

# IRGP30B120KD-EP

## INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

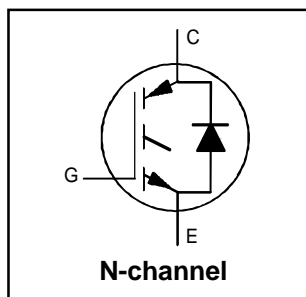
## Motor Control Co-Pack IGBT

### Features

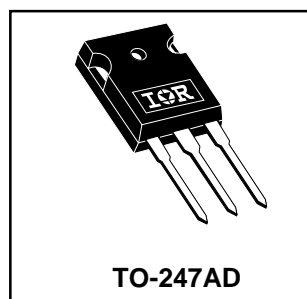
- Low  $V_{CE(on)}$  Non Punch Through (NPT) Technology
- Low Diode  $V_F$  (1.76V Typical @ 25A & 25°C)
- 10  $\mu$ s Short Circuit Capability
- Square RBSOA
- Ultrasoft Diode Recovery Characteristics
- Positive  $V_{CE(on)}$  Temperature Coefficient
- Extended Lead TO-247AD Package
- Lead-Free

### Benefits

- Benchmark Efficiency for Motor Control Applications
- Rugged Transient Performance
- Low EMI
- Significantly Less Snubber Required
- Excellent Current Sharing in Parallel Operation
- Longer leads for Easier Mounting



$V_{CES} = 1200V$
$V_{CE(on) \text{ typ.}} = 2.28V$
$V_{GE} = 15V, I_C = 25A, 25^\circ C$



### Absolute Maximum Ratings

	Parameter	Max.	Units
$V_{CES}$	Collector-to-Emitter Breakdown Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current (Fig.1)	60	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current (Fig.1)	30	
$I_{CM}$	Pulsed Collector Current (Fig.3, Fig. CT.5)	120	
$I_{LM}$	Clamped Inductive Load Current(Fig.4, Fig. CT.2)	120	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	30	
$I_{FM}$	Diode Maximum Forward Current	120	
$V_{GE}$	Gate-to-Emitter Voltage	$\pm 20$	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation (Fig.2)	300	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation (Fig.2)	120	
$T_J$	Operating Junction and Storage Temperature Range	-55 to + 150	°C
$T_{STG}$			
	Mounting Torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

### Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.42	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	0.83	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	—	40	
$W_t$	Weight	—	6 (0.21)	—	g (oz)
$Z_{\theta JC}$	Transient Thermal Impedance Junction-to-Case (Fig.24)				

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	Fig.
V <sub>(BR)CES</sub>	Collector-to-Emitter Breakdown Voltage	1200			V	V <sub>GE</sub> = 0V, I <sub>c</sub> = 250 μA	
ΔV <sub>(BR)CES</sub> / ΔT <sub>J</sub>	Temperature Coeff. of Breakdown Voltage		+1.2		V/°C	V <sub>GE</sub> = 0V, I <sub>c</sub> = 1 mA ( 25 -125 °C )	
V <sub>CE(on)</sub>	Collector-to-Emitter Saturation Voltage		2.28	2.48	V	I <sub>c</sub> = 25A, V <sub>GE</sub> = 15V	5, 6
			2.46	2.66		I <sub>c</sub> = 30A, V <sub>GE</sub> = 15V	7, 9
			3.43	4.00		I <sub>c</sub> = 60A, V <sub>GE</sub> = 15V	10
			2.74	3.10		I <sub>c</sub> = 25A, V <sub>GE</sub> = 15V, T <sub>J</sub> = 125°C	11
			2.98	3.35		I <sub>c</sub> = 30A, V <sub>GE</sub> = 15V, T <sub>J</sub> = 125°C	
V <sub>GE(th)</sub>	Gate Threshold Voltage	4.0	5.0	6.0	V	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>c</sub> = 250 μA	9,10,11,12
ΔV <sub>GE(th)</sub> / ΔT <sub>J</sub>	Temperature Coeff. of Threshold Voltage		- 1.2		mV/°C	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>c</sub> = 1 mA ( 25 -125 °C )	
g <sub>fe</sub>	Forward Transconductance	14.8	16.9	19.0	S	V <sub>CE</sub> = 50V, I <sub>c</sub> = 25A, PW=80μs	
I <sub>CES</sub>	Zero Gate Voltage Collector Current			250	μA	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V	
			325	675		V <sub>GE</sub> = 0v, V <sub>CE</sub> = 1200V, T <sub>J</sub> =125°C	
				2000		V <sub>GE</sub> = 0v, V <sub>CE</sub> = 1200V, T <sub>J</sub> =150°C	
V <sub>FM</sub>	Diode Forward Voltage Drop		1.76	2.06	V	I <sub>c</sub> = 25A	8
			1.86	2.17		I <sub>c</sub> = 30A	
			1.87	2.18		I <sub>c</sub> = 25A, T <sub>J</sub> = 125°C	
			2.01	2.40		I <sub>c</sub> = 30A, T <sub>J</sub> = 125°C	
I <sub>GES</sub>	Gate-to-Emitter Leakage Current			±100	nA	V <sub>GE</sub> = ±20V	

