

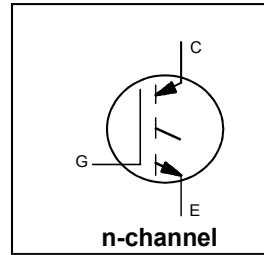
INSULATED GATE BIPOLAR TRANSISTOR

Features

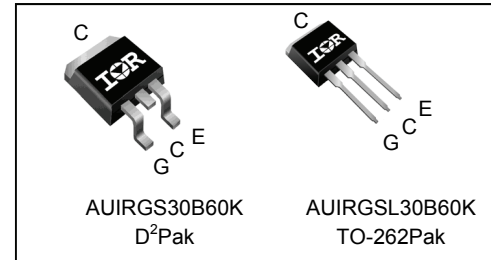
- Low $V_{CE(on)}$ Non Punch Through IGBT Technology
- 10 μ s Short Circuit Capability
- Square RBSOA
- Positive $V_{CE(on)}$ Temperature Coefficient.
- Maximum Junction Temperature rated at 175°C
- Lead-Free, RoHS Compliant
- Automotive Qualified **

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		
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		CT4	
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	12,14, 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	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.

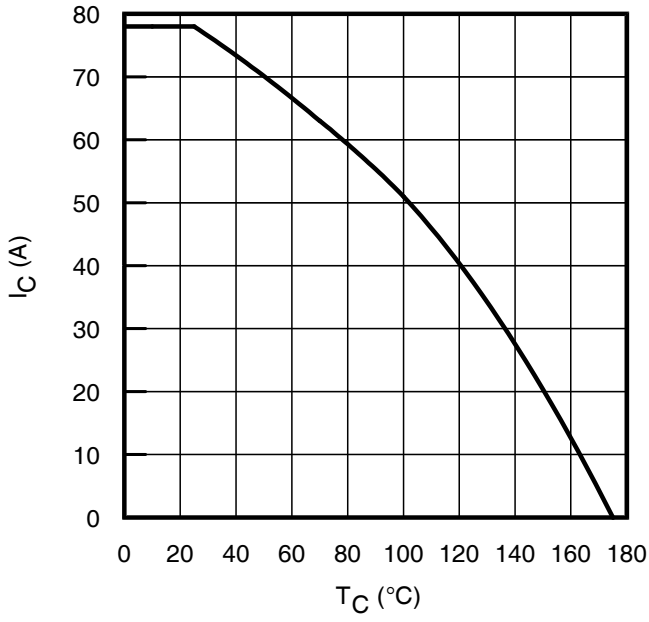


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

