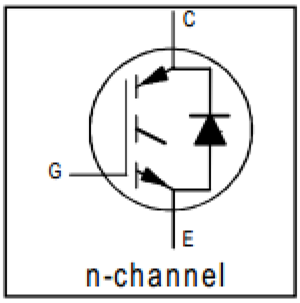
IRG4PC50UD

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

UltraFast CoPack IGBT

Features

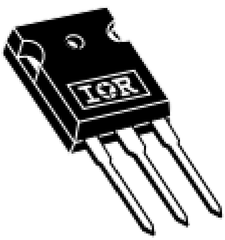
- UltraFast: Optimized for high operating frequencies 8-40 kHz in hard switching, >200 kHz in resonant mode
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency than Generation 3
- IGBT co-packaged with HEXFRED™ ultrafast, ultra-soft-recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-247AC package



V_{CES} = 600V

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

@V_{GE} = 15V, I_C = 27A



TO-247AC

Benefits

- Generation 4 IGBT's offer highest efficiencies available
- IGBT's optimized for specific application conditions
- HEXFRED diodes optimized for performance with IGBT's . Minimized recovery characteristics require less/no snubbing
- Designed to be a "drop-in" replacement for equivalent industry-standard Generation 3 IR IGBT's

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	55	
I_C @ T_C = 100°C	Continuous Collector Current	27	
I_{CM}	Pulsed Collector Current ①	220	A
I_{LM}	Clamped Inductive Load Current ②	220	
I_F @ T_C = 100°C	Diode Continuous Forward Current	25	
I_{FM}	Diode Maximum Forward Current	220	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	200	W
P_D @ T_C = 100°C	Maximum Power Dissipation	78	
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
$R_{\theta JC}$	Junction-to-Case - IGBT	------	------	0.64	
$R_{\theta JC}$	Junction-to-Case - Diode	------	------	0.83	°C/W
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	------	0.24	------	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	-----	-----	40	
Wt	Weight	------	6 (0.21)	------	g (oz)

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage③	600	----	----	V	V_{GE} = 0V, I_C = 250µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	----	0.60	----	V/°C	V_{GE} = 0V, I_C = 1.0mA	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	----	1.65	2.0	V	I_C = 27A	V_{GE} = 15V
		----	2.0	----		I_C = 55A	See Fig. 2, 5
		----	1.6	----		I_C = 27A, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	----	6.0		V_{CE} = V_{GE}, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	----	-13	----	mV/°C	V_{CE} = V_{GE}, I_C = 250µA	
g_{fe}	Forward Transconductance ④	16	24	----	S	V_{CE} = 100V, I_C = 27A	
I_{CES}	Zero Gate Voltage Collector Current	----	----	250	µA	V_{GE} = 0V, V_{CE} = 600V	
		----	----	6500		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C	
V_{FM}	Diode Forward Voltage Drop	----	1.3	1.7	V	I_C = 25A	See Fig. 13
		----	1.2	1.5		I_C = 25A, 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	
Q_g	Total Gate Charge (turn-on)	----	180	270	nC	I_C = 27A	
Qge	Gate - Emitter Charge (turn-on)	----	25	38		V_{CC} = 400V	See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	----	61	90		V_{GE} = 15V	
$t_{d(on)}$	Turn-On Delay Time	----	46	----	ns	T_J = 25°C	
t_r	Rise Time	----	25	----		I_C = 27A, V_{CC} = 480V	
$t_{d(off)}$	Turn-Off Delay Time	----	140	230		V_{GE} = 15V, R_G = 5.0Ω	
t_f	Fall Time	----	74	110		Energy losses include "tail" and	
E_{on}	Turn-On Switching Loss	----	0.99	----	mJ	diode reverse recovery.	
E_{off}	Turn-Off Switching Loss	----	0.59	----		See Fig. 9, 10, 11, 18	
E_{ts}	Total Switching Loss	----	1.58	1.9			
$t_{d(on)}$	Turn-On Delay Time	----	44	----	ns	T_J = 150°C,	See Fig. 9, 10, 11, 18
t_r	Rise Time	----	27	----		I_C = 27A, V_{CC} = 480V	
$t_{d(off)}$	Turn-Off Delay Time	----	240	----		V_{GE} = 15V, R_G = 5.0Ω	
t_f	Fall Time	----	130	----		Energy losses include "tail" and	
E_{ts}	Total Switching Loss	----	2.3	----	mJ	diode reverse recovery.	
L_E	Internal Emitter Inductance	----	13	----	nH	Measured 5mm from package	
C_{ies}	Input Capacitance	----	4000	----	pF	V_{GE} = 0V	
C_{oes}	Output Capacitance	----	250	----		V_{CC} = 30V	See Fig. 7
C_{res}	Reverse Transfer Capacitance	----	52	----		f = 1.0MHz	
t_{rr}	Diode Reverse Recovery Time	----	50	75	ns	T_J = 25°C See Fig.	
		----	105	160		T_J = 125°C 14	I_F = 25A
I_{rr}	Diode Peak Reverse Recovery Current	----	4.5	10	A	T_J = 25°C See Fig.	
		----	8.0	15		T_J = 125°C 15	V_R = 200V
Q_{rr}	Diode Reverse Recovery Charge	----	112	375	nC	T_J = 25°C See Fig.	
		----	420	1200		T_J = 125°C 16	di/dt 200A/µs
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery	----	250	----	A/µs	T_J = 25°C	
	During t_b	----	160	----		T_J = 125°C	