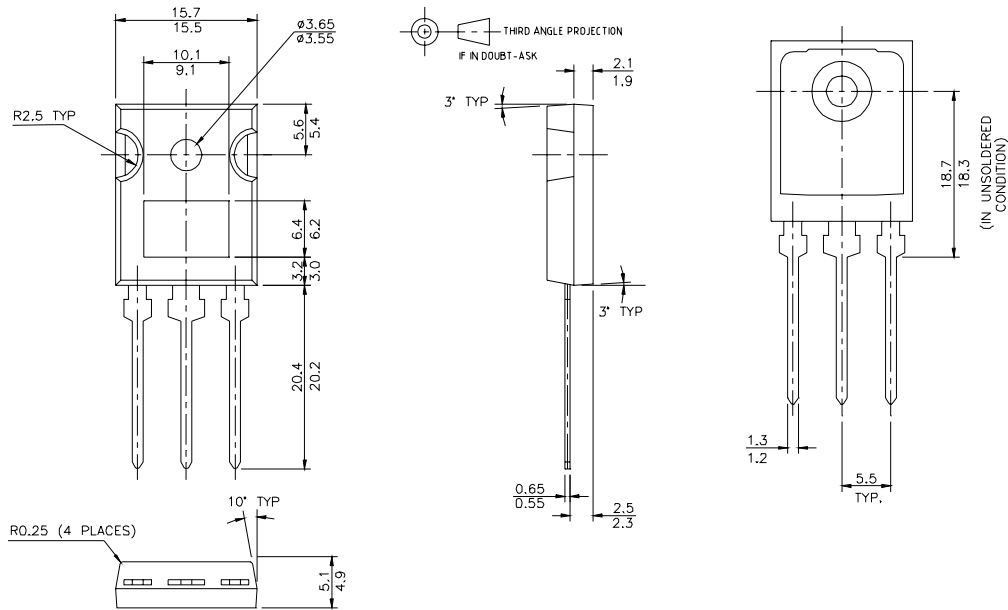
## Switching Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	Fig.
Q <sub>g</sub>	Total Gate charge (turn-on)		169	254	nC	I <sub>c</sub> = 25A	23
Q <sub>ge</sub>	Gate - Emitter Charge (turn-on)		19	29		V <sub>CC</sub> =600V	CT 1
Q <sub>gc</sub>	Gate - Collector Charge (turn-on)		82	123		V <sub>GE</sub> = 15V	
E <sub>on</sub>	Turn-On Switching Loss		1066	1250	μJ	I <sub>c</sub> = 25A, V <sub>CC</sub> = 600V	CT 4
E <sub>off</sub>	Turn-Off Switching Loss		1493	1800		V <sub>GE</sub> = 15V, R <sub>g</sub> = 5Ω, L =200μH	WF1
E <sub>tot</sub>	Total Switching Loss		2559	3050		T <sub>J</sub> = 25°C, Energy losses include tail and diode reverse recovery	WF2
E <sub>on</sub>	Turn-on Switching Loss		1660	1856	μJ	I <sub>c</sub> =25A, V <sub>CC</sub> =600V	13, 15
E <sub>off</sub>	Turn-off Switching Loss		2118	2580		V <sub>GE</sub> = 15V, R <sub>g</sub> = 5Ω, L =200μH	CT 4
E <sub>tot</sub>	Total Switching Loss		3778	4436		T <sub>J</sub> = 125°C, Energy losses include tail and diode reverse recovery	WF1 & 2
td(on)	Turn - on delay time		50	65	ns	I <sub>c</sub> =25A, V <sub>CC</sub> =600V	14, 16
tr	Rise time		25	35		V <sub>GE</sub> = 15V, R <sub>g</sub> = 5Ω, L =200μH	CT 4
td(off)	Turn - off delay time		210	230		T <sub>J</sub> = 125°C,	WF1
tf	Fall time		60	75			WF2
C <sub>ies</sub>	Input Capacitance		2200		pF	V <sub>GE</sub> = 0V	22
