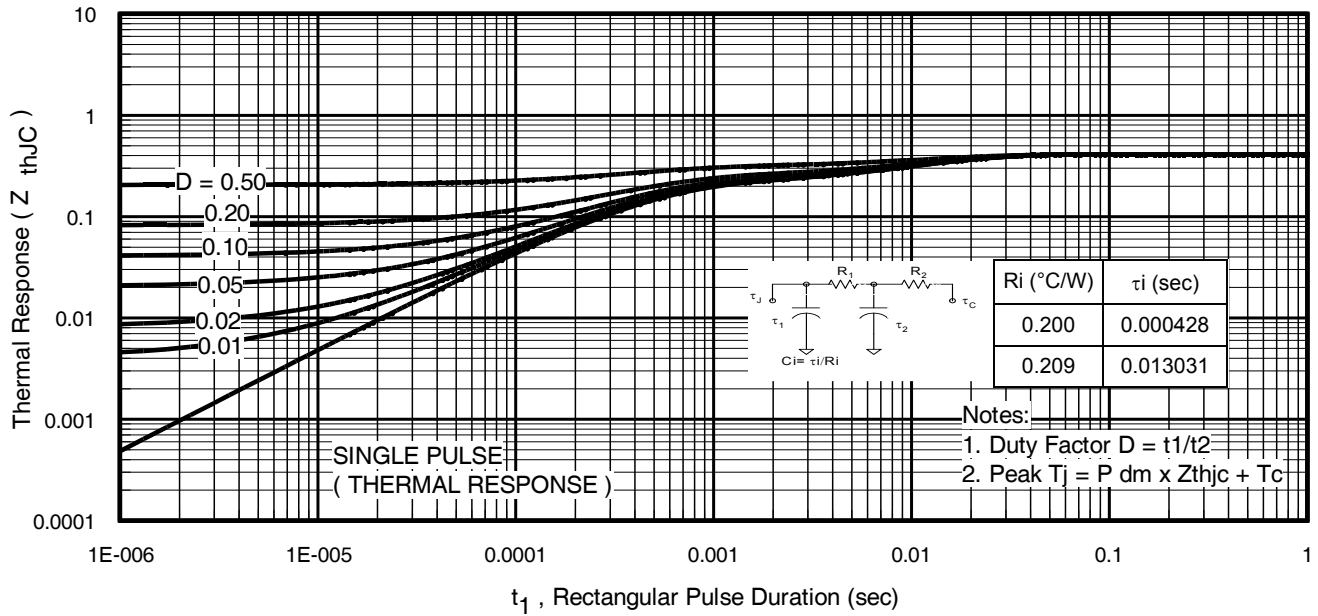
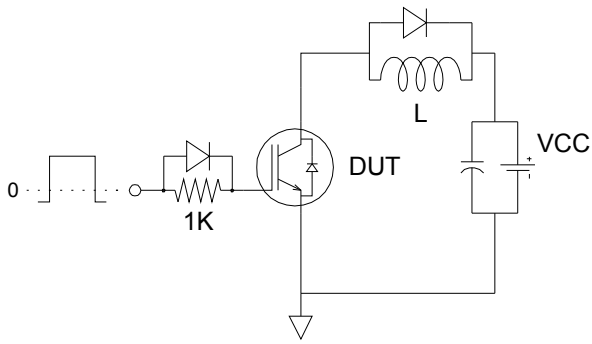
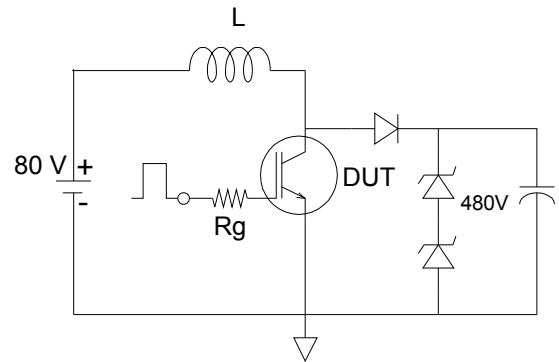
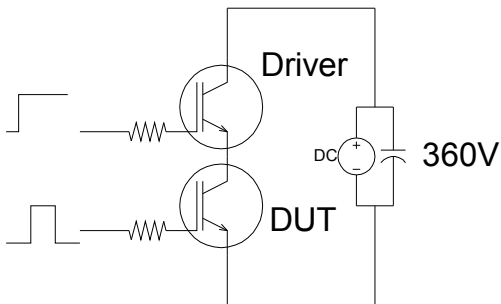
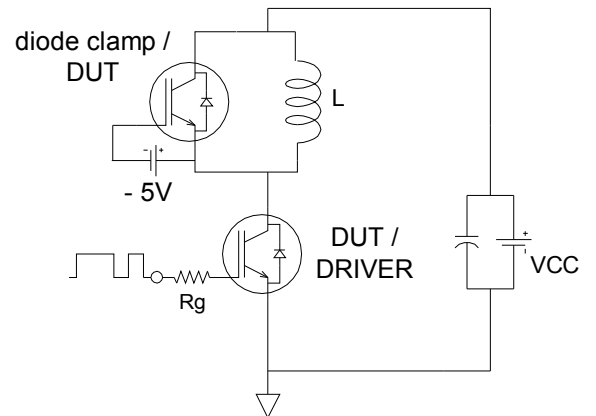
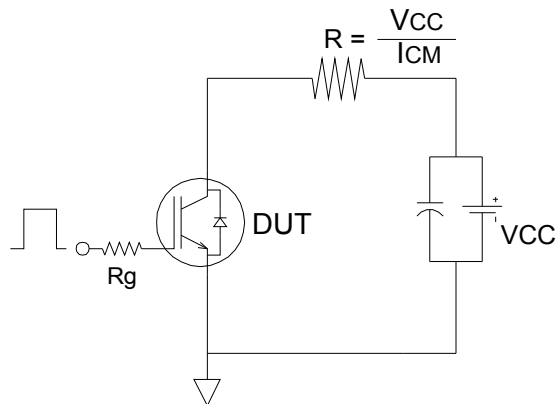


