

**Features**

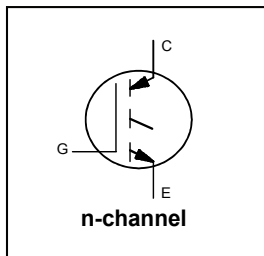
- Low  $V_{CE(on)}$  Planar IGBT Technology
- Low Switching Losses
- Square RBSOA
- 100% of The Parts Tested for ILM<sup>①</sup>
- Positive  $V_{CE(on)}$  Temperature Coefficient
- Reflow Capable per JDS22-A113
- Lead-Free, RoHS Compliant
- Automotive Qualified \*

**Benefits**

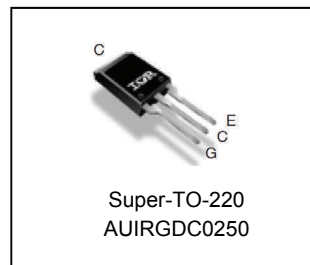
- Device optimized for soft switching applications
- High Efficiency due to Low  $V_{CE(on)}$ , low switching losses
- Rugged transient performance for increased reliability
- Excellent current sharing in parallel operation
- Low EMI

**Application**

- PTC Heater
- Relay Replacement



$V_{CES} = 1200V$   
 $I_C = 81A @ T_C = 100^{\circ}C$   
 $V_{CE(on)} \text{ typ.} = 1.37V @ 33A$



G	C	E
Gate	Collector	Emitter

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRGDC0250	Super-TO-220	Tube	50	AUIRGDC0250

**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  $25^{\circ}C$ , unless otherwise specified.

	Parameter	Max.	Units
$V_{CES}$	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^{\circ}C$	Continuous Collector Current	141 <sup>⑤</sup>	A
$I_C @ T_C = 100^{\circ}C$	Continuous Collector Current	81	
$I_{CM}$	Pulse Collector Current, $V_{GE} = 15V$ <sup>②</sup>	99	
$I_{LM}$	Clamped Inductive Load Current, $V_{GE} = 20V$ <sup>①</sup>	99	V
$V_{GE}$	Continuous Gate-to-Emitter Voltage	$\pm 20$	
	Transient Gate-to-Emitter Voltage	$\pm 30$	
$P_D @ T_C = 25^{\circ}C$	Maximum Power Dissipation	543	W
$P_D @ T_C = 100^{\circ}C$	Maximum Power Dissipation	217	
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	$^{\circ}C$
	Soldering Temperature, for 10 sec. (Through Hole Mounting)	300 (0.063 in. (1.6mm) from case)	

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance Junction-to-Case (each IGBT) <sup>④</sup>	—	0.23	$^{\circ}C/W$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface)	0.50	—	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (typical socket mount)	—	62	

\* Qualification standards can be found at [www.infineon.com](http://www.infineon.com)

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

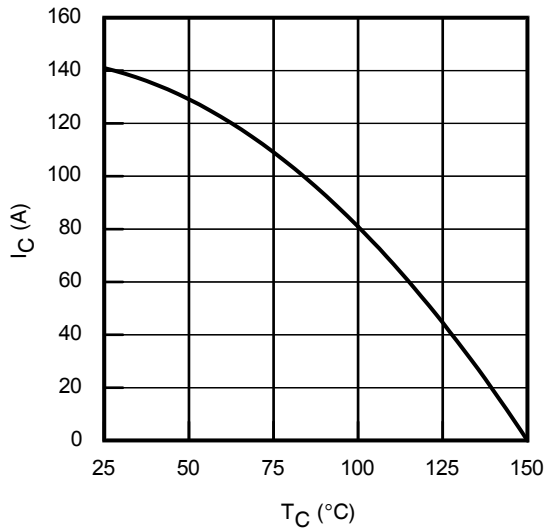
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	1200	—	—	V	$V_{GE} = 0V, I_C = 250\mu\text{A}$ ③
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	1.2	—	V/°C	$V_{GE} = 0V, I_C = 1\text{mA}$ (25°C-150°C)③
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.37	1.57	V	$I_C = 33A, V_{GE} = 15V, T_J = 25^\circ\text{C}$
		—	1.45	—		$I_C = 33A, V_{GE} = 15V, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0	V	$V_{CE} = V_{GE}, I_C = 250\mu\text{A}$
$\Delta V_{GE(th)}/\Delta T_J$	Threshold Voltage temp. coefficient	—	-15	—	mV/°C	$V_{CE} = V_{GE}, I_C = 250\mu\text{A}$ (25°C-150°C)
gfe	Forward Transconductance	—	30	—	S	$V_{CE} = 50V, I_C = 33A, PW = 20\mu\text{S}$
$I_{CES}$	Collector-to-Emitter Leakage Current	—	—	250	$\mu\text{A}$	$V_{GE} = 0V, V_{CE} = 1200V, T_J = 25^\circ\text{C}$
		—	—	1000		$V_{GE} = 0V, V_{CE} = 1200V, T_J = 150^\circ\text{C}$
$I_{GES}$	Gate-to-Emitter Leakage Current	—	—	$\pm 100$	nA	$V_{GE} = \pm 20V$