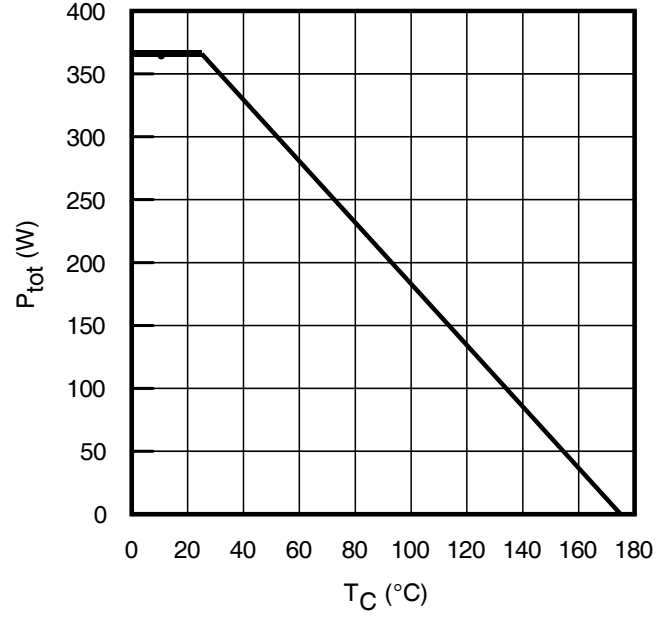


Fig. 2 - Power Dissipation vs. Case Temperature

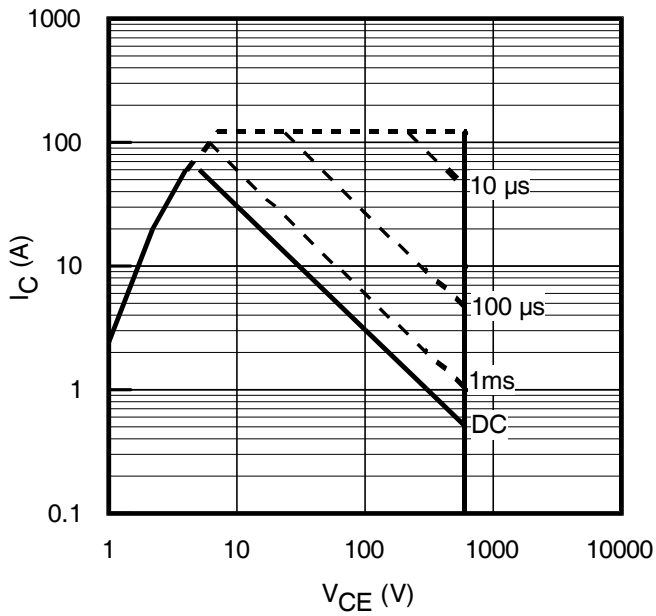


Fig. 3 - Forward SOA
 $T_C = 25^{\circ}C$, $T_J \leq 150^{\circ}C$

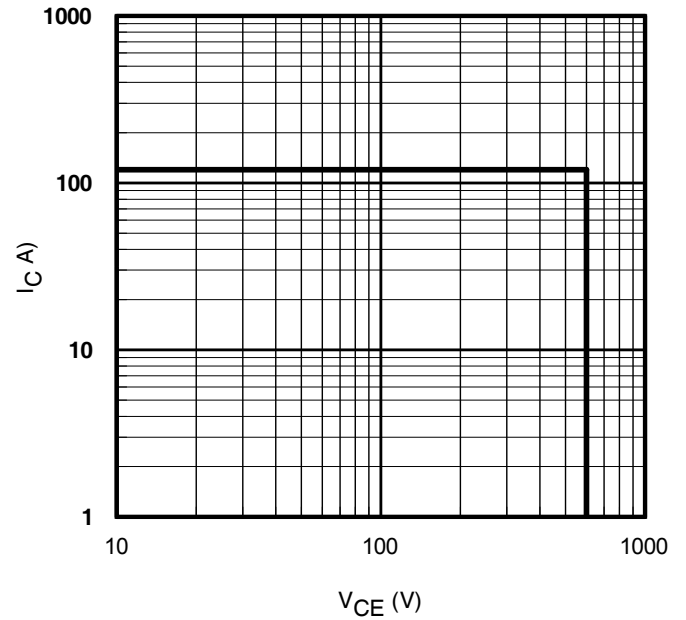


Fig. 4 - Reverse Bias SOA
 $T_J = 150^{\circ}C$; $V_{GE} = 15V$

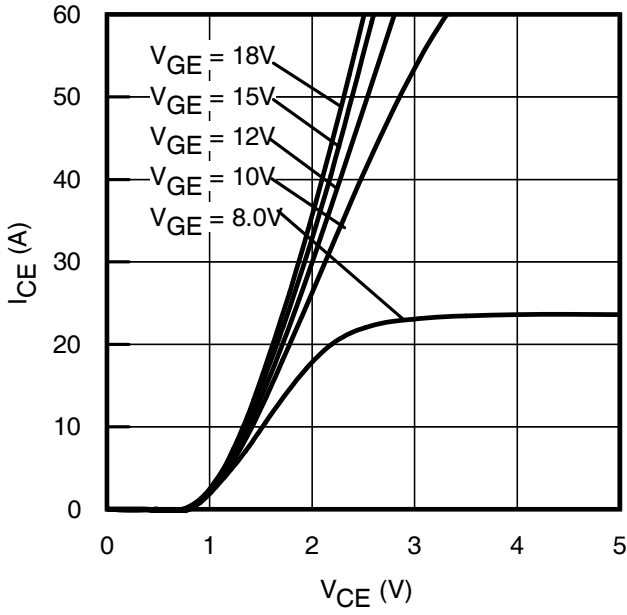


Fig. 5 - Typ. IGBT Output Characteristics
 $T_J = -40^\circ\text{C}$; $t_p = 80\mu\text{s}$

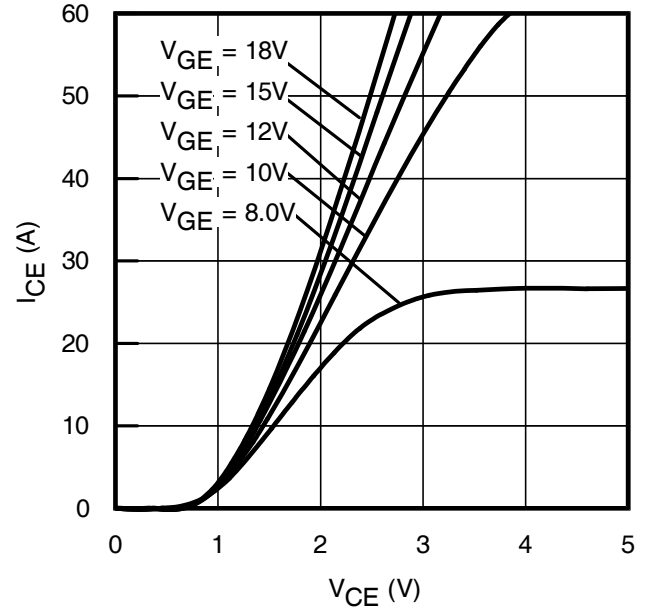


Fig. 6 - Typ. IGBT Output Characteristics
 $T_J = 25^\circ\text{C}$; $t_p = 80\mu\text{s}$

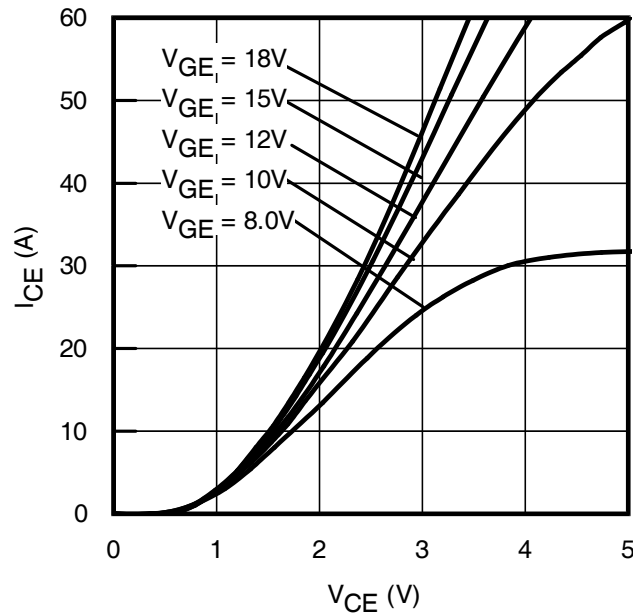


Fig. 7 - Typ. IGBT Output Characteristics
 $T_J = 150^\circ\text{C}$; $t_p = 80\mu\text{s}$

