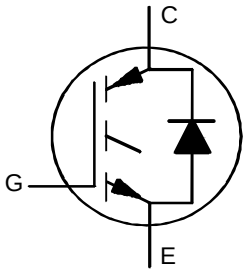
International
IOR Rectifier

IRGP4068DPbF
IRGP4068D-EPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRA-LOW VF DIODE FOR INDUCTION HEATING AND SOFT SWITCHING APPLICATIONS

Features

- Low $V_{CE\ (ON)}$ Trench IGBT Technology
- Low Switching Losses
- Maximum Junction temperature 175 °C
- 5 µS short circuit SOA
- Square RBSOA
- 100% of the parts tested for I_{LM} ①
- Positive $V_{CE\ (ON)}$ Temperature co-efficient
- Ultra-low V_F Hyperfast Diode
- Tight parameter distribution
- Lead Free Package



n-channel

V_{CES} = 600V

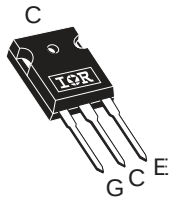
I_C = 48A, T_C = 100°C

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

$V_{CE(on)}$ typ. = 1.65V

Benefits

- Device optimized for induction heating and soft switching applications
- High Efficiency due to Low $V_{CE(on)}$, Low Switching Losses and Ultra-low V_F
- Rugged transient Performance for increased reliability
- Excellent Current sharing in parallel operation
- Low EMI



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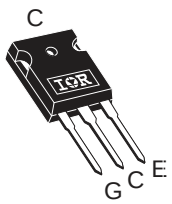

TO-247AD
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G	C	E
Gate	Collector	Emitter

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	96	A
I_C @ T_C = 100°C	Continuous Collector Current	48	
I_{CM}	Pulse Collector Current, V_{GE} = 15V	144	
I_{LM}	Clamped Inductive Load Current, V_{GE} = 20V ①	192	
I_F @ T_C = 160°C	Diode Continous Forward Current ⑤	8.0	
I_{FSM}	Diode Non Repetitive Peak Surge Current @ T_J = 25°C ②⑤	175	
I_{FRM} @Tc = 100°C	Diode Repetitive Peak Forward Current at tp=10µs ②④	100	
V_{GE}	Continuous Gate-to-Emitter Voltage	±20	V
	Transient Gate-to-Emitter Voltage	±30	
P_D @ T_C = 25°C	Maximum Power Dissipation	330	W
P_D @ T_C = 100°C	Maximum Power Dissipation	170	
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)	—	—	0.45	°C/W
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case-(each Diode)	—	—	2.0	
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface)	—	0.24	—	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (typical socket mount)	—	—	40	

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 = 100µA ③	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)	CT6
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.65	2.14	V	I_C = 48A, V_{GE} = 15V, T_J = 25°C	4,5,6
		—	2.0	—		I_C = 48A, V_{GE} = 15V, T_J = 150°C	8,9,10
		—	2.05	—		I_C = 48A, V_{GE} = 15V, T_J = 175°C	
$V_{GE(th)}$	Gate Threshold Voltage	4.0	—	6.5	V	V_{CE} = V_{GE}, I_C = 1.4mA	8,9,10,11,20
gfe	Forward Transconductance	—	32	—	S	V_{CE} = 50V, I_C = 48A, PW = 80µs	
I_{CES}	Collector-to-Emitter Leakage Current	—	1.0	150	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	450	1000		V_{GE} = 0V, V_{CE} = 600V, T_J = 175°C	
V_{FM}	Diode Forward Voltage Drop	—	0.96	1.05	V	I_F = 8.0A	7
		—	0.81	0.86		I_F = 8.0A, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ±20V	

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig
Q_g	Total Gate Charge (turn-on)	—	95	140	nC	I_C = 48A	18
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	28	42		V_{GE} = 15V	CT1
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	35	53		V_{CC} = 400V	
E_{off}	Turn-Off Switching Loss	—	1275	1481	µJ	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V R_G = 10Ω, L = 200µH,T_J = 25°C Energy losses include tail	CT4
$t_{d(off)}$	Turn-Off delay time	—	145	176	ns	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V	
t_f	Fall time	—	35	46		R_G = 10Ω, L = 200µH,T_J = 25°C	
E_{off}	Turn-Off Switching Loss	—	1585	—	µJ	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V R_G = 10Ω, L = 200µH,T_J = 175°C Energy losses include tail	CT4
$t_{d(off)}$	Turn-Off delay time	—	165	—	ns	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V	WF1
t_f	Fall time	—	45	—		R_G=10Ω, L=200µH, T_J = 175°C	
C_{ies}	Input Capacitance	—	3025	—	pF	V_{GE} = 0V	17
C_{oes}	Output Capacitance	—	245	—		V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	90	—		f = 1.0Mhz	
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 175°C, I_C = 192A V_{CC} = 480V, Vp =600V Rg = 10Ω, V_{GE} = +20V to 0V	3 CT2
SCSOA	Short Circuit Safe Operating Area	5	—	—	µs	V_{CC} = 400V, Vp =600V Rg = 10Ω, V_{GE} = +15V to 0V	16, CT3 WF2

Notes:

① V_{CC} = 80% (V_{CES}), V_{GE} = 20V, L = 200µH, R_G = 10Ω.

② Pulse width limited by max. junction temperature.

③ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely.

④ fsw = 20KHz, refer to figure 19.

⑤ Sinusoidal half wave, t=10ms.