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

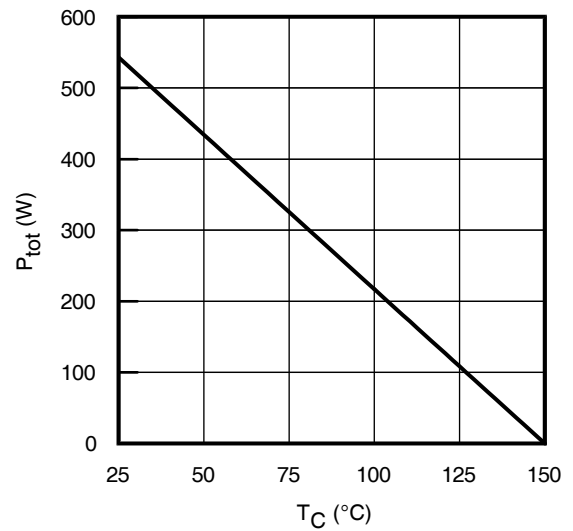
	Parameter	Min.	Typ.	Max.	Units	Conditions
$Q_g$	Total Gate Charge (turn-on)	—	151	227	nC	$I_C = 33A$ $V_{GE} = 15V$ $V_{CC} = 600V$
$Q_{ge}$	Gate-to-Emitter Charge (turn-on)	—	26	39		
$Q_{gc}$	Gate-to-Collector Charge (turn-on)	—	62	93		
$E_{off}$	Turn-Off Switching Loss	—	15	16	mJ	$I_C = 33A, V_{CC} = 600V, V_{GE} = 15V$
$t_{d(off)}$	Turn-Off delay time	—	485	616	ns	$R_G = 5\Omega, L = 400\mu\text{H}, T_J = 25^\circ\text{C}$ Energy losses include tail
$t_f$	Fall time	—	1193	1371		
$E_{off}$	Turn-Off Switching Loss	—	29	—	mJ	$I_C = 33A, V_{CC} = 600V, V_{GE} = 15V$
$t_{d(off)}$	Turn-Off delay time	—	689	—	ns	$R_G = 5\Omega, L = 400\mu\text{H}, T_J = 150^\circ\text{C}$ Energy losses include tail
$t_f$	Fall time	—	2462	—		
$C_{ies}$	Input Capacitance	—	3804	—	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ $f = 1.0\text{Mhz}$
$C_{oes}$	Output Capacitance	—	161	—		
$C_{res}$	Reverse Transfer Capacitance	—	31	—		
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				$T_J = 150^\circ\text{C}, I_C = 99A$ $V_{CC} = 960V, V_p \leq 1200V$ $R_g = 5\Omega, V_{GE} = +20V \text{ to } 0V$

**Notes:**

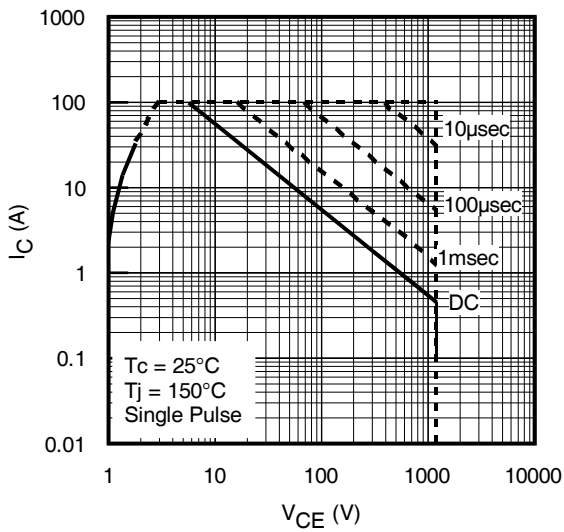
- ①  $V_{CC} = 80\% (V_{CES}), V_{GE} = 20V, L = 400\mu\text{H}, R_G = 5\Omega$ .
- ② Pulse width limited by max. junction temperature.
- ③ Refer to AN-1086 for guidelines for measuring  $V_{(BR)CES}$  safely.
- ④  $R_\theta$  is measured at  $T_J$  approximately  $90^\circ\text{C}$ .
- ⑤ Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 78A.  
Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements



