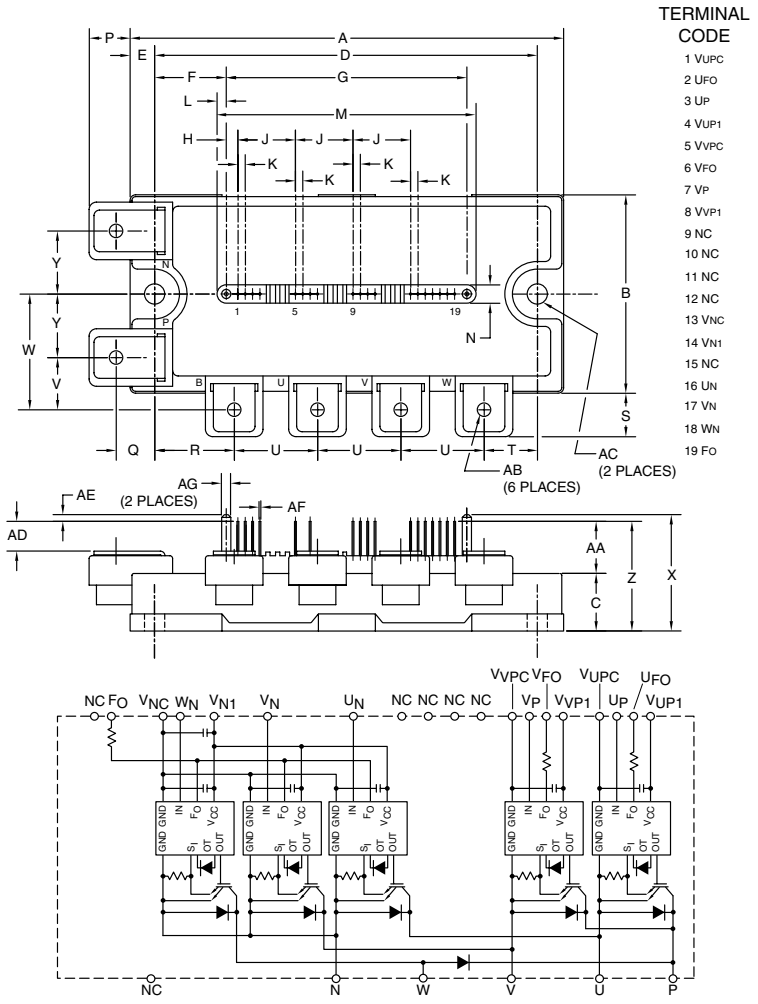
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Photo Voltaic IPM

H-Bridge + 1 Chopper
50 Amperes/600 Volts

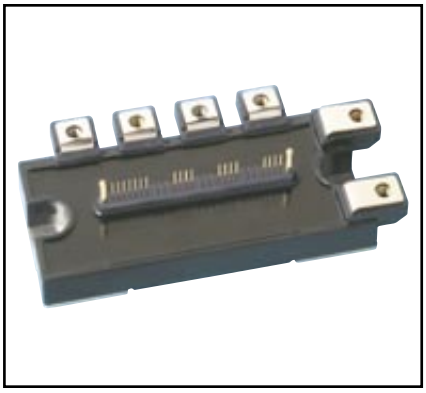
Package A



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.72	120.0
B	2.17	55.0
C	0.63	16.0
D	4.17	106.0
E	0.28	7.0
F	0.78	19.75
G	2.62	66.5
H	0.13	3.25
J	0.63	16.0
K	0.08	2.0
L	0.10	2.5
M	2.81	71.5
N	0.20	5.0
P	0.43	11.0
Q	0.42	10.75
R	0.87	22.0

Dimensions	Inches	Millimeters
S	0.46	11.75
T	0.59	15.0
U	0.91	23.0
V	0.57	14.5
W	1.26	32.0
X	1.22	31.0
Y	0.69	17.5
Z	1.14	29.0
AA	0.51	13.0
AB	M5 Metric	M5
AC	0.22 Dia.	Dia. 5.5
AD	0.28	7.0
AE	0.08	2.0
AF	0.02 Sq.	Sq. 0.5
AG	0.10 Dia.	Dia. 2.5



Description:
Powerex Intellimod™ 5th generation PV-IPMs are isolated base modules designed for power switching applications operating at frequencies to 30kHz. Built-in control circuits provide optimum gate drive and protection for the IGBT and free-wheel diode power devices.