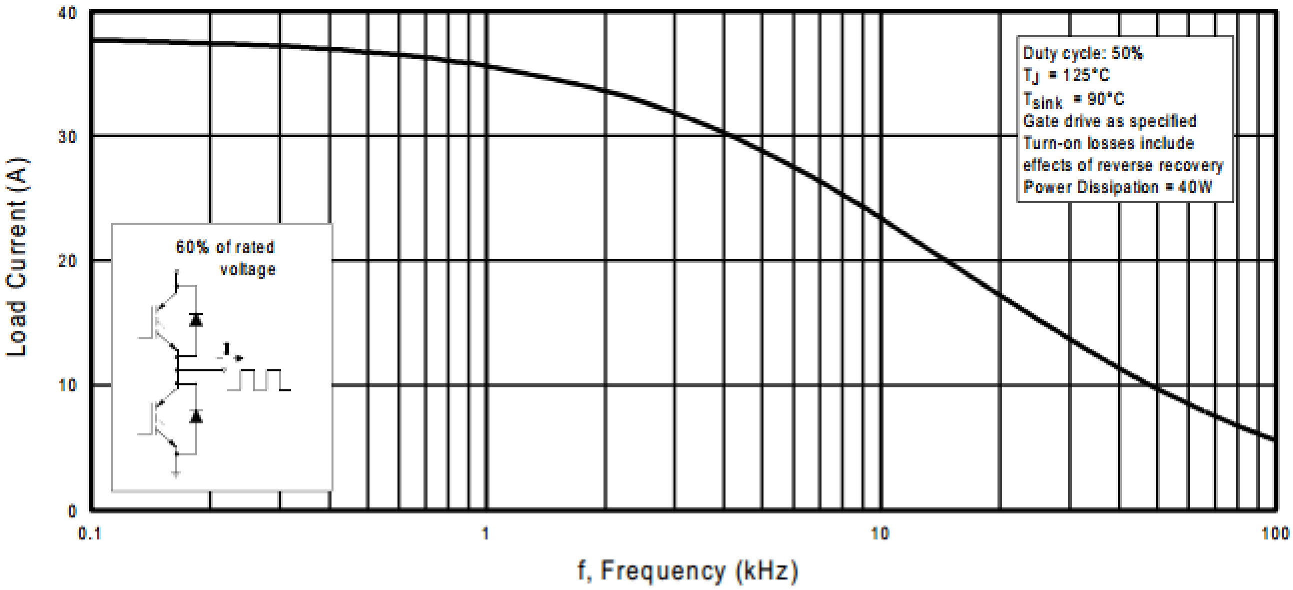


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)