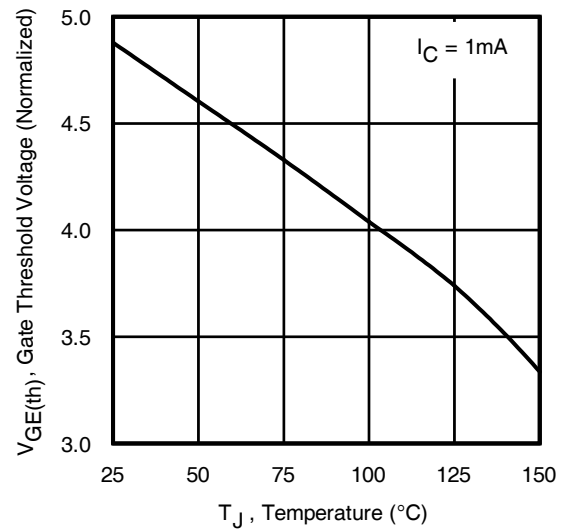
**Fig. 1** - Maximum DC Collector Current vs. Case Temperature



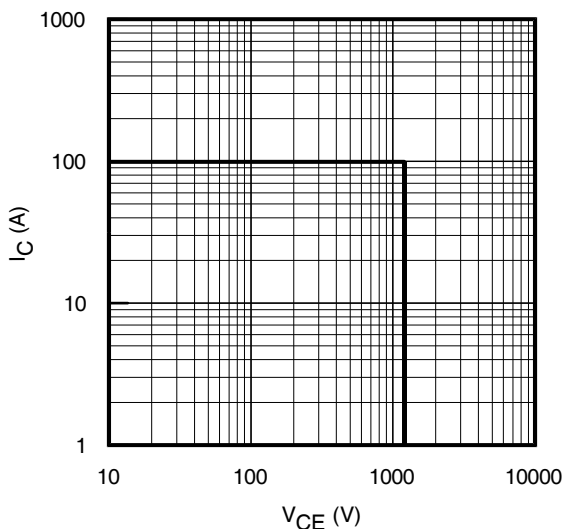
**Fig. 2** - Power Dissipation vs. Case Temperature



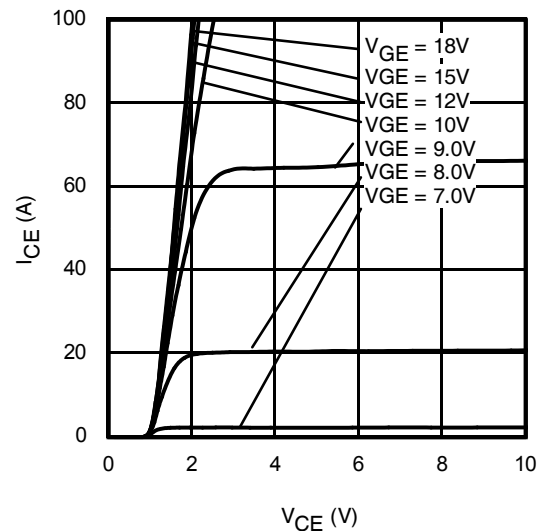
**Fig. 3** - Forward SOA  
 $T_C = 25^\circ\text{C}$ ,  $T_J \leq 150^\circ\text{C}$ ;  $V_{GE} = 15\text{V}$



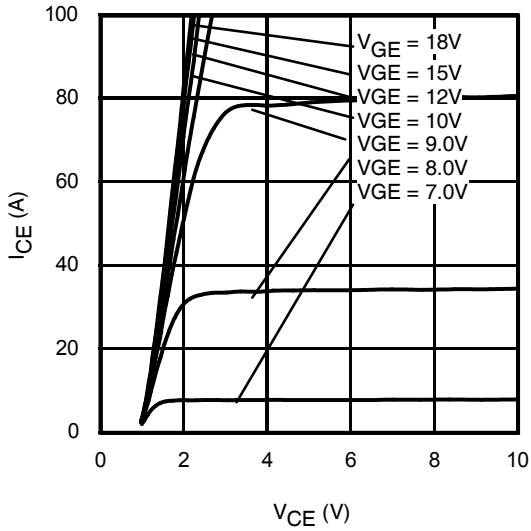
**Fig. 4** - Typical Gate Threshold Voltage (Normalized) vs. Junction Temperature



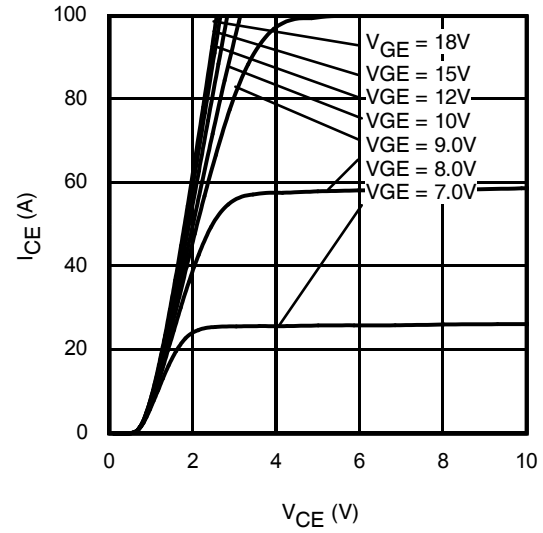
**Fig. 5** - Reverse Bias SOA  
 $T_J = 150^\circ\text{C}$ ;  $V_{GE} = 20\text{V}$