Fig 18. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)


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

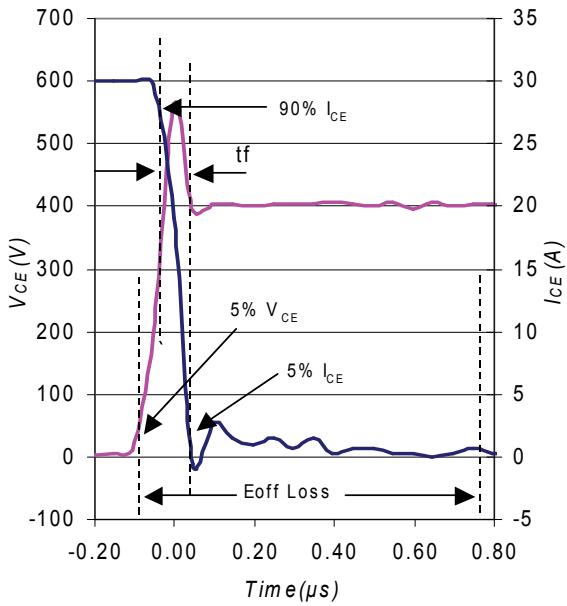


Fig. WF1 - Typ. Turn-off Loss Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.4

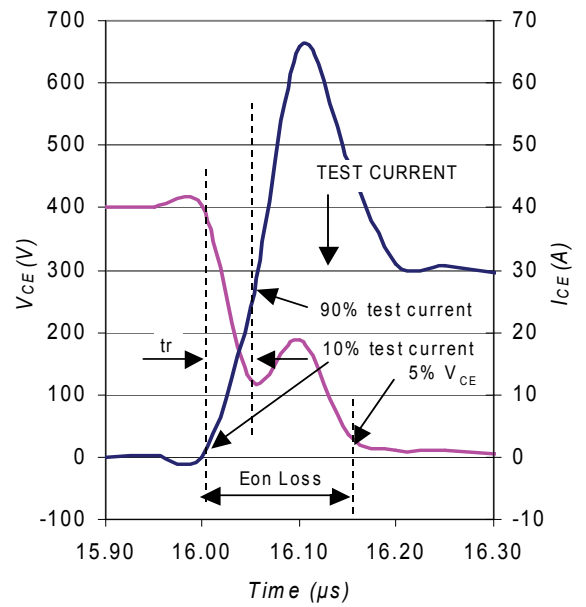


Fig. WF2 - Typ. Turn-on Loss Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.4