Features:
- ☐ Complete Output Power Circuit
- ☐ Gate Drive Circuit
- ☐ Protection Logic
  - – Short Circuit
  - – Over Temperature Using On-chip Temperature Sensing
  - – Under Voltage
- ☐ Low Loss Using 5th Generation IGBT Chip

Applications:
- ☐ PV Inverters
- ☐ PV UPS
- ☐ PV Power Supplies

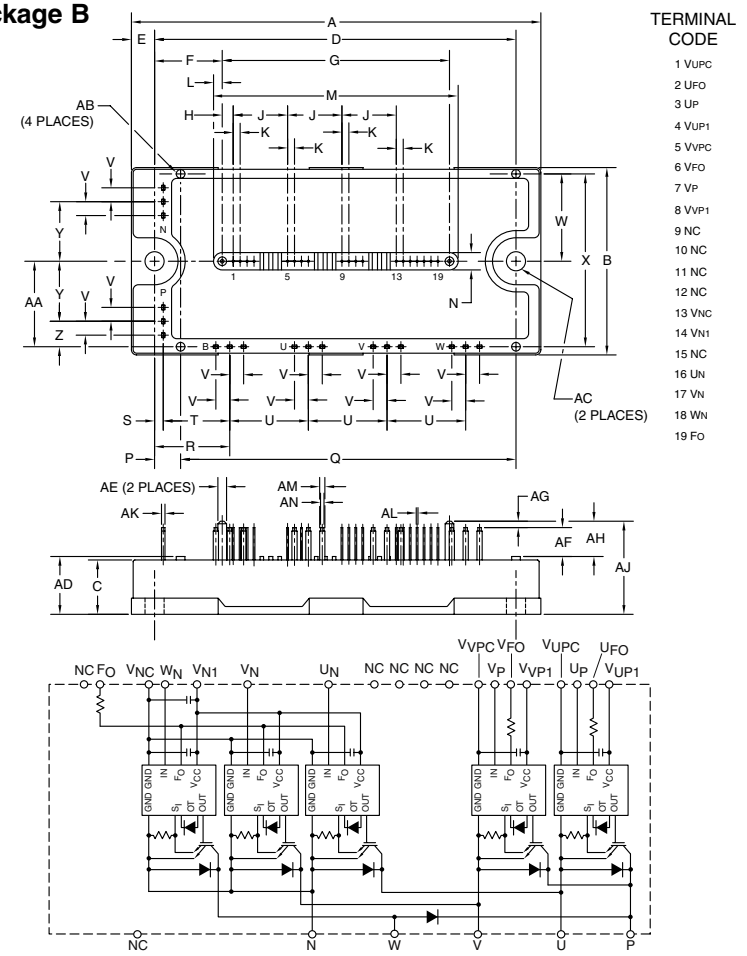
Ordering Information:
Example: Select the complete part number from the table below -i.e. PM50B5LA060 (Package A) is a 600V, 50 Ampere PV-IPM.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	50	60

Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

PM50B5LA060 / PM50B5LB060
Photo Voltaic IPM
H-Bridge + 1 Chopper
50 Amperes/600 Volts

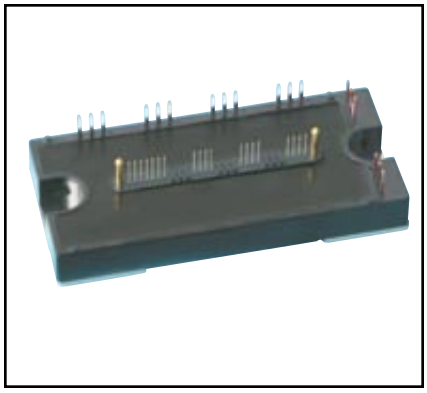
Package B



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.72	120.0
B	2.17	55.0
C	0.63	16.0
D	4.17	106.0
E	0.28	7.0
F	0.78	19.75
G	2.62	66.5
H	0.13	3.25
J	0.63	16.0
K	0.08	2.0
L	0.10	2.5
M	2.81	71.5
N	0.20	5.0
P	0.31	7.75
Q	3.87	98.25
R	0.87	22.0
S	0.10	2.5
T	0.77	19.5
U	0.91	23.0

Dimensions	Inches	Millimeters
V	0.16	4.0
W	1.01	25.75
X	2.00	50.75
Y	0.69	17.5
Z	0.30	7.5
AA	0.98	25.0
AB	0.10 Dia.	Dia. 2.5
AC	0.22 Dia.	Dia. 5.5
AD	0.67	17.0
AE	0.10 Dia.	Dia. 2.5
AF	0.33	8.5
AG	0.08	2.0
AH	0.41	10.5
AJ	1.08	27.5
AK	0.04	1.0
AL	0.02 Sq.	Sq. 0.5
AM	0.06	1.5
AN	0.04	1.0



Description:
Powerex Intellimod™ 5th generation PV-IPMs are isolated base modules designed for power switching applications operating at frequencies to 30kHz. Built-in control circuits provide optimum gate drive and protection for the IGBT and free-wheel diode power devices.