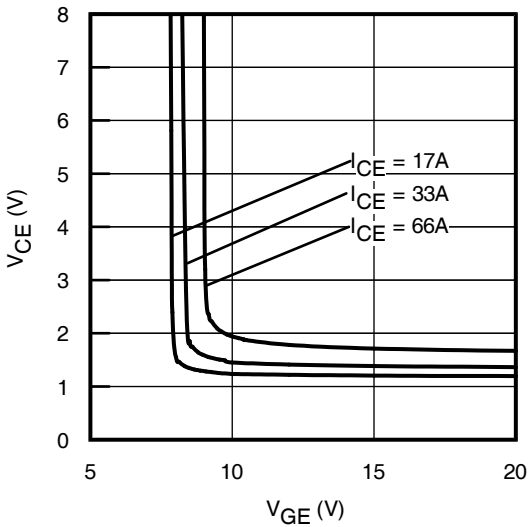
**Fig. 6** - Typ. IGBT Output Characteristics  
 $T_J = -40^\circ\text{C}$ ;  $t_p = 20\mu\text{s}$



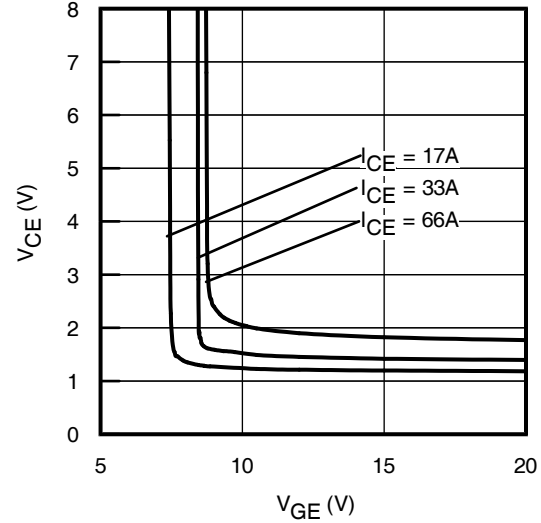
**Fig. 7 - Typ. IGBT Output Characteristics**  
 $T_J = 25^\circ\text{C}$ ;  $t_p = 20\mu\text{s}$



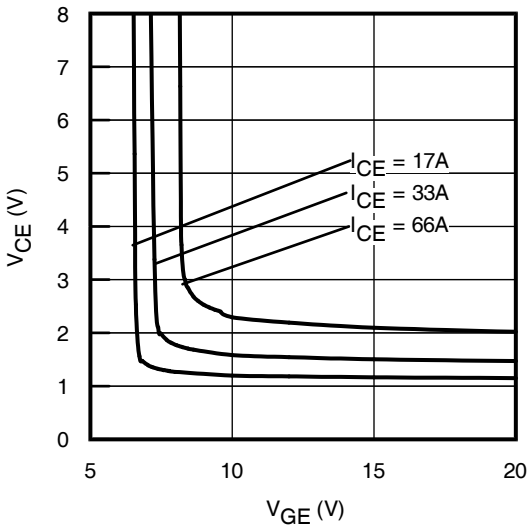
**Fig. 8 - Typ. IGBT Output Characteristics**  
 $T_J = 150^\circ\text{C}$ ;  $t_p = 20\mu\text{s}$



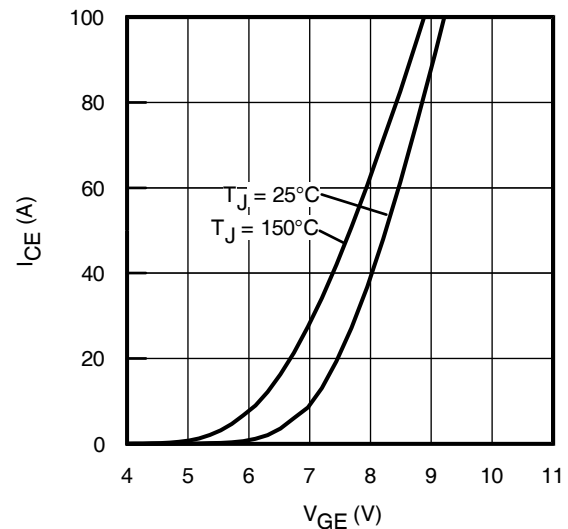
**Fig. 9 - Typical  $V_{CE}$  vs.  $V_{GE}$**   
 $T_J = -40^\circ\text{C}$