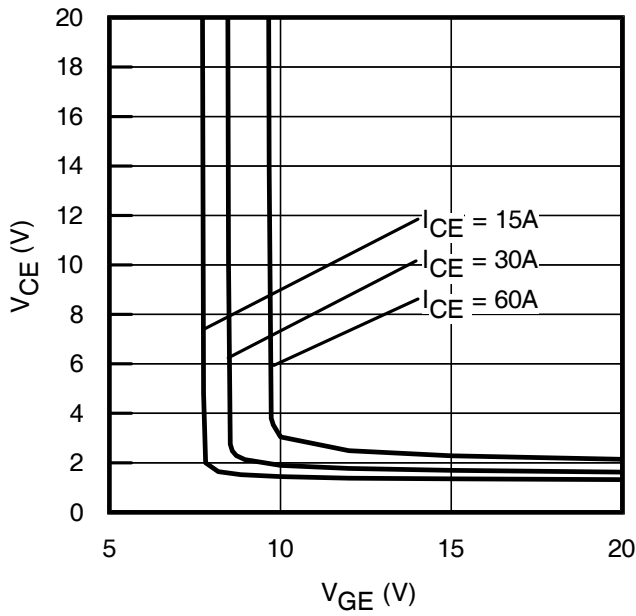


Fig. 8 - Typical V_{CE} vs. V_{GE}
 $T_J = -40^\circ\text{C}$

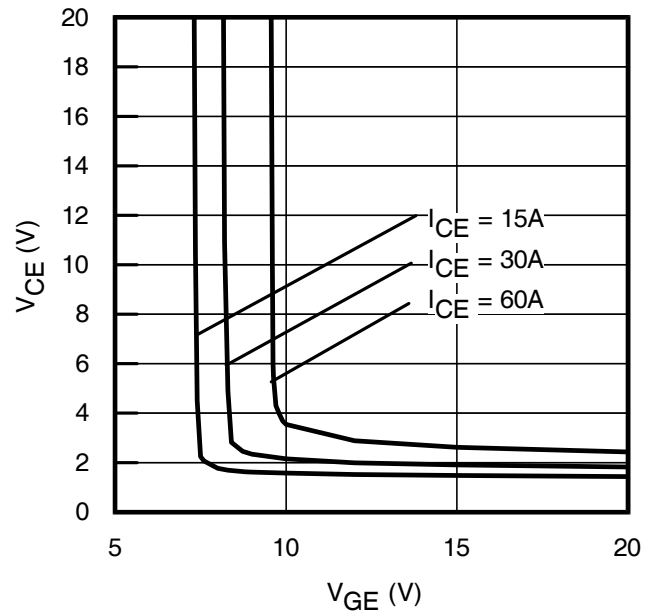


Fig. 9 - Typical V_{CE} vs. V_{GE}
 $T_J = 25^\circ\text{C}$

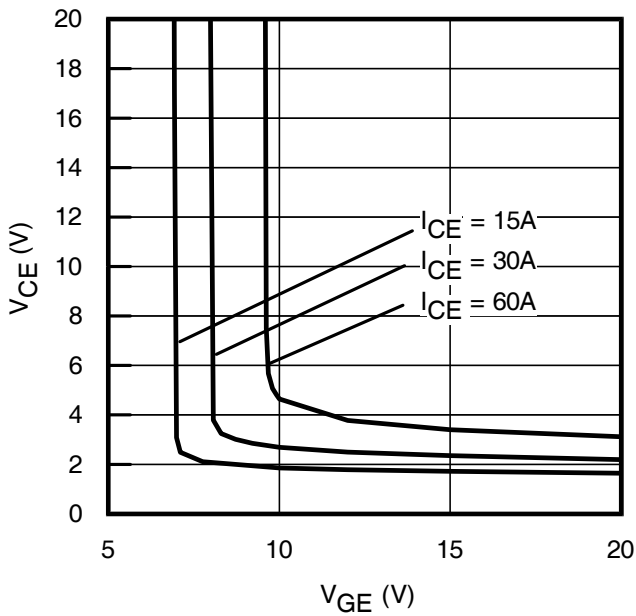


Fig. 10 - Typical V_{CE} vs. V_{GE}
 $T_J = 150^\circ\text{C}$

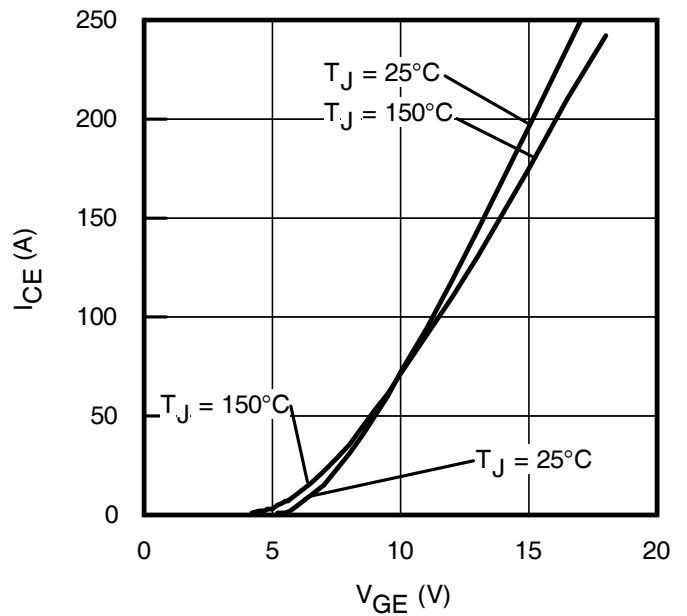
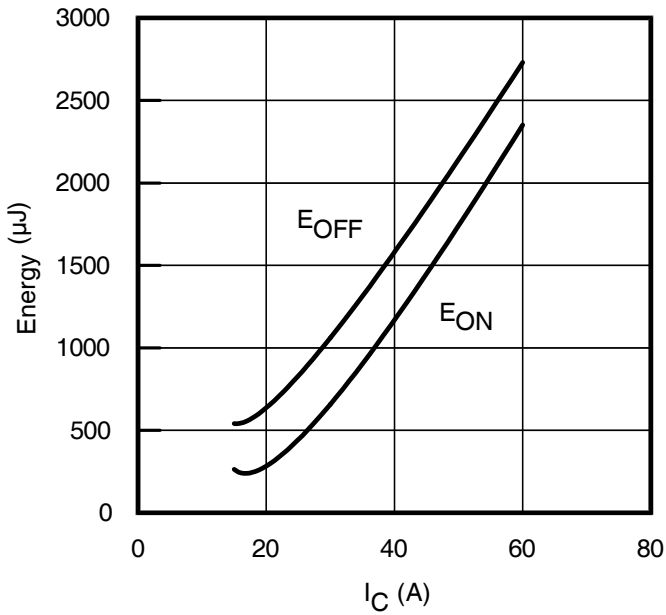