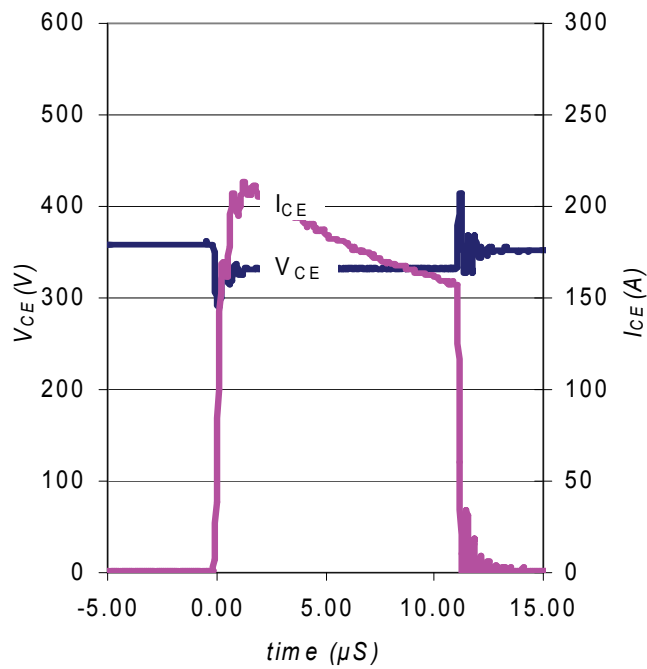
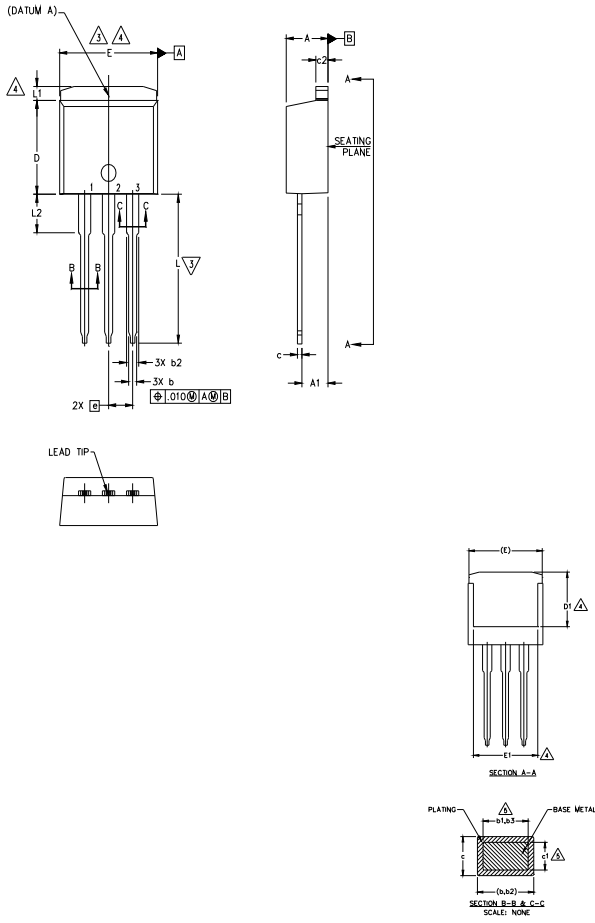


Fig. WF3 - Typ. S.C. Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.3

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 | |
| c | 0.38 | 0.74 | .015 | .029 | |
| c1 | 0.38 | 0.58 | .015 | .023 | |
| c2 | 1.14 | 1.65 | .045 | .065 | |
| D | 8.38 | 9.65 | .330 | .380 | |
| 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 | 4 |
| L1 | - | 1.65 | - | .065 | |
| L2 | 3.56 | 3.71 | .140 | .146 | |