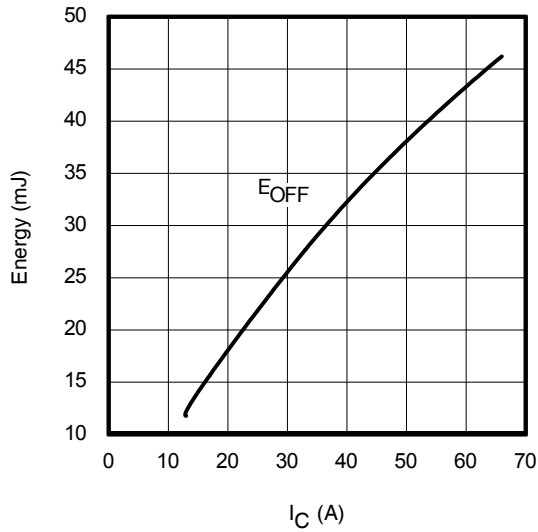
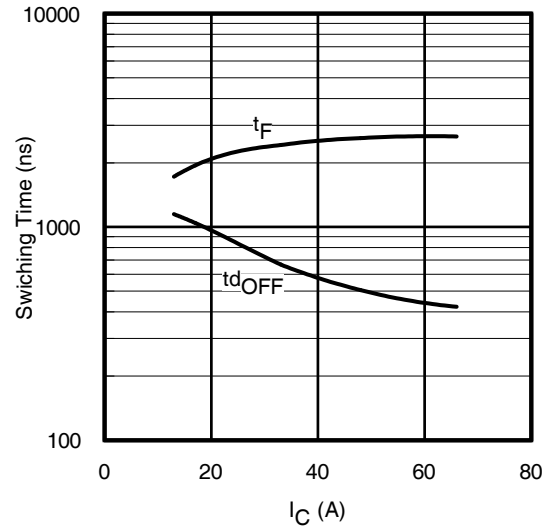
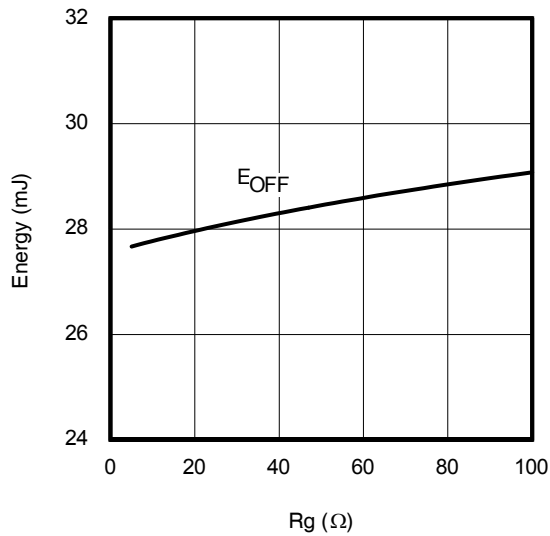
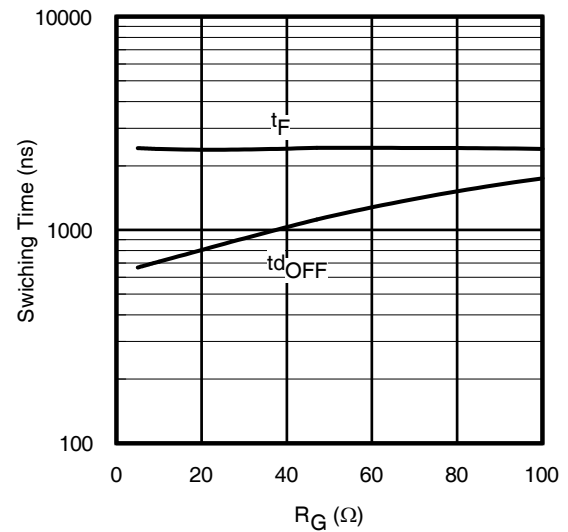
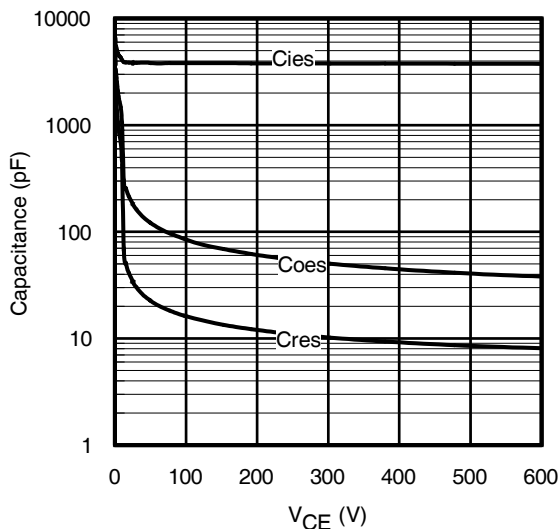
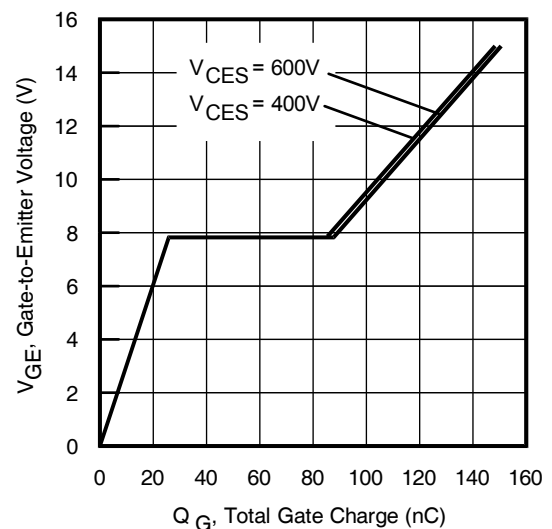
**Fig. 10 - Typical  $V_{CE}$  vs.  $V_{GE}$**   
 $T_J = 25^\circ\text{C}$

