PD- 95913

International
IOR Rectifier

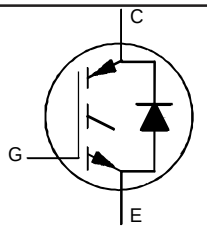
IRGPS60B120KDP

INSULATED GATE BIPOLAR TRANSISTOR WITH
ULTRAFAST SOFT RECOVERY DIODE

Motor Control Co-Pack IGBT

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.
- Super-247 Package.
- Lead-Free



N-channel

V_{CES} = 1200V

$V_{CE(on)}$ typ. = 2.50V

@ V_{GE} = 15V,

I_{CE} = 60A, Tj=25°C

Benefits

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

Super-247™

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	105②	A
I_C @ T_C = 100°C	Continuous Collector Current	60	
I_{CM}	Pulsed Collector Current	240	
I_{LM}	Clamped Inductive Load Current ①	240	
I_F @ T_C = 25°C	Diode Continuous Forward Current	120	
I_F @ T_C = 100°C	Diode Continuous Forward Current	60	
I_{FM}	Diode Maximum Forward Current	240	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	595	W
P_D @ T_C = 100°C	Maximum Power Dissipation	238	
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)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.20	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	0.41	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	—	40	
	Recommended Clip Force	20 (2)	—	—	N(kgf)
Wt	Weight	—	6.0 (0.21)	—	g (oz)
Le	Internal Emitter Inductance (5mm from package)	—	13	—	nH

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	1200	—	—	V	V_{GE} = 0V, I_C = 500µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.40	—	V/°C	V_{GE} = 0V, I_C = 1.0mA, (25°C-125°C)	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.33	2.50	V	I_C = 50A V_{GE} = 15V	5, 6
		—	2.50	2.75		I_C = 60A	7, 9
		—	2.79	3.1		I_C = 50A, T_J = 125°C	10
		—	3.04	3.5		I_C = 60A, T_J = 125°C	11
$V_{GE(th)}$	Gate Threshold Voltage	4.0	5.0	6.0		V_{CE} = V_{GE}, I_C = 250µA	9,10
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-12	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA, (25°C-125°C)	11 ,12
g_{fe}	Forward Transconductance	—	34.4	—	S	V_{CE} = 50V, I_C = 60A, PW=80µs	
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	µA	V_{GE} = 0V, V_{CE} = 1200V	
		—	650	1350		V_{GE} = 0V, V_{CE} = 1200V, T_J = 125°C	
V_{FM}	Diode Forward Voltage Drop	—	1.82	2.10	V	I_C = 50A	8
		—	1.93	2.20		I_C = 60A	
		—	1.96	2.20		I_C = 50A, T_J = 125°C	
		—	2.13	2.40		I_C = 60A, T_J = 125°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)	—	340	510	nC	I_C = 60A	23
Qge	Gate - Emitter Charge (turn-on)	—	40	60		V_{CC} = 600V	CT1
Q_{gc}	Gate - Collector Charge (turn-on)	—	165	248		V_{GE} = 15V	
E_{on}	Turn-On Switching Loss	—	3214	4870	µJ	I_C = 60A, V_{CC} = 600V	CT4
E_{off}	Turn-Off Switching Loss	—	4783	5450		V_{GE} = 15V,R_G = 4.7Ω, L =200µH	WF1
E_{tot}	Total Switching Loss	—	8000	10320		Ls = 150nH T_J = 25°C	WF2
E_{on}	Turn-On Switching Loss	—	5032	6890	µJ	T_J = 125°C	13,15
E_{off}	Turn-Off Switching Loss	—	7457	8385		Energy losses include "tail" and	
E_{tot}	Total Switching Loss	—	12500	15275		diode reverse recovery.	
$t_{d(on)}$	Turn-On Delay Time	—	72	94	ns	I_C = 15A, V_{CC} = 600V	14, 16
t_r	Rise Time	—	32	45		V_{GE} = 15V, R_G = 4.7Ω L =200µH	CT4
$t_{d(off)}$	Turn-Off Delay Time	—	366	400		Ls = 150nH, T_J = 125°C	WF1
t_f	Fall Time	—	45	58			WF2
C_{ies}	Input Capacitance	—	4300	—	pF	V_{GE} = 0V	22
C_{oes}	Output Capacitance	—	395	—		V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	160	—		f = 1.0MHz	
RBSOA	Reverse Bias Safe Operting Area	FULL SQUARE				T_J = 150°C, I_C = 240A, Vp =1200V V_{CC} = 1000V, V_{GE} = +15V to 0V R_G = 4.7Ω	4 CT2
SCSOA	Short Circuit Safe Operting Area	10	—	—	µs	T_J = 150°C, Vp =1200V V_{CC} = 900V, V_{GE} = +15V to 0V, R_G = 4.7Ω	CT3 WF4
Erec	Reverse Recovery energy of the diode	—	3346	—	µJ	T_J = 125°C	17,18,19
t_{rr}	Diode Reverse Recovery time	—	180	—	ns	V_{CC} = 600V, I_F = 60A, L =200µH	20, 21
I_{rr}	Diode Peak Reverse Recovery Current	—	50	—	A	V_{GE} = 15V,R_G = 4.7Ω, Ls = 150nH	CT4,WF3