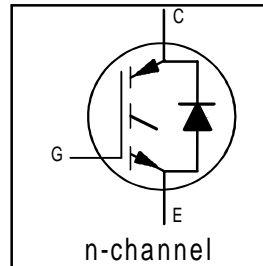


# IRG4PSC71UD

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE UltraFast CoPack IGBT

## Features

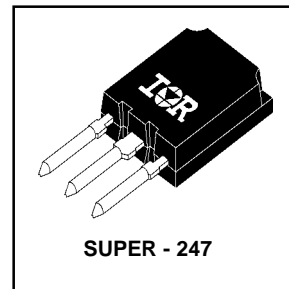
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency (minimum switching and conduction losses) than prior generations
- IGBT co-packaged with HEXFRED ultrafast, ultrasoft recovery anti-parallel diodes for use in bridge configurations
- Industry-benchmark Super-247 package with higher power handling capability compared to same footprint TO-247
- Creepage distance increased to 5.35mm



$V_{CES} = 600V$   
 $V_{CE(on)} \text{ typ.} = 1.67V$   
 @  $V_{GE} = 15V, I_C = 60A$

## Benefits

- Generation 4 IGBT's offer highest efficiencies available
- Maximum power density, twice the power handling of TO-247, less space than TO-264
- IGBTs optimized for specific application conditions
- HEXFRED diodes optimized for performance with IGBTs
- Cost and space saving in designs that require multiple, paralleled 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	85 <sup>⑤</sup>	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	60	
$I_{CM}$	Pulsed Collector Current <sup>①</sup>	200	
$I_{LM}$	Clamped Inductive Load Current <sup>②</sup>	200	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	60	
$I_{FM}$	Diode Maximum Forward Current	350	
$V_{GE}$	Gate-to-Emitter Voltage	$\pm 20$	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	350	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	140	
$T_J$	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)	

## Thermal Resistance\ Mechanical

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.36	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	0.69	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	—	38	
	Recommended Clip Force	20.0(2.0)	—	—	N (kgf)
	Weight	—	6 (0.21)	—	g (oz)

**Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)CES</sub>	Collector-to-Emitter Breakdown Voltage <sup>③</sup>	600	—	—	V	V <sub>GE</sub> = 0V, I <sub>C</sub> = 250μA
ΔV <sub>(BR)CES</sub> /ΔT <sub>J</sub>	Temperature Coeff. of Breakdown Voltage	—	0.39	—	V/°C	V <sub>GE</sub> = 0V, I <sub>C</sub> = 10mA
V <sub>CE(on)</sub>	Collector-to-Emitter Saturation Voltage	—	1.67	2.0	V	I <sub>C</sub> = 60A, V <sub>GE</sub> = 15V
		—	1.95	—		I <sub>C</sub> = 100A
		—	1.71	—		I <sub>C</sub> = 60A, T <sub>J</sub> = 150°C
V <sub>GE(th)</sub>	Gate Threshold Voltage	3.0	—	6.0		V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 250μA
ΔV <sub>GE(th)</sub> /ΔT <sub>J</sub>	Temperature Coeff. of Threshold Voltage	—	-13	—	mV/°C	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 1.5mA
g <sub>fe</sub>	Forward Transconductance <sup>④</sup>	47	70	—	S	V <sub>CE</sub> = 50V, I <sub>C</sub> = 60A
I <sub>CES</sub>	Zero Gate Voltage Collector Current	—	—	500	μA	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V
		—	—	13	mA	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V, T <sub>J</sub> = 150°C
V <sub>FM</sub>	Diode Forward Voltage Drop	—	1.4	1.7	V	I <sub>C</sub> = 60A
		—	1.3	—		I <sub>C</sub> = 60A, T <sub>J</sub> = 150°C
I <sub>GES</sub>	Gate-to-Emitter Leakage Current	—	—	±100	nA	V <sub>GE</sub> = ±20V

**Switching Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q <sub>g</sub>	Total Gate Charge (turn-on)	—	340	520	nC	I <sub>C</sub> = 60A
Q <sub>ge</sub>	Gate - Emitter Charge (turn-on)	—	44	66		V <sub>CC</sub> = 400V
Q <sub>gc</sub>	Gate - Collector Charge (turn-on)	—	160	240		V <sub>GE</sub> = 15V
t <sub>d(on)</sub>	Turn-On Delay Time	—	90	—	ns	T <sub>J</sub> = 25°C
t <sub>r</sub>	Rise Time	—	94	—		I <sub>C</sub> = 60A, V <sub>CC</sub> = 480V
t <sub>d(off)</sub>	Turn-Off Delay Time	—	245	368		V <sub>GE</sub> = 15V, R <sub>G</sub> = 5.0Ω
t <sub>f</sub>	Fall Time	—	110	167		Energy losses include "tail" and diode reverse recovery.
E <sub>on</sub>	Turn-On Switching Loss	—	3.26	—	mJ	See Fig. 9, 10, 11, 18
E <sub>off</sub>	Turn-Off Switching Loss	—	2.27	—		
E <sub>ts</sub>	Total Switching Loss	—	5.53	7.2		
t <sub>d(on)</sub>	Turn-On Delay Time	—	91	—	ns	T <sub>J</sub> = 150°C, See Fig. 9, 10, 11, 18
t <sub>r</sub>	Rise Time	—	88	—		I <sub>C</sub> = 60A, V <sub>CC</sub> = 480V
t <sub>d(off)</sub>	Turn-Off Delay Time	—	353	—		V <sub>GE</sub> = 15V, R <sub>G</sub> = 5.0Ω
t <sub>f</sub>	Fall Time	—	150	—		Energy losses include "tail" and diode reverse recovery.
E <sub>ts</sub>	Total Switching Loss	—	7.1	—	mJ	
L <sub>E</sub>	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C <sub>ies</sub>	Input Capacitance	—	7500	—	pF	V <sub>GE</sub> = 0V
C <sub>oes</sub>	Output Capacitance	—	720	—		V <sub>CC</sub> = 30V
C <sub>res</sub>	Reverse Transfer Capacitance	—	93	—		f = 1.0MHz
t <sub>rr</sub>	Diode Reverse Recovery Time	—	82	120	ns	T <sub>J</sub> = 25°C See Fig.
		—	140	210		T <sub>J</sub> = 125°C 14
I <sub>rr</sub>	Diode Peak Reverse Recovery Current	—	8.2	12	A	T <sub>J</sub> = 25°C See Fig.
		—	13	20		T <sub>J</sub> = 125°C 15
Q <sub>rr</sub>	Diode Reverse Recovery Charge	—	364	546	nC	T <sub>J</sub> = 25°C See Fig.
		—	1084	1625		T <sub>J</sub> = 125°C 16
di <sub>(rec)M</sub> /dt During t <sub>b</sub>	Diode Peak Rate of Fall of Recovery	—	328	—	A/μs	T <sub>J</sub> = 25°C See Fig.
		—	266	—		T <sub>J</sub> = 125°C 17