LEAD ASSIGNMENTS

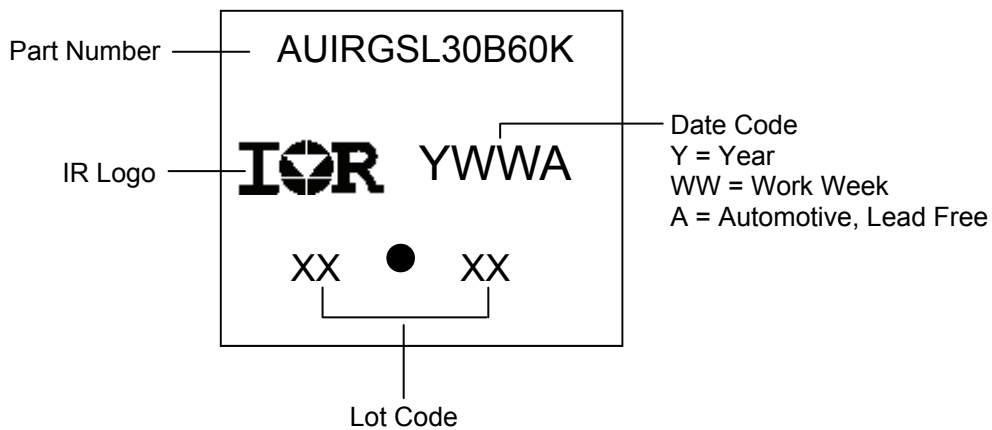
HEXFET

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

IGBTs, CoPACK

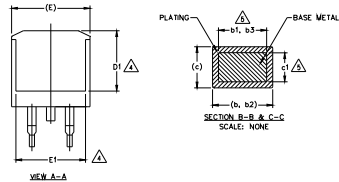
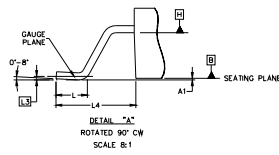
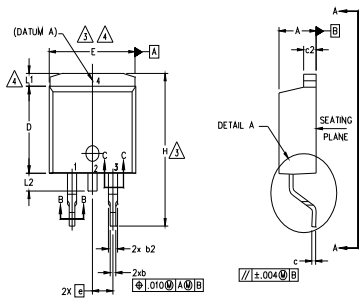
- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

TO-262 Part Marking Information



D2 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

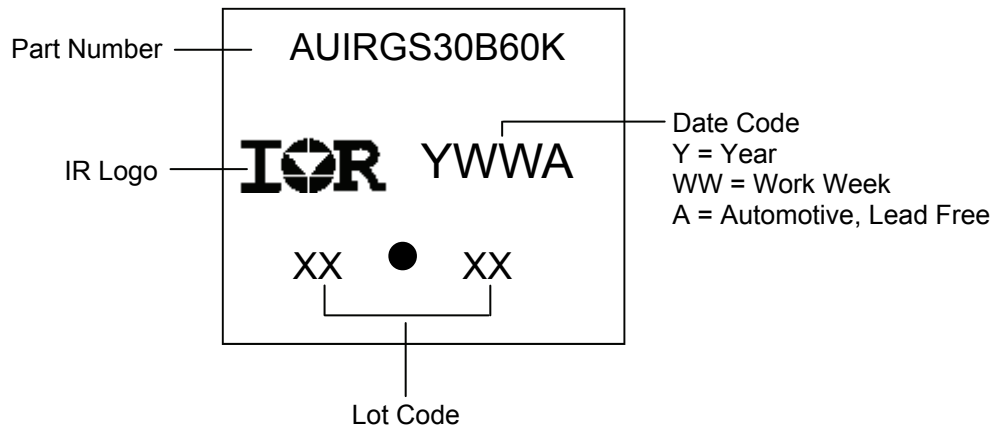
- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

