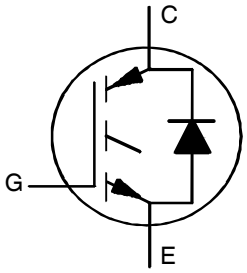
IRGP4063DPbF
IRGP4063D-EPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

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 4X rated current (I_{LM})
- Positive $V_{CE\ (ON)}$ Temperature co-efficient
- Ultra fast soft Recovery Co-Pak Diode
- Tight parameter distribution
- Lead Free Package



n-channel

V_{CES} = 600V

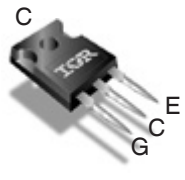
I_C = 48A, T_C = 100°C

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

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

Benefits

- 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



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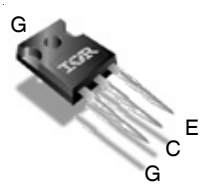

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G	C	E
Gate	Collector	Emitter

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	200	
I_{LM}	Clamped Inductive Load Current ①	192	
I_F @ T_C = 25°C	Diode Continous Forward Current	96	
I_F @ T_C = 100°C	Diode Continous Forward Current	48	
I_{FM}	Diode Maximum Forward Current ③	192	
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)	—	—	0.92	
$R_{\theta CS}$	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 = 150µA ④	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	5,6,7
		—	2.0	—		I_C = 48A, V_{GE} = 15V, T_J = 150°C	9,10,11
		—	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	9, 10,
$\Delta V_{GE(th)}/\Delta TJ$	Threshold Voltage temp. coefficient	—	-21	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA (25°C - 175°C)	11, 12
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	—	1.95	2.91	V	I_F = 48A	8
		—	1.45	—		I_F = 48A, T_J = 175°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	24
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_{on}	Turn-On Switching Loss	—	625	1141	µJ	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V	CT4
E_{off}	Turn-Off Switching Loss	—	1275	1481		R_G = 10Ω, L = 200µH, L_S = 150nH, T_J = 25°C	
E_{total}	Total Switching Loss	—	1900	2622		Energy losses include tail & diode reverse recovery	
$t_{d(on)}$	Turn-On delay time	—	60	78	ns	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V	CT4
t_r	Rise time	—	40	56		R_G = 10Ω, L = 200µH, L_S = 150nH, T_J = 25°C	
$t_{d(off)}$	Turn-Off delay time	—	145	176			
t_f	Fall time	—	35	46			
E_{on}	Turn-On Switching Loss	—	1625	—	µJ	I_C = 48A, V_{CC} = 400V, V_{GE}=15V	13, 15
E_{off}	Turn-Off Switching Loss	—	1585	—		R_G=10Ω, L=200µH, L_S=150nH, T_J = 175°C ④	CT4
E_{total}	Total Switching Loss	—	3210	—		Energy losses include tail & diode reverse recovery	WF1, WF2
$t_{d(on)}$	Turn-On delay time	—	55	—	ns	I_C = 48A, V_{CC} = 400V, V_{GE} = 15V	14, 16
t_r	Rise time	—	45	—		R_G = 10Ω, L = 200µH, L_S = 150nH	CT4
$t_{d(off)}$	Turn-Off delay time	—	165	—		T_J = 175°C	WF1
t_f	Fall time	—	45	—			WF2
C_{ies}	Input Capacitance	—	3025	—	pF	V_{GE} = 0V	23
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	4
						V_{CC} = 480V, Vp =600V	CT2
						Rg = 10Ω, V_{GE} = +15V to 0V	
SCSOA	Short Circuit Safe Operating Area	5	—	—	µs	V_{CC} = 400V, Vp =600V	22, CT3
						Rg = 10Ω, V_{GE} = +15V to 0V	WF4
Erec	Reverse Recovery Energy of the Diode	—	845	—	µJ	T_J = 175°C	17, 18, 19
t_{rr}	Diode Reverse Recovery Time	—	115	—	ns	V_{CC} = 400V, I_F = 48A	20, 21
I_{rr}	Peak Reverse Recovery Current	—	40	—	A	V_{GE} = 15V, Rg = 10Ω, L =200µH, L_s = 150nH	WF3

Notes:

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

② This is only applied to TO-247AC package.

③ Pulse width limited by max. junction temperature.

④ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely.

