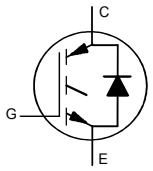
INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Features

- Low $V_{CE\ (on)}$ Trench IGBT Technology
- Low Switching Losses
- 5µs SCSOA
- Square RBSOA
- 100% of The Parts Tested for ILM①
- Positive $V_{CE\ (on)}$ Temperature Coefficient.
- Ultra Fast Soft Recovery Co-pak Diode
- Tighter Distribution of Parameters
- Lead-Free, RoHS Compliant
- Automotive Qualified *



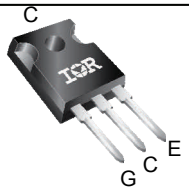
n-channel

V_{CES} = 600V

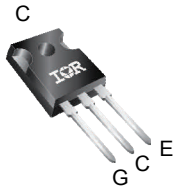
I_C = 24A, T_C = 100°C

$t_{SC} \geq$ 5µs, $T_{J(max)}$ = 175°C

$V_{CE(on)}$ typ. = 1.60V



TO-247AC
AUIRGP4062D



TO-247AD
AUIRGP4062D-E

G	C	E
Gate	Collector	Emitter

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

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRGP4062D	TO-247AC	Tube	25	AUIRGP4062D
AUIRGP4062D-E	TO-247AD	Tube	25	AUIRGP4062D-E

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°C	Continuous Collector Current	48	A
I_C @ T_C = 100°C	Continuous Collector Current	24	
I_{CM}	Pulse Collector Current V_{GE} =15V	72	
I_{LM}	Clamped Inductive Load Current V_{GE} =20V①	96	
I_F @ T_C = 25°C	Diode Continuous Forward Current	48	
I_F @ T_C = 100°C	Diode Continuous Forward Current	24	
I_{FSM}	Maximum Repetitive Forward Current ③	96	
V_{GE}	Continuous Gate-to-Emitter Voltage	±20	V
	Transient Gate-to-Emitter Voltage	±30	
P_D @ T_C = 25°C	Maximum Power Dissipation	250	W
P_D @ T_C = 100°C	Maximum Power Dissipation	125	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +175	°C
	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 (each IGBT) TO-247	——	——	0.65	°C/W
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case (each Diode) TO-247	——	——	1.62	
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface) TO-247	——	0.24	——	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (typical socket mount) TO-247	——	40	——	

* 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.
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 100µA④	CT6
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.30	—	V/°C	V_{GE} = 0V, I_C = 1mA (25°C-175°C)	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.60	1.95	V	I_C = 24A, V_{GE} = 15V, T_J = 25°C	5,6,7
		—	2.03	—		I_C = 24A, V_{GE} = 15V, T_J = 150°C	9,10,11
		—	2.04	—		I_C = 24A, V_{GE} = 15V, T_J = 175°C	
$V_{GE(th)}$	Gate Threshold Voltage	4.0	—	6.5	V	I_C = 700µA	9,10,
$\Delta V_{GE(th)}/\Delta TJ$	Threshold Voltage temp. coefficient	—	-18	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA (25°C-175°C)	11,12
gfe	Forward Transconductance	—	17	—	S	V_{CE} = 50V, I_C = 24A,PW = 80µs	
I_{CES}	Collector-to-Emitter Leakage Current	—	2.0	25	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	775	—		V_{GE} = 0V, V_{CE} = 600V,T_J = 175°C	
V_{FM}	Diode Forward Voltage Drop	—	1.80	2.6	V	I_F = 24A	8
		—	1.28			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	Ref. Fig.
Q_g	Total Gate Charge (turn-on)	—	50	75	nC	I_C = 24A	24
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	13	20		V_{GE} = 15V	CT1
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	21	31		V_{CC} = 400V	
E_{on}	Turn-On Switching Loss	—	115	201	µJ		
E_{off}	Turn-Off Switching Loss	—	600	700			
E_{total}	Total Switching Loss	—	715	901		I_C = 24A, V_{CC} = 400V,	
$t_{d(on)}$	Turn-On delay time	—	41	53	ns	V_{GE} = +15V,T_J = 25°C	CT4
t_r	Rise time	—	22	31		R_G = 10Ω, L = 200µH,L_S = 150nH ,	
$t_{d(off)}$	Turn-Off delay time	—	104	115		Energy losses include tail & diode	
t_f	Fall time	—	29	41		reverse recovery	
E_{on}	Turn-On Switching Loss	—	420	—	µJ		13,15, CT4 WF1,WF2
E_{off}	Turn-Off Switching Loss	—	840	—			
E_{total}	Total Switching Loss	—	1260	—		I_C = 24A, V_{CC} = 400V,	
$t_{d(on)}$	Turn-On delay time	—	40	—	ns	V_{GE} = +15V,T_J = 175°C ④	14,16 CT4 WF1 WF2
t_r	Rise time	—	24	—		R_G = 10Ω, L = 200µH, L_S = 150nH	
$t_{d(off)}$	Turn-Off delay time	—	125	—		Energy losses include tail & diode	
t_f	Fall time	—	39	—		reverse recovery	
C_{ies}	Input Capacitance	—	1490	—	pF	V_{GE} = 0V	23
C_{oes}	Output Capacitance	—	129	—		V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	45	—		f = 1.0Mhz	
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 175°C, I_C = 96A V_{CC} = 480V, Vp = 600V Rg = 10Ω, V_{GE} = +20V to 0V	4 CT2
SCSOA	Short Circuit Safe Operating Area	5	—	—	µs	V_{CC} = 400V, Vp = 600V Rg = 10Ω, V_{GE} = +15V to 0V	22,CT3 WF4
E_{rec}	Reverse Recovery Energy of the Diode	—	624	—	µJ	T_J = 175°C	17,18,19,
t_{rr}	Diode Reverse Recovery Time	—	89	—	ns	V_{CC} = 400V,I_F = 24A,V_{GE} = 15V,	20,21
I_{rr}	Peak Reverse Recovery Current	—	37	—	A	R_G = 10Ω, L = 200µH,L_S = 150nH	WF3

Notes:

① V_{CC} = 80% (V_{CES}), V_{GE} = 20V, L = 100µH, R_G = 10Ω.
② This is only applied to TO-220AB package.
③ Pulse width limited by max. junction temperature.
④ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely.