

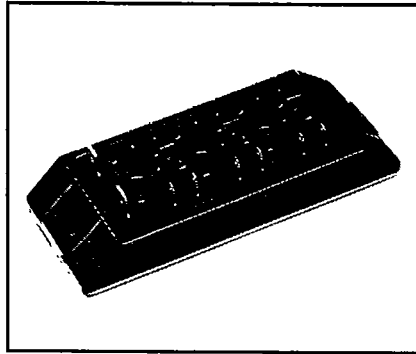
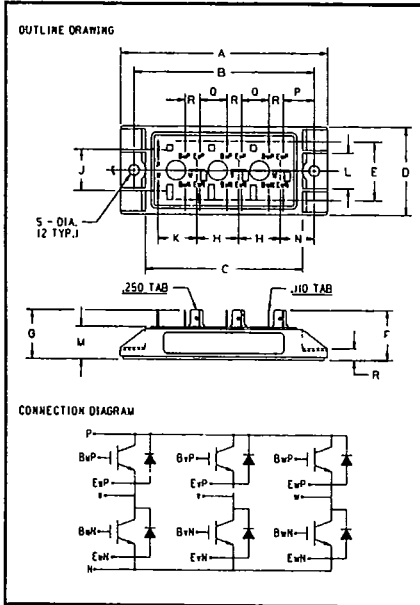


IEF21KA1

T-39-31

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272
 Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

**Six-IGBT IGBTMOD™
 Power Module**
 15 Amperes/1000 Volts



IEF21KA1
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IEF21KA1
Outline Drawing

Dimension	Inches	Millimeters
A	4.21	107
B	3.66±.01	93±0.3
C	3.19	81
D	1.77	45
E	1.18	30
F	1.04	26.5
G	1.01	25.6
H	.85	21.5
J	.83	21
K	.79	20
L	.71	18
M	.69±.02	17.5±0.5
N	.69	17.5
P	.63	16
Q	.55	14
R	.30	7.5
S	.22 Dia.	Dia. 5.5

Description

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase bridge configuration, with each transistor having a reverse-connected super-fast recovery free wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:

- Low Drive Power
- Low $V_{CE(sat)}$
- Discrete Super-Fast Recovery (150ns) Free Wheel Diode
- High Frequency Operation (15-20kHz)
- Isolated Base Plate for Easy Heat Sinking

Applications:

- AC Motor Control
- Motion/Servo Control
- UPS
- Welding Power Supplies
- Laser Power Supplies

Ordering Information

Example: Select the complete eight digit part module number you desire from the table below -i.e. IEF21KA1 is a 1000V (V_{CES}), 15 Ampere Six-IGBT IGBTMOD™ Power Module.

Type	V_{CES} Volts (1000)	Current Rating Amperes (15)
IEF2	1K	A1



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Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	IEF21KA1	Units
Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Collector-Emitter Voltage (G-E SHORT)	V_{CES}	1000	Volts
Gate-Emitter Voltage	V_{GES}	± 20	Volts
Collector Current	I_c	15	Amperes
Peak Collector Current	I_{CM}	30*	Amperes
Diode Forward Current	I_{FM}	15	Amperes
Diode Forward Surge Current	I_{FM}	30*	Amperes
Power Dissipation	P_d	150	Watts
Max. Mounting Torque M Terminal Screws	—	—	in.-lb.
Max. Mounting Torque M6 Mounting Screws	—	17	in.-lb.
Module Weight (Typical)	—	260	Grams
V isolation	V_{RMS}	2500	Volts

* Pulse width and repetition rate should be such that device junction temperature does not exceed the device rating.