C <sub>oes</sub>	Output Capacitance		210			V <sub>CC</sub> = 30V	
C <sub>res</sub>	Reverse Transfer Capacitance		85			f = 1.0 MHz	
RBSOA	Reverse bias safe operating area	FULL SQUARE				T <sub>J</sub> =150°C, I <sub>c</sub> = 120A V <sub>CC</sub> = 1000V, V <sub>P</sub> = 1200V R <sub>g</sub> = 5Ω, V <sub>GE</sub> = +15V to 0 V	4 CT 2
SCSOA	Short Circuit Safe Operating Area	10	----	----	μs	T <sub>J</sub> = 150°C V <sub>CC</sub> = 900V, V <sub>P</sub> = 1200V R <sub>g</sub> = 5Ω, V <sub>GE</sub> = +15V to 0 V	CT 3 WF 4
E <sub>rec</sub>	Reverse recovery energy of the diode		1820	2400	μJ	T <sub>J</sub> = 125°C	17,18,19
trr	Diode Reverse recovery time		300		ns	V <sub>CC</sub> = 600V, I <sub>c</sub> = 25A	20, 21
I <sub>rr</sub>	Peak Reverse Recovery Current		34	38	A	V <sub>GE</sub> = 15V, R <sub>g</sub> = 5Ω, L =200μH	CT 4, WF 3
Le	Internal Emitter Inductance		13		nH	Measured 5 mm from the package.	

# IRGP30B120KD-EP

## TO-247AD Package Outline

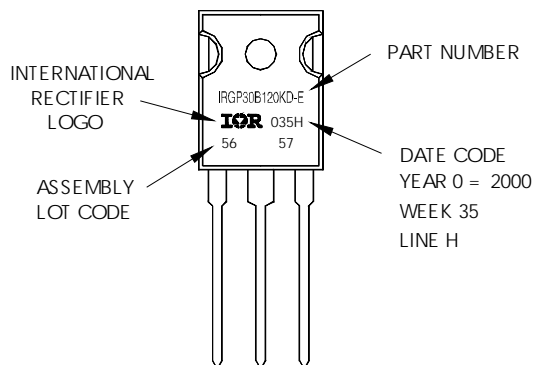
Dimensions are shown in millimeters (inches)



## TO-247AD Part Marking Information

EXAMPLE: THIS IS AN IRGP30B120KD-E  
WITH ASSEMBLY  
LOT CODE 5657  
ASSEMBLED ON WW 35, 2000  
IN THE ASSEMBLY LINE "H"

Note: "P" in assembly line position  
indicates "Lead-Free"



Data and specifications subject to change without notice.