DIODES

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

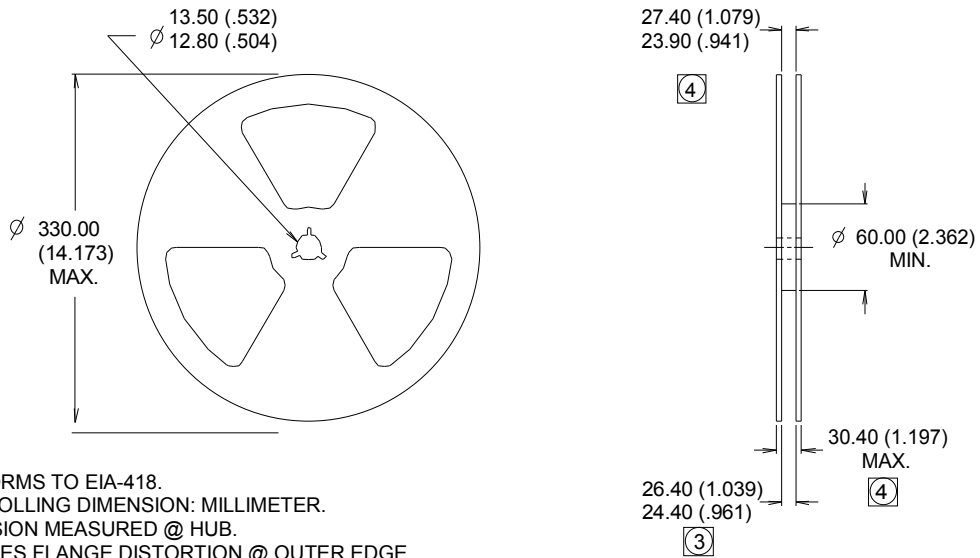
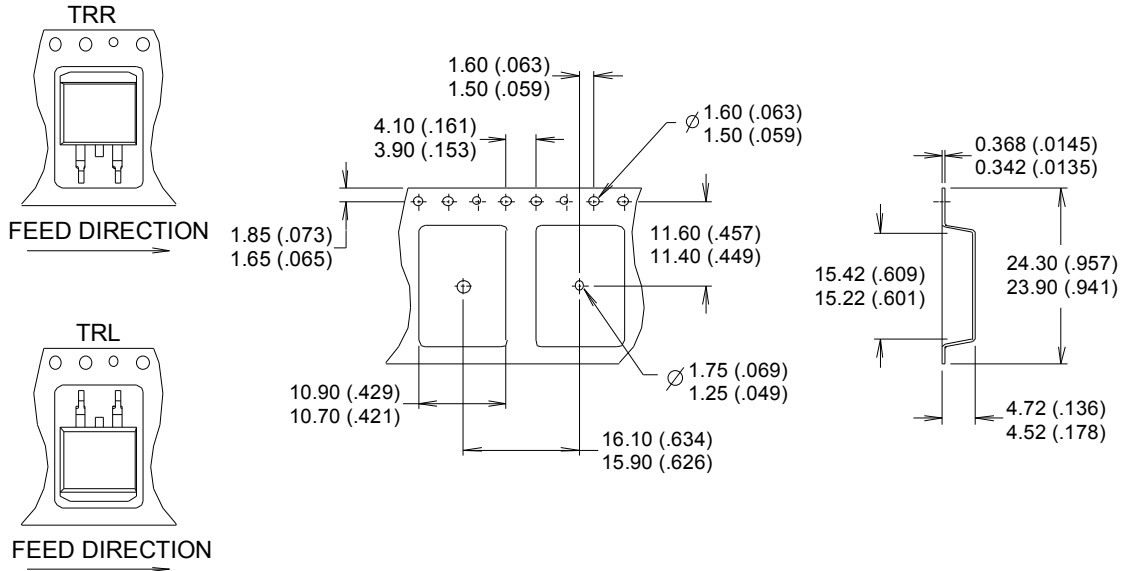
* PART DEPENDENT.

D2 Pak (TO-263AB) Part Marking Information



D2Pak Tape & Reel Information

(Dimensions are shown in millimeters (inches))



Qualification Information

| | | | |
|-----------------------------------|----------------------|---|------|
| Qualification Level | | Automotive (per AEC-Q101) | |
| | | This part number(s) passed Automotive qualification. Infineon's Industrial and Consumer qualification level is granted by extension of the higher Automotive level. | |
| Moisture Sensitivity Level | | TO-262 | N/A |
| | | D2 PAK | MSL1 |
| ESD | Machine Model | Class M4(+/- 400V) [†] AEC-Q101-002 | |
| | Human Body Model | Class H2(+/- 4000V) [†] AEC-Q101-001 | |
| | Charged Device Model | Class C4 (+/- 1000V) [†] AEC-Q101-005 | |
| RoHS Compliant | | Yes | |

† Highest passing voltage.

Revision History

| Date | Comments |
|------------|---|
| 09/08/2017 | <ul style="list-style-type: none"> Updated datasheet with corporate template Corrected part marking on pages 10,11. |

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