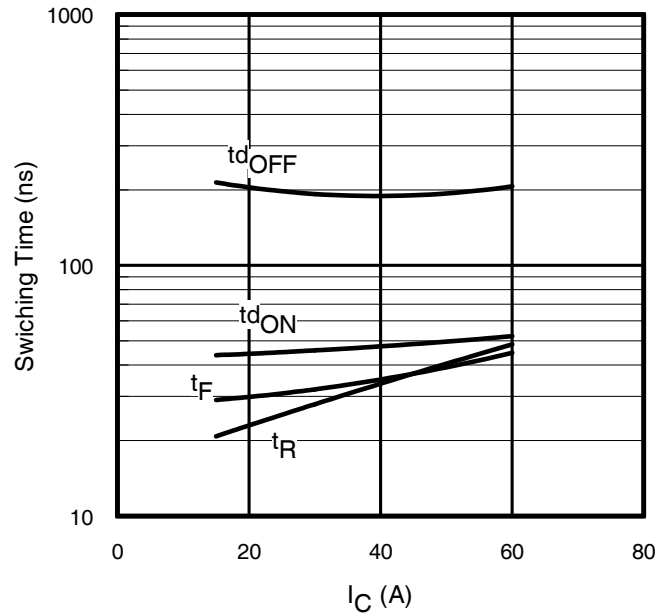
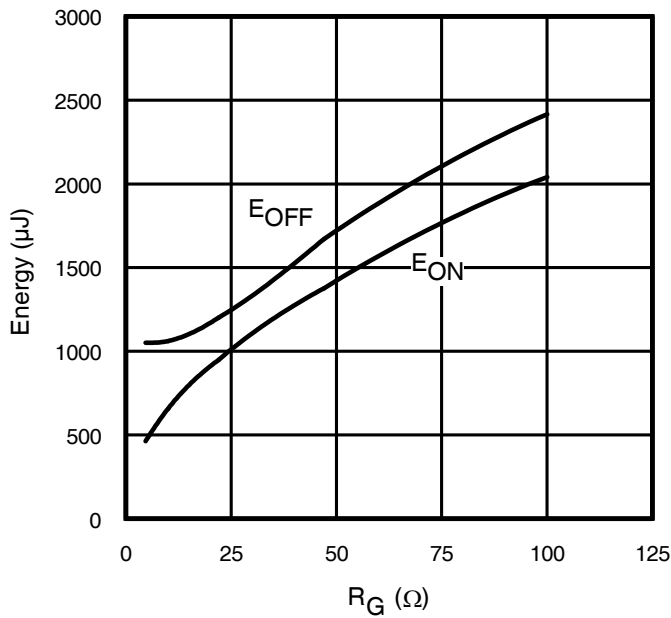
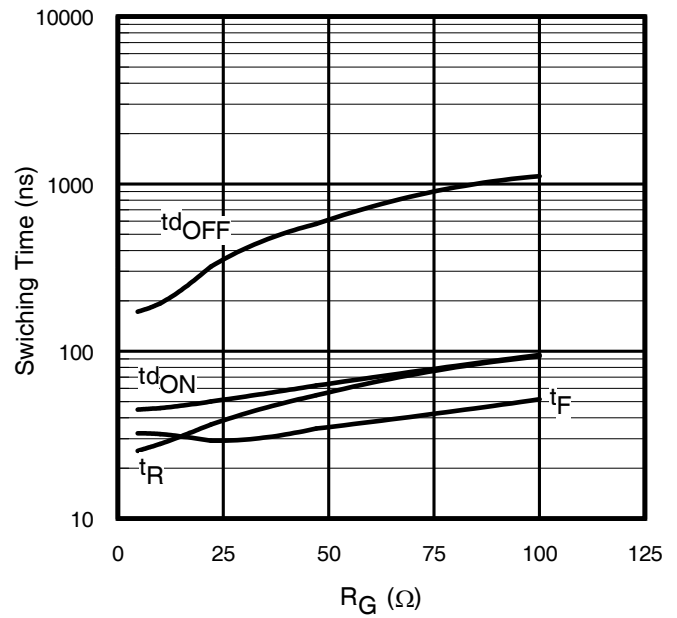


Fig. 11 - Typ. Transfer Characteristics
 $V_{CE} = 50\text{V}$; $t_p = 10\mu\text{s}$


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

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
 $T_J = 150^\circ\text{C}; L = 200\mu\text{H}; V_{CE} = 400\text{V}, I_{CE} = 30\text{A}; V_{GE} = 15\text{V}$

