International
IOR Rectifier

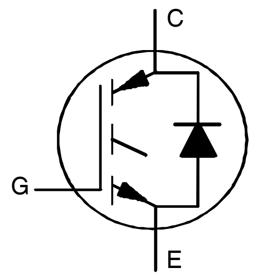
PD-96288

IRG7PH35UDPbF
IRG7PH35UD-EP

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Features

- Low $V_{CE\,(ON)}$ trench IGBT technology
- Low switching losses
- Square RBSOA
- 100% of the parts tested for I_{LM} [1]
- Positive $V_{CE\,(ON)}$ temperature co-efficient
- Ultra fast soft recovery co-pak diode
- Tight parameter distribution
- Lead-Free



n-channel

V_{CES} = 1200V

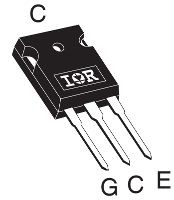
$I_{NOMINAL}$ = 20A

$T_{J(max)}$ = 150°C

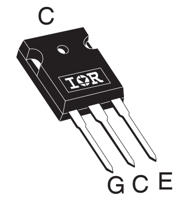
$V_{CE(on)}$ typ. = 1.9V

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



TO-247AC
IRG7PH35UDPbF



TO-247AD
IRG7PH35UD-EP

G	C	E
Gate	Collector	Emitter

Applications

- U.P.S.
- Welding
- Solar Inverter
- Induction Heating

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	50	A
I_C @ T_C = 100°C	Continuous Collector Current	25	
$I_{NOMINAL}$	Nominal Current	20	
I_{CM}	Pulse Collector Current, V_{GE}=15V	60	
I_{LM}	Clamped Inductive Load Current, V_{GE}=20V [1]	80	
I_F @ T_C = 25°C	Diode Continous Forward Current	50	
I_F @ T_C = 100°C	Diode Continous Forward Current	25	
I_{FM}	Diode Maximum Forward Current [2]	80	
V_{GE}	Continuous Gate-to-Emitter Voltage	±30	V
P_D @ T_C = 25°C	Maximum Power Dissipation	180	W
P_D @ T_C = 100°C	Maximum Power Dissipation	70	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°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) [4]	–––	–––	0.70	°C/W
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case-(each Diode)	–––	–––	0.65	
$R_{\theta CS}$	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
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	1200	—	—	V	V_{GE} = 0V, I_C = 250μA ③
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	1.2	—	V/°C	V_{GE} = 0V, I_C = 1mA (25°C-150°C)
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.9	2.2	V	I_C = 20A, V_{GE} = 15V, T_J = 25°C
		—	2.3	—		I_C = 20A, V_{GE} = 15V, T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0	V	V_{CE} = V_{GE}, I_C = 600μA
$\Delta V_{GE(th)}/\Delta TJ$	Threshold Voltage temp. coefficient	—	-16	—	mV/°C	V_{CE} = V_{GE}, I_C = 600μA (25°C - 150°C)
gfe	Forward Transconductance	—	22	—	S	V_{CE} = 50V, I_C = 20A, PW = 30μs
I_{CES}	Collector-to-Emitter Leakage Current	—	2.0	100	μA	V_{GE} = 0V, V_{CE} = 1200V
		—	2000	—		V_{GE} = 0V, V_{CE} = 1200V, T_J = 150°C
V_{FM}	Diode Forward Voltage Drop	—	2.8	3.6	V	I_F = 20A
		—	2.5	—		I_F = 20A, T_J = 150°C
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ±30V

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	85	130	nC	I_C = 20A
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	15	20		V_{GE} = 15V
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	35	50		V_{CC} = 600V
E_{on}	Turn-On Switching Loss	—	1060	1300	μJ	I_C = 20A, V_{CC} = 600V, V_{GE} = 15V
E_{off}	Turn-Off Switching Loss	—	620	850		R_G = 10Ω, L = 200uH, L_S = 150nH, T_J = 25°C
E_{total}	Total Switching Loss	—	1680	2150		Energy losses include tail & diode reverse recovery
$t_{d(on)}$	Turn-On delay time	—	30	50	ns	I_C = 20A, V_{CC} = 600V, V_{GE} = 15V
t_r	Rise time	—	15	30		R_G = 10Ω, L = 200uH, L_S = 150nH, T_J = 25°C
$t_{d(off)}$	Turn-Off delay time	—	160	180		
t_f	Fall time	—	80	105		
E_{on}	Turn-On Switching Loss	—	1750	—	μJ	I_C = 20A, V_{CC} = 600V, V_{GE}=15V
E_{off}	Turn-Off Switching Loss	—	1120	—		R_G=10Ω, L=200uH, L_S=150nH, T_J = 150°C ③
E_{total}	Total Switching Loss	—	2870	—		Energy losses include tail & diode reverse recovery
$t_{d(on)}$	Turn-On delay time	—	30	—	ns	I_C = 20A, V_{CC} = 600V, V_{GE} = 15V
t_r	Rise time	—	15	—		R_G = 10Ω, L = 200uH, L_S = 150nH
$t_{d(off)}$	Turn-Off delay time	—	190	—		T_J = 150°C
t_f	Fall time	—	210	—		
C_{ies}	Input Capacitance	—	1940	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	120	—		V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance	—	40	—		f = 1.0Mhz
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 150°C, I_C = 80A V_{CC} = 960V, Vp =1200V Rg = 10Ω, V_{GE} = +20V to 0V
Erec	Reverse Recovery Energy of the Diode	—	790	—	μJ	T_J = 150°C
t_{rr}	Diode Reverse Recovery Time	—	105	—	ns	V_{CC} = 600V, I_F = 20A
I_{rr}	Peak Reverse Recovery Current	—	40	—	A	V_{GE} = 15V, Rg = 10Ω, L =1.0mH, L_s = 150nH

Notes:

① V_{CC} = 80% (V_{CES}), V_{GE} = 20V, R_G = 50Ω.
② Pulse width limited by max. junction temperature.
③ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely.
④ R_θ is measured at T_J of approximately 90°C.