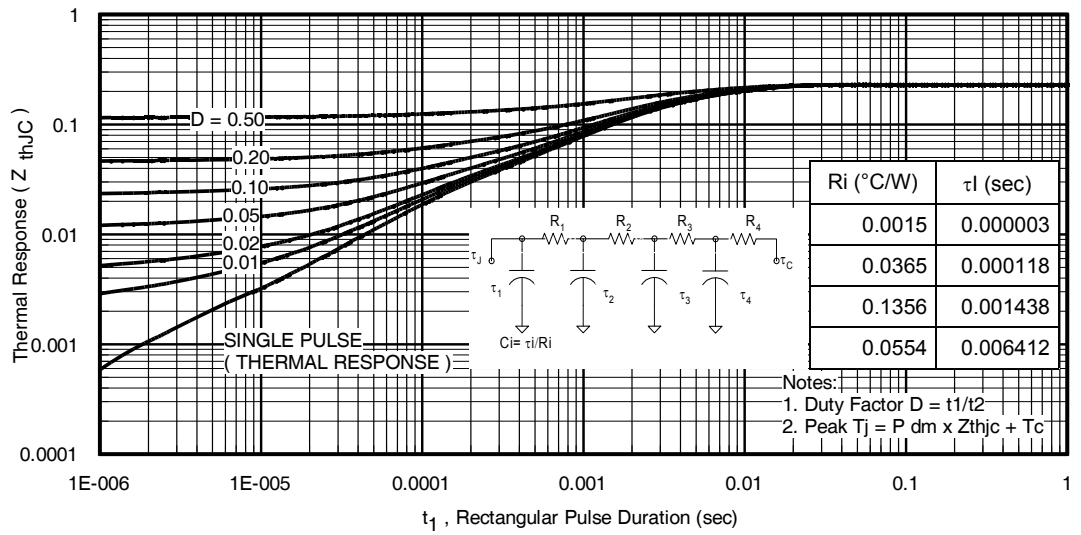


**Fig. 11 - Typical  $V_{CE}$  vs.  $V_{GE}$**   
 $T_J = 150^\circ\text{C}$

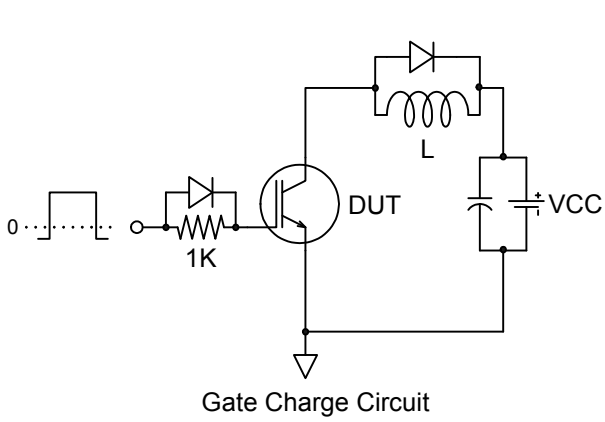
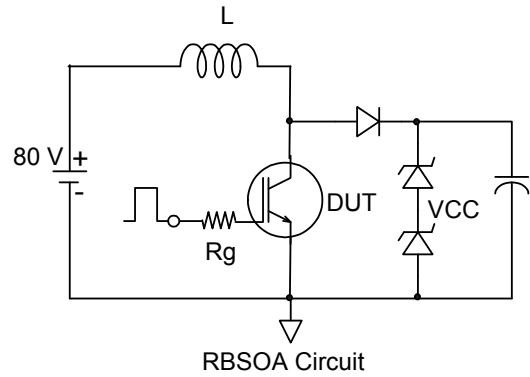
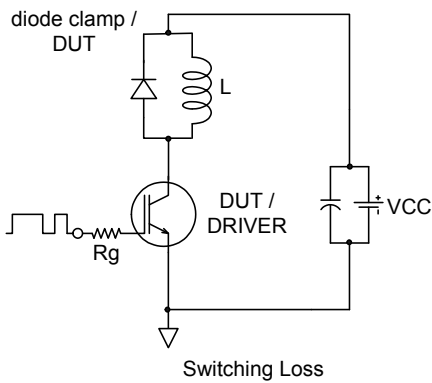
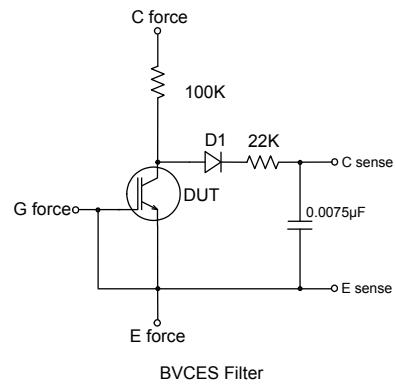
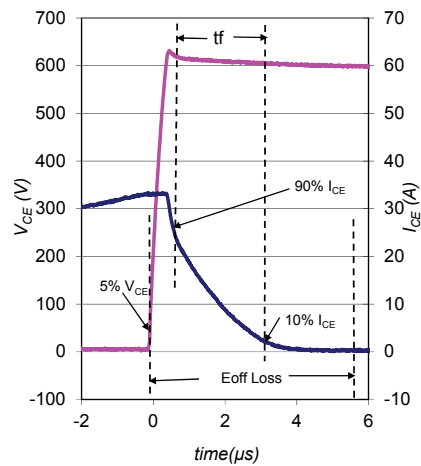