Static Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{\text{CE}}=V_{\text{CES}}, V_{\text{GE}}=0\text{V}$	—	—	1.0	mA
Gate Leakage Current	I_{GES}	$V_{\text{GE}}=V_{\text{GES}}, V_{\text{CE}}=0\text{V}$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_c=1.5\text{mA}, V_{\text{CE}}=10\text{V}$	3.0	4.0	6.0	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_c=15\text{A}, V_{\text{GE}}=15\text{V}$	—	3.8	5.0**	Volts
		$I_c=15\text{A}, V_{\text{GE}}=15\text{V}, T_j=150^\circ\text{C}$	—	3.9	**	Volts
Total Gate Charge	Q_g	$V_{\text{CC}}=600\text{V}, I_c=15\text{A}, V_{\text{GS}}=15\text{V}$	—	83	—	nC
Diode Forward Voltage	V_{FM}	$I_c=-15\text{A}, V_{\text{GS}}=0\text{V}$	—	—	2.5	Volts

** Pulse width and repetition rate should be such that device junction temperature rise is negligible.

Dynamic Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{ies}	—	—	—	2500	pF
Output Capacitance	C_{oes}	$V_{\text{GE}}=0\text{V}, V_{\text{CE}}=10\text{V}, f=1\text{MHz}$	—	—	600	pF
Reverse Transfer Capacitance	C_{res}	—	—	—	60	pF
Resistive Load	Turn-on Delay Time	$V_{\text{CC}}=600\text{V}, I_c=15\text{A}, V_{\text{GE1}}=V_{\text{GE2}}=15\text{V}, R_g=83\Omega$	—	—	250	ns
	Rise Time					
Switch Times	Turn-off Delay Time	$V_{\text{CC}}=600\text{V}, I_c=15\text{A}, V_{\text{GE1}}=V_{\text{GE2}}=15\text{V}, R_g=83\Omega$	—	—	600	ns
	Fall Time					
Diode Reverse Recovery Time	t_{rr}	$I_c=15\text{A}, di_c/dt=-30\text{A}/\mu\text{s}$	—	—	300	ns
Diode Reverse Recovery Charge	Q_{rr}	$I_c=15\text{A}, di_c/dt=-30\text{A}/\mu\text{s}$	—	0.2	—	μC

Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

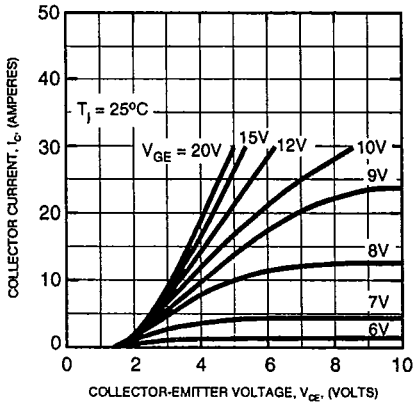
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per IGBT	—	—	0.80	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per Free Wheel Diode	—	—	1.40	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{\text{th(c-t)}}$	Per 1/6 Module	—	—	0.35	$^\circ\text{C}/\text{W}$



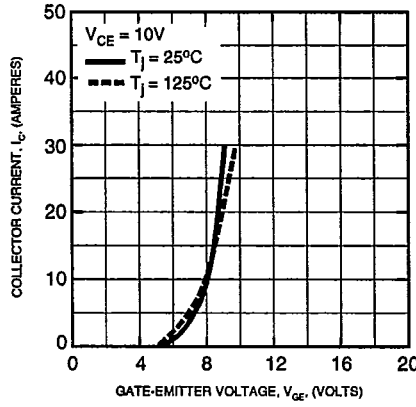
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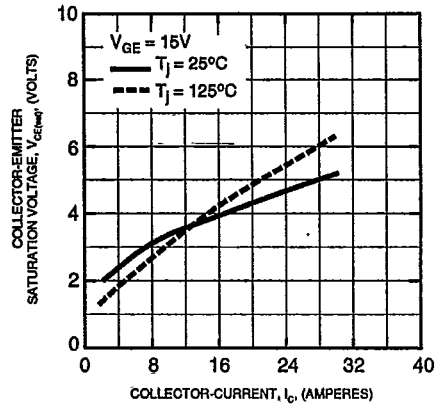
OUTPUT CHARACTERISTICS (TYPICAL)



