

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Features

- Low $V_{CE(on)}$ Trench IGBT Technology
- Low Switching Losses
- 5 μ s short circuit SOA
- Square RBSOA
- 100% of the parts tested for I_{LM} ①
- Positive $V_{CE(on)}$ Temperature Coefficient.
- Ultra Fast Soft Recovery Co-pak Diode
- Tighter Distribution of Parameters
- Lead-Free, RoHS Compliant
- Automotive Qualified *

Benefits

- High Efficiency in a Wide Range of Applications
- Suitable for a Wide Range of Switching Frequencies due to Low $V_{CE(ON)}$ and Low Switching Losses
- Rugged Transient Performance for Increased Reliability
- Excellent Current Sharing in Parallel Operation
- Low EMI

Applications

- Air Conditioning Compressor

n-channel

$V_{CES} = 600V$

$I_{C(Nominal)} = 24A$

$t_{SC} \geq 5\mu s, T_{J(max)} = 175^{\circ}C$

$V_{CE(on)} \text{ typ.} = 1.57V$

AUIRGB4062D1
TO-220AB

AUIRGS4062D1
D²Pak

AUIRGL4062D1
TO-262Pak

G	C	E
Gate	Collector	Emitter

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRGB4062D1	TO-220	Tube	50	AUIRGB4062D1
AUIRGL4062D1	TO-262	Tube	50	AUIRGL4062D1
AUIRGS4062D1	D² Pak	Tube	50	AUIRGS4062D1
		Tape and Reel Left	800	AUIRGS4062D1TRL
		Tape and Reel Right	800	AUIRGS4062D1TRR

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	59	A
$I_C @ T_C = 100^{\circ}C$	Continuous Collector Current	39	
$I_C (Nominal)$	Nominal Current	24	
I_{CM}	Pulse Collector Current $V_{GE} = 15V$	72	
I_{LM}	Clamped Inductive Load Current $V_{GE} = 20V$ ①	96	
$I_F @ T_C = 25^{\circ}C$	Diode Continuous Forward Current	59	
$I_F @ T_C = 100^{\circ}C$	Diode Continuous Forward Current	39	
I_{FM}	Maximum Repetitive Forward Current ②	96	V
V_{GE}	Continuous Gate-to-Emitter Voltage	± 20	
	Transient Gate-to-Emitter Voltage	± 30	
$P_D @ T_C = 25^{\circ}C$	Maximum Power Dissipation	246	W
$P_D @ T_C = 100^{\circ}C$	Maximum Power Dissipation	123	
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)	
	Mounting Torque, 6-32 or M3 Screw	10 lbf·in (1.1 N·m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance Junction-to-Case (IGBT) ③	—	—	0.61	°C/W
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case (Diode) ③	—	—	1.2	
$R_{\theta CS}$	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

Electrical Characteristics @ T_J = 25°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 = 100μA ^③
ΔV _{(BR)CES} /ΔT _J	Temperature Coeff. of Breakdown Voltage	—	0.3	—	V/°C	V _{GE} = 0V, I _C = 10mA (25°C-175°C)
V _{CE(on)}	Collector-to-Emitter Saturation Voltage	—	1.57	1.77	V	I _C = 24A, V _{GE} = 15V, T _J = 25°C
		—	1.87	—		I _C = 24A, V _{GE} = 15V, T _J = 150°C
		—	1.94	—		I _C = 24A, V _{GE} = 15V, T _J = 175°C
V _{GE(th)}	Gate Threshold Voltage	4.0	—	6.5	V	V _{CE} = V _{GE} , I _C = 700μA
ΔV _{GE(th)} /ΔT _J	Threshold Voltage temp. coefficient	—	-17	—	mV/°C	V _{CE} = V _{GE} , I _C = 1.0mA (25°C-175°C)
g _{fe}	Forward Transconductance	—	12	—	S	V _{CE} = 50V, I _C = 24A, PW = 20μs
I _{CES}	Collector-to-Emitter Leakage Current	—	1.0	25	μA	V _{GE} = 0V, V _{CE} = 600V
		—	3.5	—	mA	V _{GE} = 0V, V _{CE} = 600V, T _J = 175°C
V _{FM}	Diode Forward Voltage Drop	—	1.57	—	V	I _F = 24A
		—	1.40	—		I _F = 19A
		—	1.47	—		I _F = 24A, 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
Q _g	Total Gate Charge (turn-on)	—	51	77	nC	I _C = 24A
Q _{ge}	Gate-to-Emitter Charge (turn-on)	—	14	21		V _{GE} = 15V
Q _{gc}	Gate-to-Collector Charge (turn-on)	—	21	32		V _{CC} = 400V
E _{on}	Turn-On Switching Loss	—	532	754	μJ	I _C = 24A, V _{CC} = 400V, V _{GE} = +15V, R _G = 10Ω, L = 210μH, T _J = 25°C
E _{off}	Turn-Off Switching Loss	—	311	526		
E _{total}	Total Switching Loss	—	843	1280		
t _{d(on)}	Turn-On delay time	—	19	36	ns	Energy losses include tail & diode reverse recovery
t _r	Rise time	—	24	41		
t _{d(off)}	Turn-Off delay time	—	90	109		
t _f	Fall time	—	23	40		
E _{on}	Turn-On Switching Loss	—	726	—	μJ	I _C = 24A, V _{CC} = 400V, V _{GE} = +15V, R _G = 10Ω, L = 210μH, T _J = 175°C ^③
E _{off}	Turn-Off Switching Loss	—	549	—		
E _{total}	Total Switching Loss	—	1275	—		
t _{d(on)}	Turn-On delay time	—	12	—	ns	Energy losses include tail & diode reverse recovery
t _r	Rise time	—	23	—		
t _{d(off)}	Turn-Off delay time	—	92	—		
t _f	Fall time	—	84	—		
C _{ies}	Input Capacitance	—	1487	—	pF	V _{GE} = 0V V _{CC} = 30V f = 1.0Mhz
C _{oes}	Output Capacitance	—	118	—		
C _{res}	Reverse Transfer Capacitance	—	44	—		
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T _J = 175°C, I _C = 96A V _{CC} = 480V, V _p ≤ 600V R _g = 10Ω, V _{GE} = +20V to 0V
SCSOA	Short Circuit Safe Operating Area	5	—	—	μs	V _{CC} = 400V, V _p ≤ 600V R _g = 10Ω, V _{GE} = +15V to 0V
E _{rec}	Reverse Recovery Energy of the Diode	—	773	—	μJ	T _J = 175°C
t _{rr}	Diode Reverse Recovery Time	—	102	—	ns	V _{CC} = 400V, I _F = 24A, V _{GE} = 15V,
I _{rr}	Peak Reverse Recovery Current	—	32	—	A	R _G = 10Ω, L = 210μH

Notes:

- ① V_{CC} = 80% (V_{CES}), V_{GE} = 20V, L = 210μH, R_G = 50Ω.
- ② Pulse width limited by max. junction temperature.
- ③ R_θ is measured at T_J of approximately 90°C.
- ④ Maximum limits are based on statistical sample size characterization.