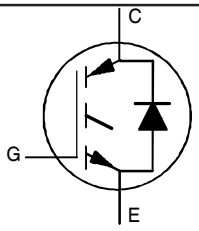
PD - 94925

International
IOR Rectifier

IRGB10B60KDPbF
IRGS10B60KD
IRGSL10B60KD

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE



n-channel

V_{CES} = 600V

I_C = 12A, T_C=100°C

t_{sc} > 10µs, T_J=150°C

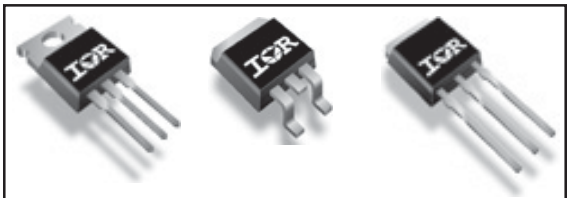
$V_{CE(on)}$ typ. = 1.8V

Features

- Low VCE (on) Non Punch Through IGBT Technology.
- Low Diode VF.
- 10µs Short Circuit Capability.
- Square RBSOA.
- Ultrasoft Diode Reverse Recovery Characteristics.
- Positive VCE (on) Temperature Coefficient.
- Lead-Free (only the TO-220AB version is currently available in a Lead-Free configuration)

Benefits

- Benchmark Efficiency for Motor Control.
- Rugged Transient Performance.
- Low EMI.
- Excellent Current Sharing in Parallel Operation.



TO-220AB	D^2Pak	TO-262
IRGB10B60KDPbF	IRGS10B60KD	IRGSL10B60KD

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	22	A
I_C @ T_C = 100°C	Continuous Collector Current	12	
I_{CM}	Pulsed Collector Current	44	
I_{LM}	Clamped Inductive Load Current	44	
I_F @ T_C = 25°C	Diode Continuous Forward Current	22	
I_F @ T_C = 100°C	Diode Continuous Forward Current	10	
I_{FM}	Diode Maximum Forward Current	44	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	156	W
P_D @ T_C = 100°C	Maximum Power Dissipation	62	
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

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.8	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	3.4	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount①	—	—	62	
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount, steady state)②	—	—	40	
Wt	Weight	—	1.44	—	g

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig.
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 500µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.3	—	V/°C	V_{GE} = 0V, I_C = 1.0mA, (25°C-150°C)	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	1.5	1.80	2.20		I_C = 10A, V_{GE} = 15V	5, 6,7
		—	2.20	2.50	V	I_C = 10A, V_{GE} = 15V T_J = 150°C	9,10,11
$V_{GE(th)}$	Gate Threshold Voltage	3.5	4.5	5.5	V	V_{CE} = V_{GE}, I_C = 250µA	9,10,11
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-10	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA, (25°C-150°C)	12
g_{fe}	Forward Transconductance	—	7.0	—	S	V_{CE} = 50V, I_C = 10A, PW=80µs	
I_{CES}	Zero Gate Voltage Collector Current	—	3.0	150	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	300	700		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C	
V_{FM}	Diode Forward Voltage Drop	—	1.30	1.45		I_C = 10A	8
		—	1.30	1.45	V	I_C = 10A T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ±20V	

