

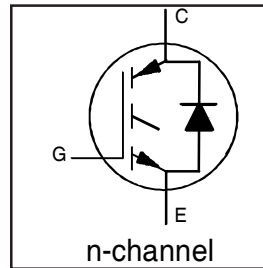
IRG4BC30UDPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH
ULTRAFast SOFT RECOVERY DIODE

UltraFast CoPack IGBT

Features

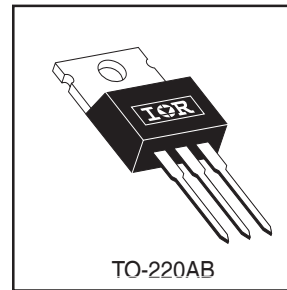
- UltraFast: Optimized for high operating frequencies 8-40 kHz in hard switching, >200 kHz in resonant mode
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency than Generation 3
- IGBT co-packaged with HEXFRED™ ultrafast, ultra-soft-recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-220AB package
- Lead-Free



$V_{CES} = 600V$
$V_{CE(on) typ.} = 1.95V$
@ $V_{GE} = 15V, I_C = 12A$

Benefits

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



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	23	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	12	
I_{CM}	Pulsed Collector Current ①	92	
I_{LM}	Clamped Inductive Load Current ②	92	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	12	
I_{FM}	Diode Maximum Forward Current	92	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	100	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	42	
T_J	Operating Junction and	-55 to +150	°C
T_{STG}	Storage Temperature Range		
	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	-----	-----	1.2	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	-----	-----	2.5	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	-----	0.50	-----	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	-----	-----	80	
Wt	Weight	-----	2 (0.07)	-----	g (oz)

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Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage ^③	600	----	----	V	$V_{GE} = 0V, I_C = 250\mu A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	----	0.63	----	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	----	1.95	2.1	V	$I_C = 12A$ $V_{GE} = 15V$ See Fig. 2, 5
		----	2.52	----		
		----	2.09	----		
$V_{GE(th)}$	Gate Threshold Voltage	3.0	----	6.0		$V_{CE} = V_{GE}, I_C = 250\mu A$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	----	-11	----	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$
g_{fe}	Forward Transconductance ^④	3.1	8.6	----	S	$V_{CE} = 100V, I_C = 12A$
I_{CES}	Zero Gate Voltage Collector Current	----	----	250	μA	$V_{GE} = 0V, V_{CE} = 600V$ $V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
		----	----	2500		
V_{FM}	Diode Forward Voltage Drop	----	1.4	1.7	V	$I_C = 12A$ See Fig. 13 $I_C = 12A, T_J = 150^\circ\text{C}$
		----	1.3	1.6		
I_{GES}	Gate-to-Emitter Leakage Current	----	----	± 100	nA	$V_{GE} = \pm 20V$

Switching Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Min.	Typ.	Max.	Units	Conditions	
Q_g	----	50	75		$I_C = 12A$	
Q_{ge}	----	8.1	12	nC	$V_{CC} = 400V$ See Fig. 8 $V_{GE} = 15V$ $T_J = 25^\circ\text{C}$	
Q_{gc}	----	18	27			
$t_{d(on)}$	----	40	----			
t_r	----	21	----	ns	$I_C = 12A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" and diode reverse recovery. See Fig. 9, 10, 11, 18	
$t_{d(off)}$	----	91	140			
t_f	----	80	130			
E_{on}	----	0.38	----			
E_{off}	----	0.16	----			
E_{ts}	----	0.54	0.9			
$t_{d(on)}$	----	40	----			$T_J = 150^\circ\text{C}$, See Fig. 9, 10, 11, 18
t_r	----	22	----			
$t_{d(off)}$	----	120	----			
t_f	----	180	----			
E_{ts}	----	0.89	----	mJ	Measured 5mm from package	
L_E	Internal Emitter Inductance	----	7.5	nH		
C_{ies}	Input Capacitance	----	1100	----	$V_{GE} = 0V$	
C_{oes}	Output Capacitance	----	73	----	$V_{CC} = 30V$ See Fig. 7	
C_{res}	Reverse Transfer Capacitance	----	14	----		
t_{rr}	Diode Reverse Recovery Time	----	42	60	ns	$T_J = 25^\circ\text{C}$ See Fig.
I_{rr}	Diode Peak Reverse Recovery Current	----	80	120	A	$T_J = 125^\circ\text{C}$ 14 $T_J = 25^\circ\text{C}$ See Fig.
		----	3.5	6.0		
Q_{rr}	Diode Reverse Recovery Charge	----	5.6	10	nC	$T_J = 125^\circ\text{C}$ 15 $T_J = 25^\circ\text{C}$ See Fig.
		----	80	180		
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery	----	220	600	A/ μs	$T_J = 125^\circ\text{C}$ 16 $T_J = 25^\circ\text{C}$ See Fig.
		----	180	----		
	During t_b	----	120	----		$T_J = 125^\circ\text{C}$ 17

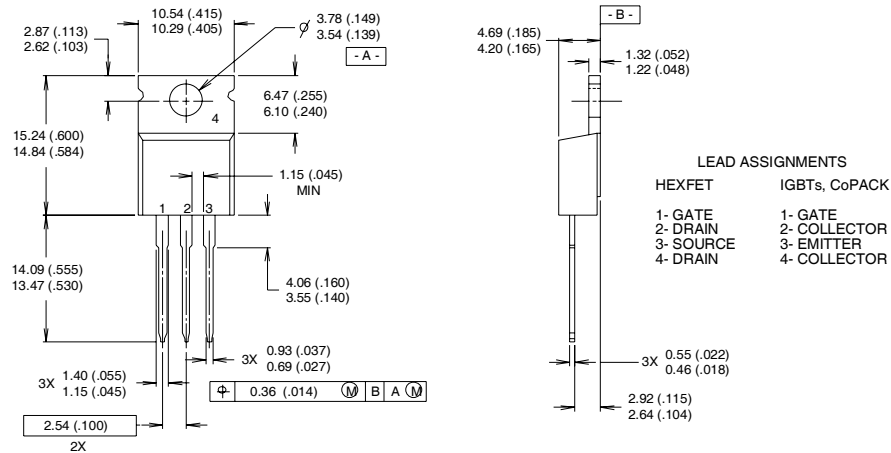
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Notes:

- ① Repetitive rating: $V_{GE}=20V$; pulse width limited by maximum junction temperature (figure 20)
- ② $V_{CC}=80\%(V_{CES})$, $V_{GE}=20V$, $L=10\mu H$, $R_G = 23\Omega$ (figure 19)
- ③ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ④ Pulse width $5.0\mu s$, single shot.

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)

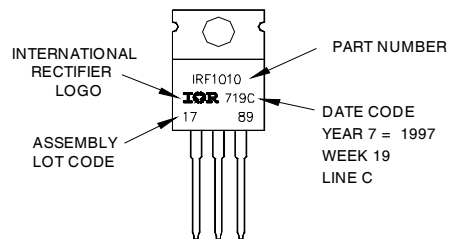


NOTES:

- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH
- 3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
- 4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
 LOT CODE 1789
 ASSEMBLED ON WW 19, 1997
 IN THE ASSEMBLY LINE "C"
Note: "P" in assembly line position indicates "Lead-Free"



Data and specifications subject to change without notice.