**Fig. 12 - Typ. Transfer Characteristics**  
 $V_{CE} = 50\text{V}$ ;  $t_p = 20\mu\text{s}$


**Fig. 13 - Typ. Energy Loss vs.  $I_C$** 
 $T_J = 150^\circ\text{C}; L = 400\mu\text{H}; V_{CE} = 600\text{V}, R_G = 5\Omega; V_{GE} = 15\text{V}$ 

**Fig. 14 - Typ. Switching Time vs.  $I_C$** 
 $T_J = 150^\circ\text{C}; L = 400\mu\text{H}; V_{CE} = 600\text{V}, R_G = 5\Omega; V_{GE} = 15\text{V}$ 

**Fig. 15 - Typ. Energy Loss vs.  $R_G$** 
 $T_J = 150^\circ\text{C}; L = 400\mu\text{H}; V_{CE} = 600\text{V}, I_{CE} = 33\text{A}; V_{GE} = 15\text{V}$ 

**Fig. 16 - Typ. Switching Time vs.  $R_G$** 
 $T_J = 150^\circ\text{C}; L = 400\mu\text{H}; V_{CE} = 600\text{V}, I_{CE} = 33\text{A}; V_{GE} = 15\text{V}$ 

**Fig. 17 - Typ. Capacitance vs.  $V_{CE}$**   
 $V_{GE} = 0\text{V}; f = 1\text{MHz}$ 

**Fig. 18 - Typical Gate Charge vs.  $V_{GE}$**   
 $I_{CE} = 33\text{A}; L = 2.0\text{mH}$

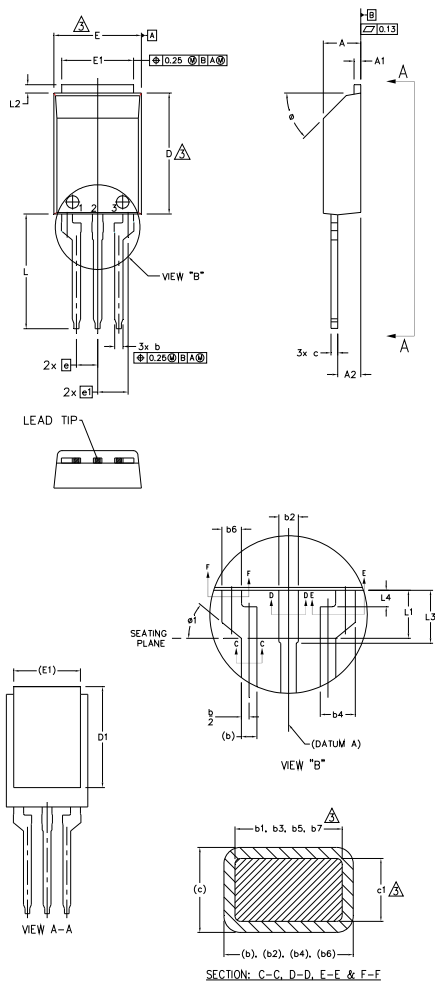


**Fig 19.** Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)


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

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

**Fig.C.T.3 - Switching Loss Circuit**

**Fig.C.T.4 - BVCES Filter Circuit**

**Fig. WF1 - Typ. Turn-off Loss Waveform**  
 @  $T_j = 150^{\circ}\text{C}$  using Fig. CT.3

# Super-TO-220 Package Outline

Dimensions are shown in millimeters (inches)



**NOTES:**

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M-1994
2. DIMENSIONS b1, b3, b5 & c1 APPLY TO BASE METAL ONLY.
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [,.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER EXTREMES OF THE PLASTIC BODY.
- 4.- ALL DIMENSIONS SHOWN IN MILLIMETERS.
- 5.- CONTROLLING DIMENSION: MILLIMETER.
- 6.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-273AA.