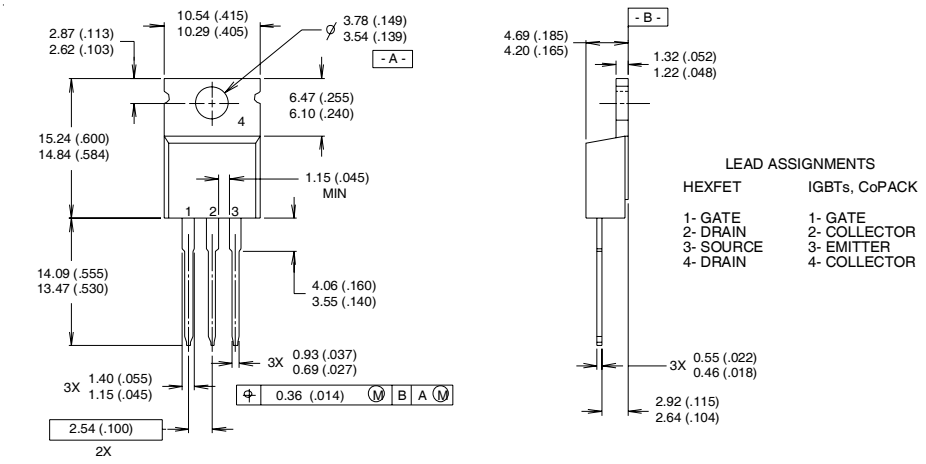
Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig.
Qg	Total Gate Charge (turn-on)	—	38	—		I_C = 10A	
Qge	Gate - Emitter Charge (turn-on)	—	4.3	—	nC	V_{CC} = 400V	CT1
Qgc	Gate - Collector Charge (turn-on)	—	16.3	—		V_{GE} = 15V	
E_{on}	Turn-On Switching Loss	—	140	247	µJ	I_C = 10A, V_{CC} = 400V	CT4
E_{off}	Turn-Off Switching Loss	—	250	360		V_{GE} = 15V,R_G = 47Ω, L = 200µH	
E_{tot}	Total Switching Loss	—	390	607		Ls = 150nH T_J = 25°C ③	
$t_{d(on)}$	Turn-On Delay Time	—	30	39		I_C = 10A, V_{CC} = 400V	
t_r	Rise Time	—	20	29		V_{GE} = 15V, R_G = 47Ω, L = 200µH	CT4
$t_{d(off)}$	Turn-Off Delay Time	—	230	262	ns	Ls = 150nH, T_J = 25°C	
t_f	Fall Time	—	23	32			
E_{on}	Turn-On Switching Loss	—	230	340		I_C = 10A, V_{CC} = 400V	CT4
E_{off}	Turn-Off Switching Loss	—	350	464	µJ	V_{GE} = 15V,R_G = 47Ω, L = 200µH	13,15
E_{tot}	Total Switching Loss	—	580	804		Ls = 150nH T_J = 150°C ③	WF1WF2
$t_{d(on)}$	Turn-On Delay Time	—	30	39		I_C = 10A, V_{CC} = 400V	14, 16
t_r	Rise Time	—	20	28		V_{GE} = 15V, R_G = 47Ω, L = 200µH	CT4
$t_{d(off)}$	Turn-Off Delay Time	—	250	274	ns	Ls = 150nH, T_J = 150°C	WF1
t_f	Fall Time	—	26	34			WF2
C_{ies}	Input Capacitance	—	620	—		V_{GE} = 0V	
C_{oes}	Output Capacitance	—	62	—	pF	V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	22	—		f = 1.0MHz	
RBSOA	Reverse Bias Safe Operting Area	FULL SQUARE				T_J = 150°C, I_C = 44A, Vp =600V	4
						V_{CC} = 500V, V_{GE} = +15V to 0V,R_G = 47Ω	CT2
SCSOA	Short Circuit Safe Operting Area	10	—	—	µs	T_J = 150°C, Vp =600V,R_G = 47Ω	CT3
						V_{CC} = 360V, V_{GE} = +15V to 0V	WF4
Erec	Reverse Recovery energy of the diode	—	245	330	µJ	T_J = 150°C	17,18,19
t_{rr}	Diode Reverse Recovery time	—	90	105	ns	V_{CC} = 400V, I_F = 10A, L = 200µH	20, 21
I_{rr}	Diode Peak Reverse Recovery Current	—	19	22	A	V_{GE} = 15V,R_G = 47Ω, Ls = 150nH	CT4,WF3

Note ① to ③ are on page 15

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"