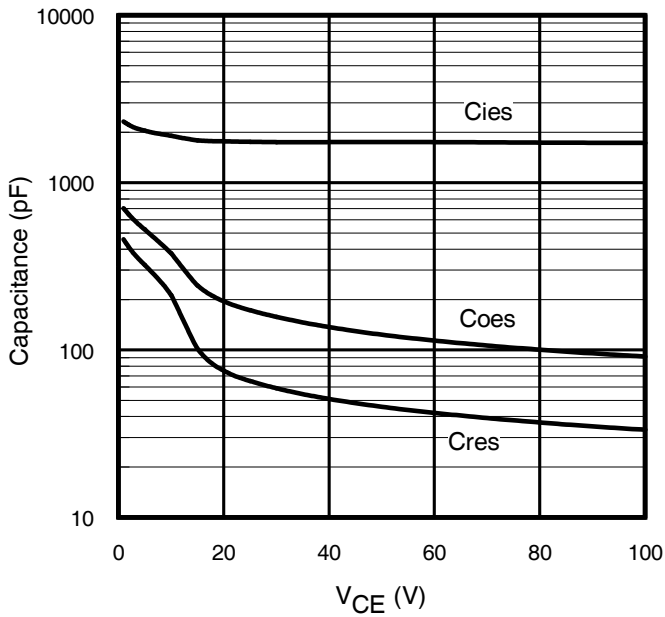


Fig. 16- Typ. Capacitance vs. V_{CE}
 $V_{GE} = 0V$; $f = 1MHz$

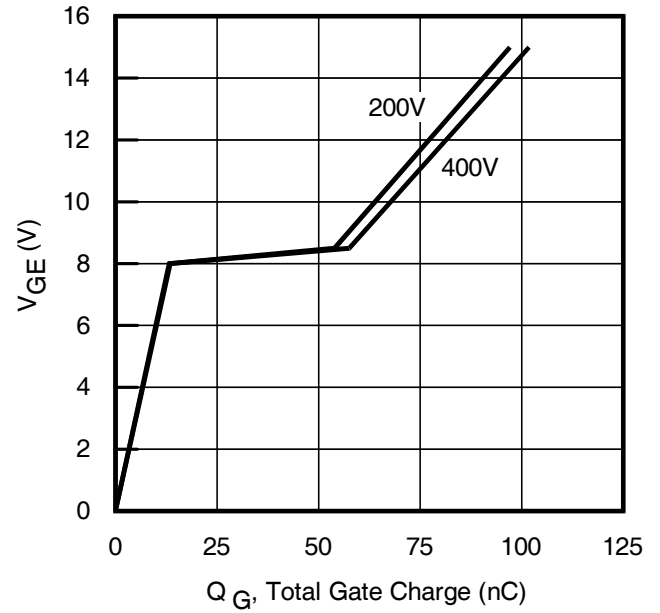


Fig. 17 - Typical Gate Charge vs. V_{GE}
 $I_{CE} = 30A$; $L = 600\mu H$

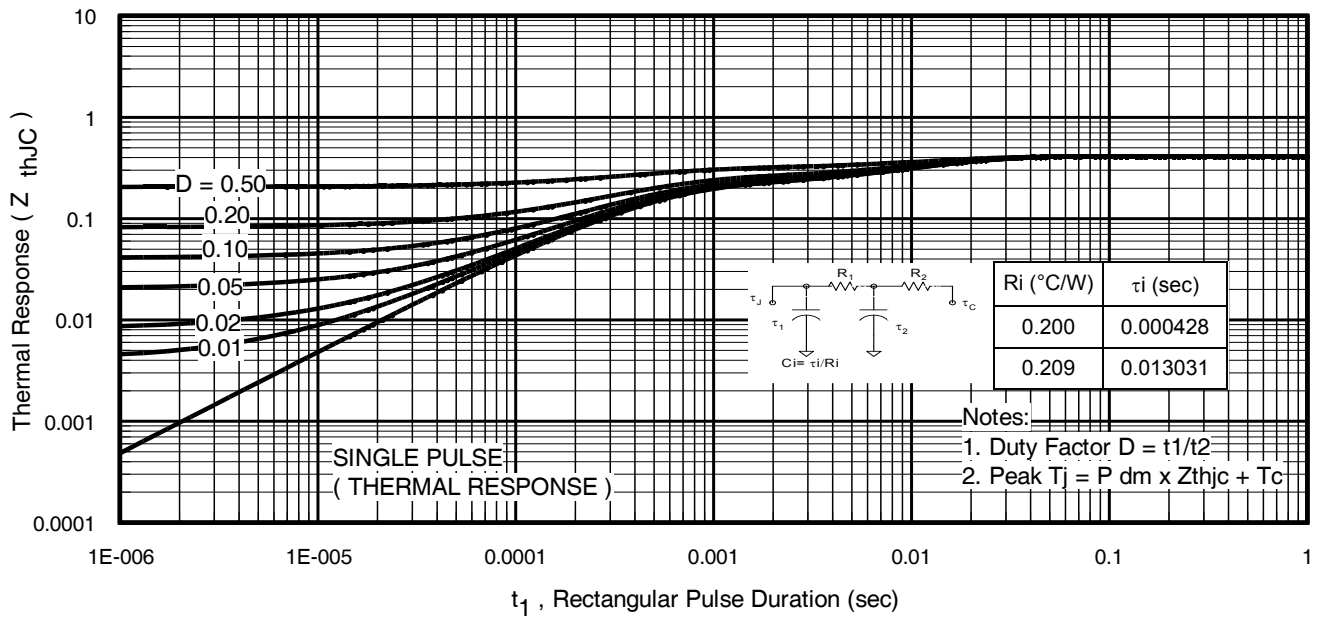
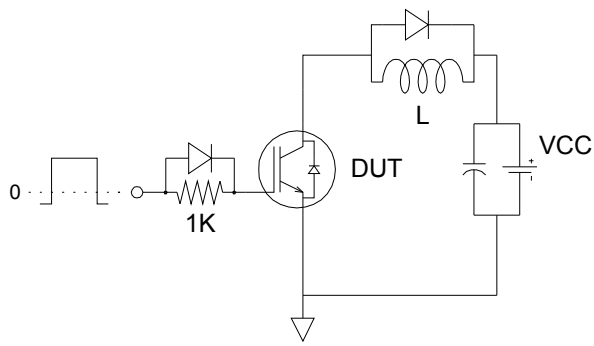
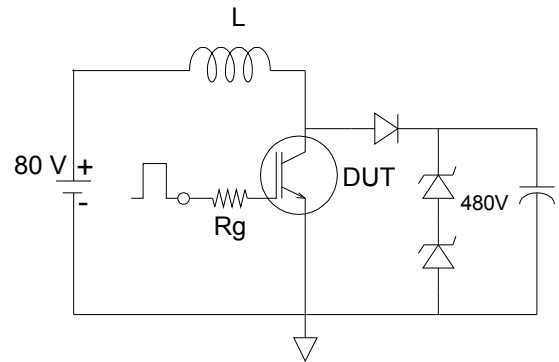
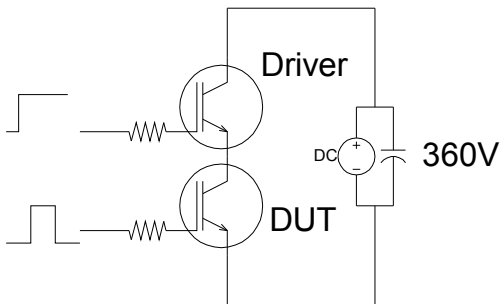
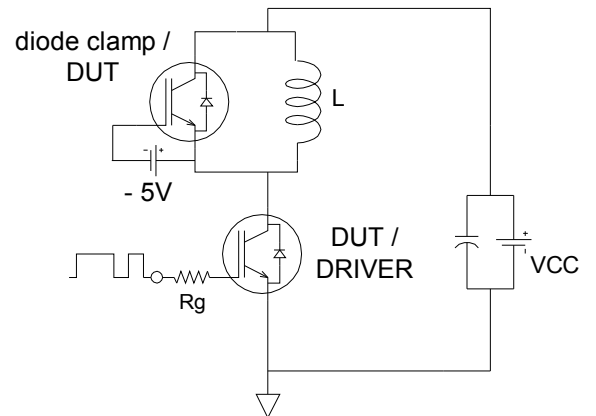