SYMBO L	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.34	4.74	.171	.187	
A1	0.50	1.00	.020	.039	
A2	2.50	3.00	.098	.118	
b	0.90	1.30	.035	.051	
b1	0.80	1.10	.031	.043	2
b2	1.25	1.65	.049	.065	
b3	1.10	1.55	.043	.061	2
b4	2.35	2.55	.093	.100	
b5	2.30	2.50	.091	.098	2
b6	1.25	1.65	.049	.065	
b7	1.10	1.55	.043	.061	2
c	0.70	1.00	.028	.039	
c1	0.60	0.90	.024	.035	2
D	14.00	15.00	.0551	.591	3
D1	12.50	13.50	.492	.531	
E	10.00	11.00	.394	.433	3
E1	8.00	9.00	.315	.354	
e	2.55 BSC		.100 BSC		
e1	3.66 BSC		.144 BSC		
L	13.00	14.50	.512	.571	
L1	3.00	3.50	.118	.138	
L2	0.50	1.50	.020	.059	
L3	3.50	4.00	.138	.157	
L4	-	1.50	-	.059	
ø	42.5*	47.5*	42.5*	47.5*	
ø1	-	42.5*	-	42.5*	

LEAD ASSIGNMENTS

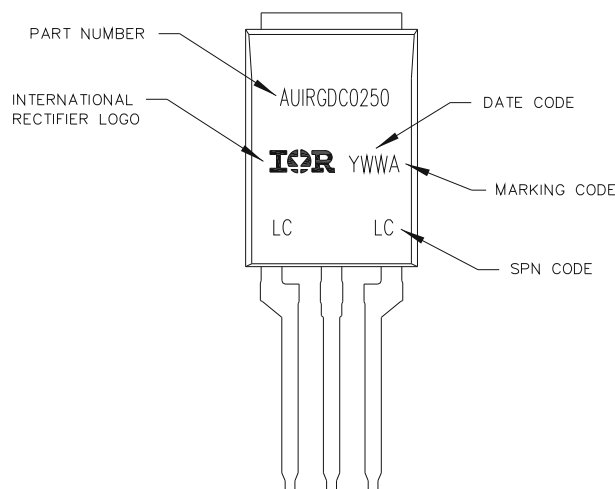
MOSFET

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

IGBT

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

## Super-TO-220 Part Marking Information





**Qualification Information**

<b>Qualification Level</b>		Automotive (per AEC-Q101)	
		Comments: This part number (s) passed Automotive qualification. Infineon's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
<b>Moisture Sensitivity Level</b>		3L– Super TO-220	N/A
<b>ESD</b>	Machine Model	Class M4 <sup>†</sup> (+/- 800V) AEC-Q101-002	
	Human Body Model	Class H3A <sup>†</sup> (+/- 6000V) AEC-Q101-001	
	Charged Device Model	Class C5 <sup>†</sup> (+/- 2000V) AEC-Q101-005	
<b>RoHS Compliant</b>		Yes	

† Highest passing voltage.

**Revision History**

Date	Comments
9/2/2014	<ul style="list-style-type: none"> <li>Updated datasheet with IR corporate template.</li> <li>Removed I<sub>c</sub> Nominal current on page 1.</li> <li>Updated package outline on page 9.</li> <li>Updated typo on switch time test condition from "25C" to "150C" on page 2.</li> </ul>
12/1/2014	<ul style="list-style-type: none"> <li>Updated Bvdss test condition from "100uA" to "250uA" on page 2.</li> <li>Updated V<sub>geth</sub> test condition from "1mA" to "250uA" on page 2.</li> <li>Updated V<sub>geth</sub> temp coefficient test condition from "1mA" to "250uA" and spec from "-12mV/C" to "-15mV/C" on page 2.</li> </ul>
3/2/2015	<ul style="list-style-type: none"> <li>Removed I<sub>CES</sub> = 2uA @ V<sub>CE</sub> = 10V on page 2.</li> </ul>
8/31/2017	<ul style="list-style-type: none"> <li>Changed datasheet with Infineon logo - all pages</li> <li>Corrected qual level from N/A to MSL1 &amp; added temp 245C -page 9.</li> <li>Updated Part Marking on page 8.</li> </ul>
03/01/2018	<ul style="list-style-type: none"> <li>Removed -Mounting Torque, 6-32 or M3 Screw –page1</li> <li>Corrected Soldering Temperature for 10 sec (Through Hole Mounting)-page1</li> <li>Corrected Moisture Sensitivity Level from "MSL1" to "N/A"-page9</li> </ul>

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