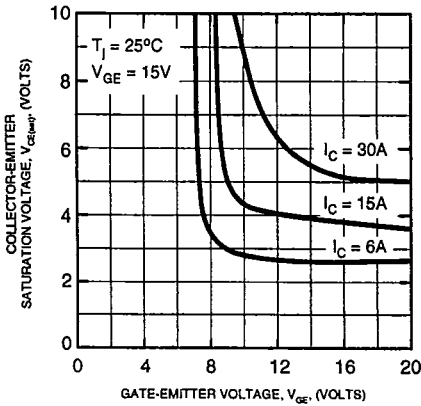
TRANSFER CHARACTERISTICS (TYPICAL)



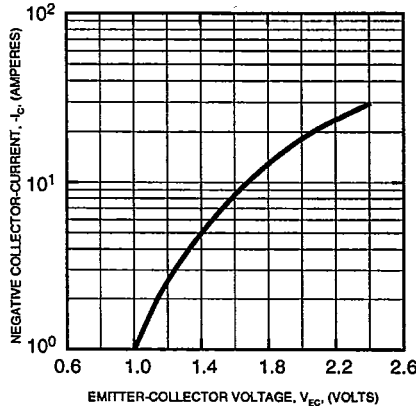
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



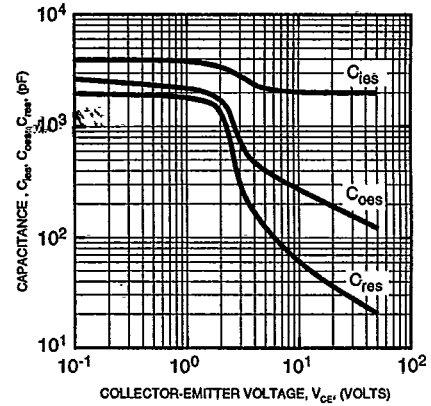
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



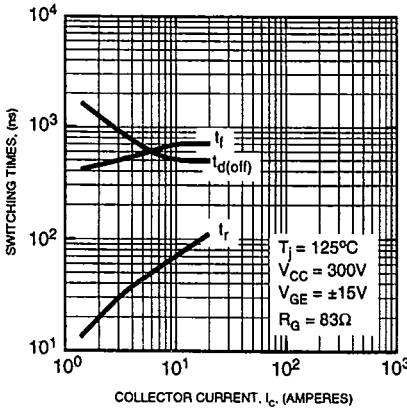
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



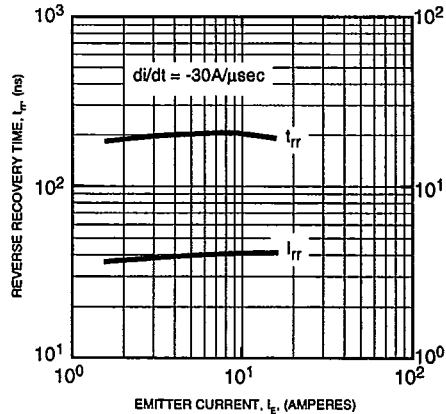
CAPACITANCE VS. V_{CE} (TYPICAL)



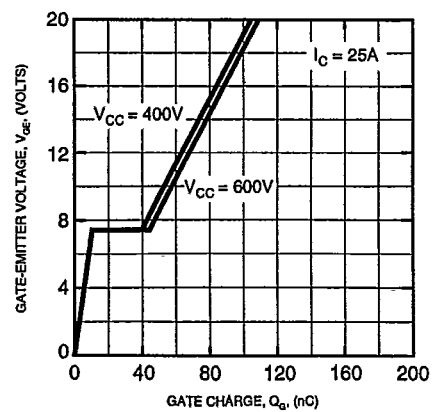
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