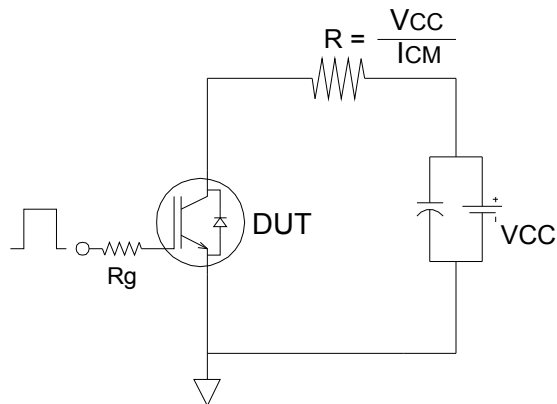


Fig 18. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)


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

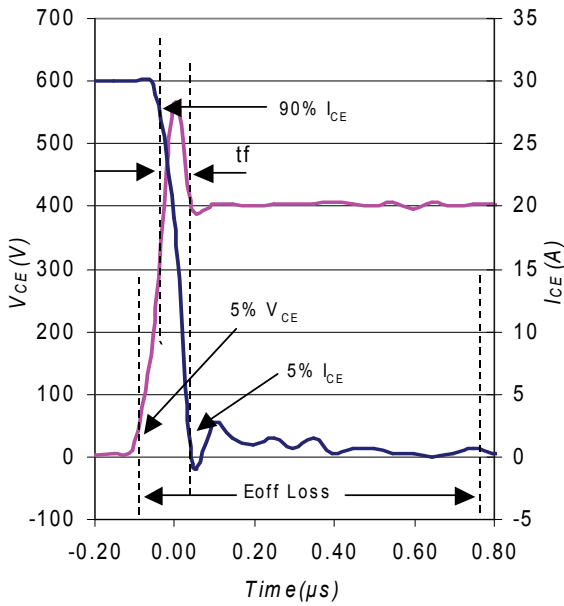


Fig. WF1 - Typ. Turn-off Loss Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.4

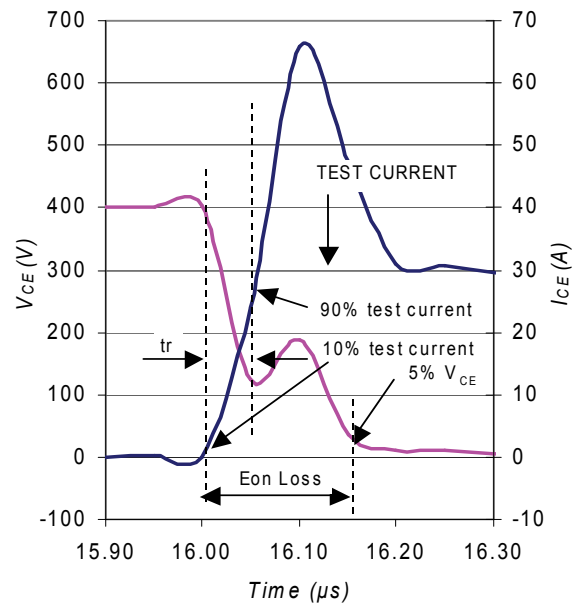


Fig. WF2 - Typ. Turn-on Loss Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.4

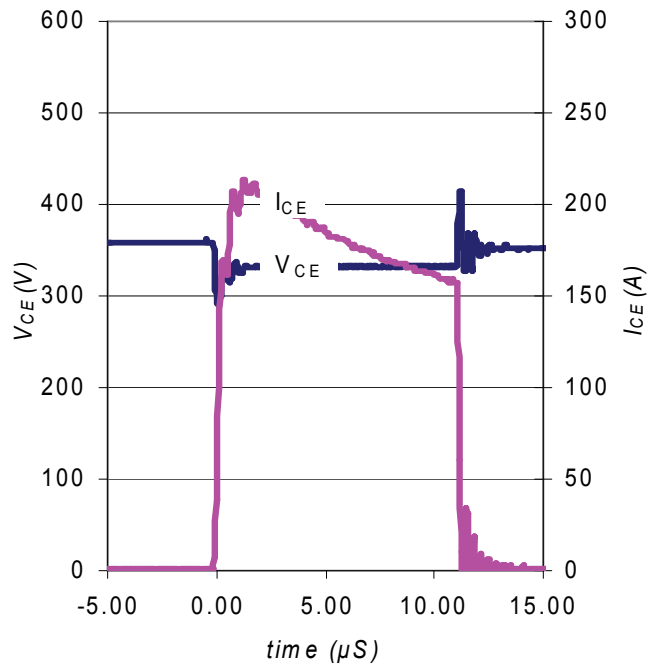
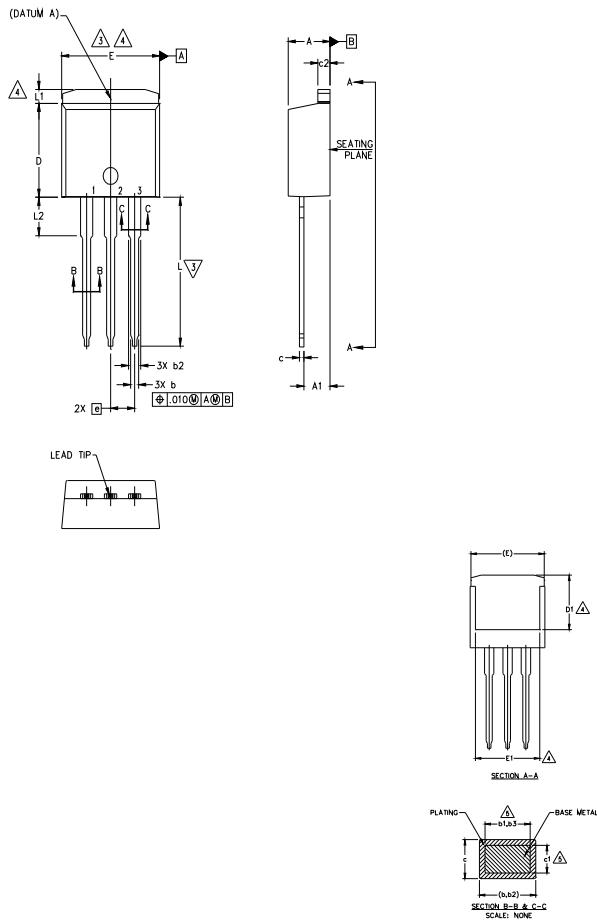


Fig. WF3 - Typ. S.C. Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.3

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

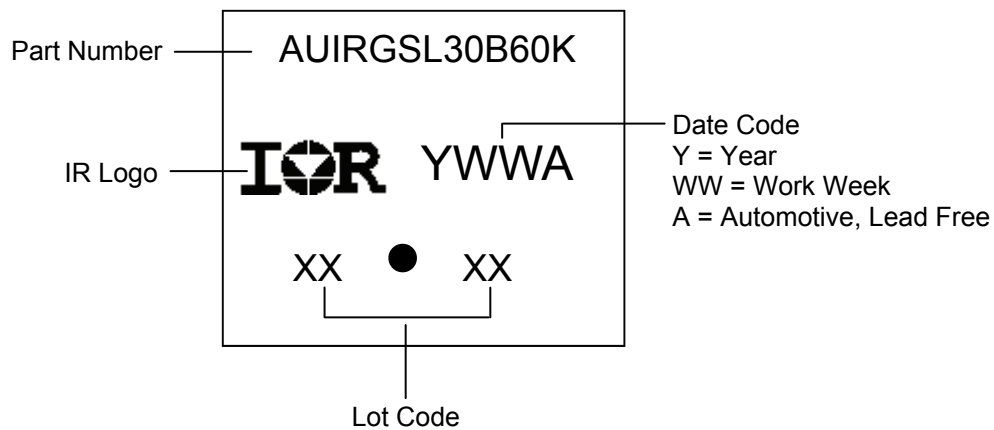
HEXFET

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

IGBTs, CoPACK

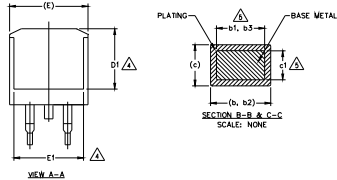
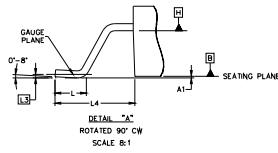
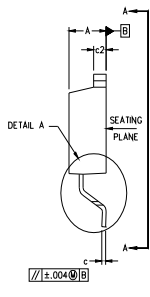
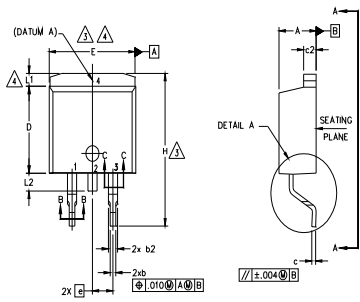
- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