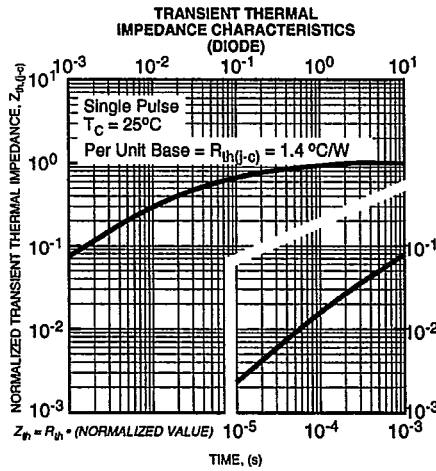
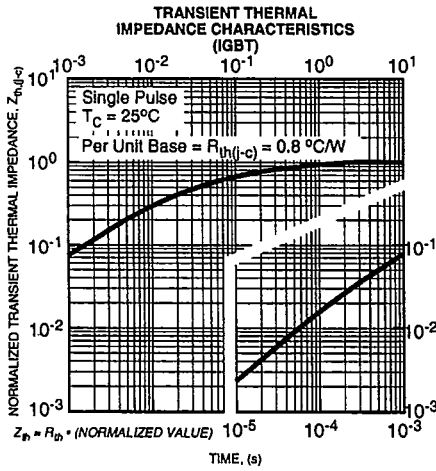
GATE CHARGE, V_{GE}



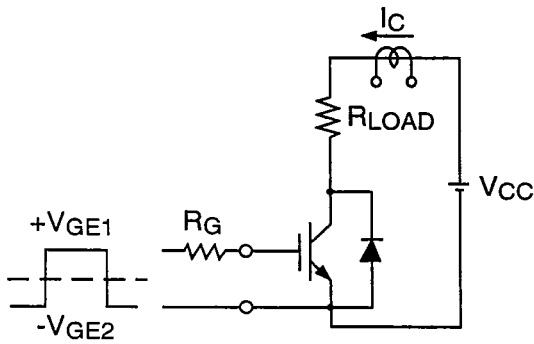


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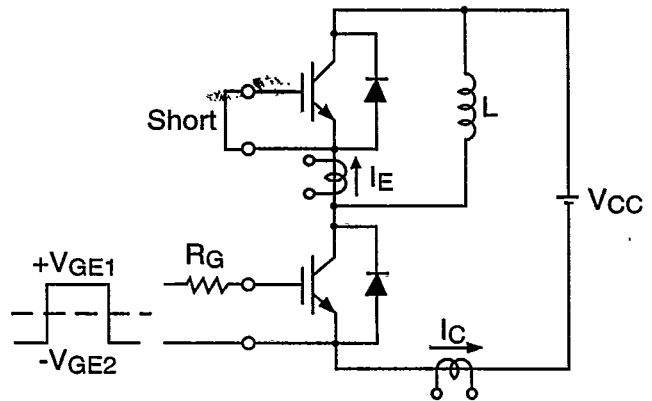
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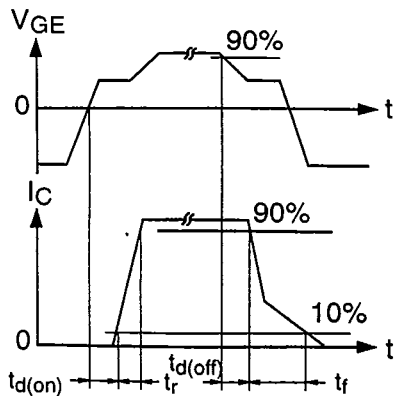
SWITCHING TIME TEST CIRCUITS & WAVEFORMS



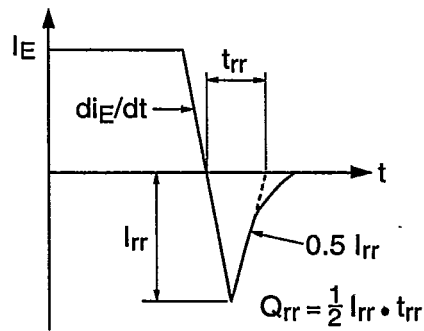
Resistance Load Switching Test Circuit



Half-Bridge Switching Test Circuit



Switching Time Test Waveforms



trr, Qrr Waveforms