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

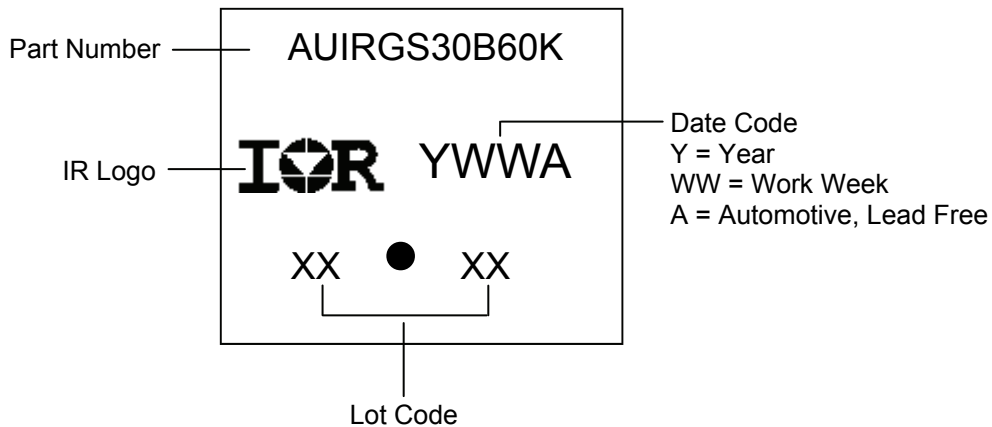
- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

DIODES

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

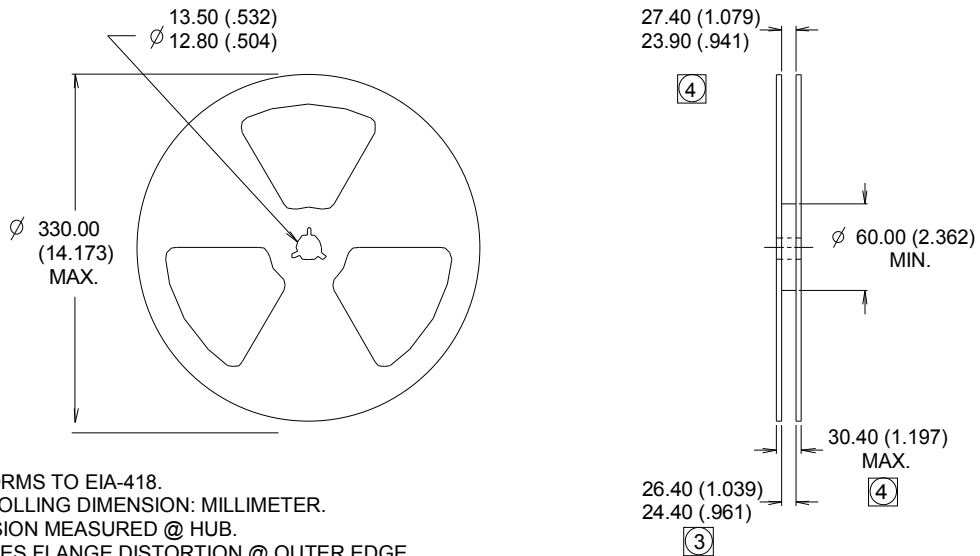
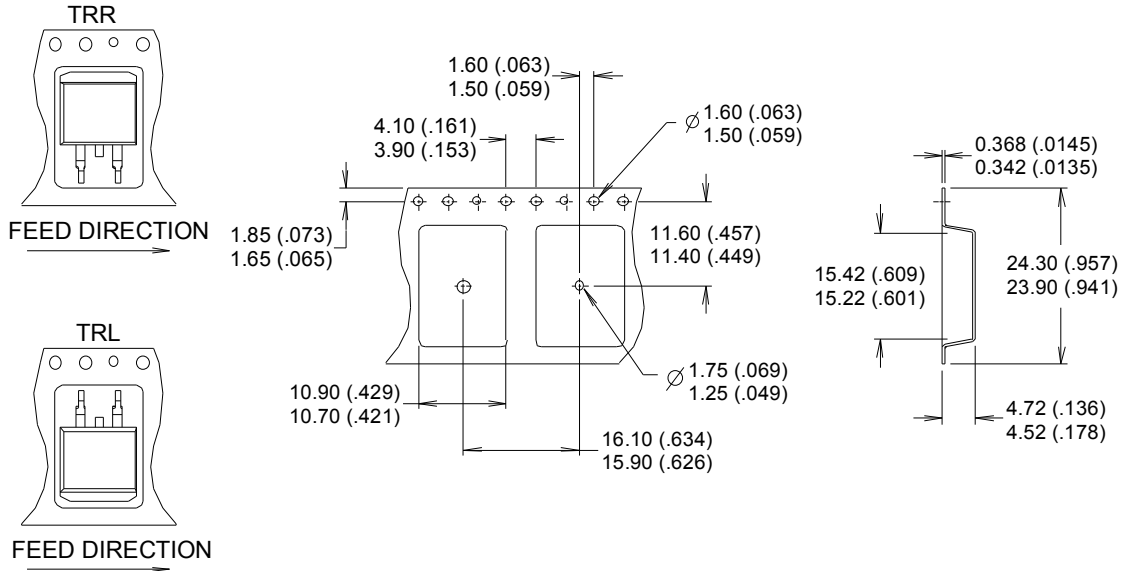
* PART DEPENDENT.

D2 Pak (TO-263AB) Part Marking Information



D2Pak Tape & Reel Information

(Dimensions are shown in millimeters (inches))



NOTES :

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

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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