Features:
- ☐ Complete Output Power Circuit
- ☐ Gate Drive Circuit
- ☐ Protection Logic
  - – Short Circuit
  - – Over Temperature Using On-chip Temperature Sensing
  - – Under Voltage
- ☐ Low Loss Using 5th Generation IGBT Chip

Applications:
- ☐ PV Inverters
- ☐ PV UPS
- ☐ PV Power Supplies

Ordering Information:
Example: Select the complete part number from the table below -i.e. PM50B5LB060 (Package B) is a 600V, 50 Ampere PV-IPM.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	50	60

PM50B5LA060 / PM50B5LB060
Photo Voltaic IPM
H-Bridge + 1 Chopper
50 Amperes/600 Volts

Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Characteristics	Symbol	PM50B5LA060 / PM50B5LB060	Units
Power Device Junction Temperature	T_j	-20 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Module Case Operating Temperature (Note 1)	T_C	-20 to 100	°C
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws (Package A only)	—	31	in-lb
Package A Module Weight (Typical)	—	380	Grams
Package B Module Weight (Typical)	—	340	Grams
Supply Voltage, Surge (Applied between P-N)	$V_{CC(surge)}$	550	Volts
Operation of Short Circuit Protections (Applied between P-N, V_D = 13.5 ~ 16.5V, Inverter Part, T_j = 125°C Start)	$V_{CC(prot.)}$	400	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

IGBT Inverter Part

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current (T_C = 25°C)	$\pm I_C$	50	Amperes
Peak Collector Current (T_C = 25°C)	$\pm I_{CP}$	100	Amperes
Collector Dissipation (T_C = 25°C) (Note 1)	P_C	131	Watts

Converter Part

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current (T_C = 25°C)	$\pm I_C$	50	Amperes
Peak Collector Current (T_C = 25°C)	$\pm I_{CP}$	100	Amperes
Collector Dissipation (T_C = 25°C) (Note 1)	P_C	131	Watts
Diode Rated DC Reverse Voltage (T_C = 25°C)	$V_{R(DC)}$	600	Volts
Diode Forward Current	I_F	50	Amperes

Control Part

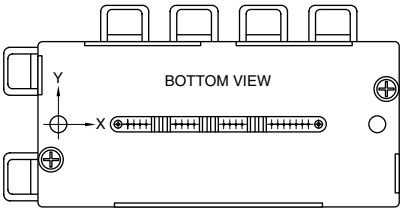
Supply Voltage (Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{N1}-V_{NC})	V_D	20	Volts
Input Voltage (Applied between U_P-V_{UPC}, V_P-V_{VPC}, U_N- V_N- W_N-Br-V_{NC})	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between U_{FO}-V_{UPC}, V_{FO}-V_{VPC}, F_O-V_{NC})	V_{FO}	20	Volts
Fault Output Supply Current (Sink Current at U_{FO}, V_{FO}, F_O Terminals)	I_{FO}	20	mA

Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

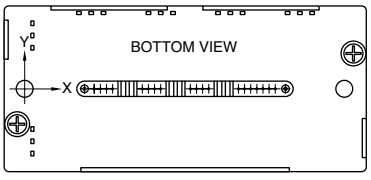
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Part						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 50A, Pulsed, T_j = 25°C	—	1.5	—	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 50A, Pulsed, T_j = 125°C	—	1.55	—	Volts
Diode Forward Voltage	V_{EC}	$-I_C$ = 50A, V_{CIN} = 15V, V_D = 15V	—	2.2	3.3	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ↔ 15V, V_{CC} = 300V, T_j = 125°C, Inductive Load (Per 1 Arm)	0.3	0.7	1.4	µs
	t_{rr}		—	0.1	0.2	µs
	$t_{C(on)}$		—	0.2	0.4	µs
	t_{off}		—	0.9	1.8	µs
	$t_{C(off)}$		—	0.2	0.4	µs
Collector-Emitter Cutoff Current	I_{CES}	V_{CE} = V_{CES}, V_{CIN} = 15V, T_j = 25°C	—	—	1.0	mA
		V_{CE} = V_{CES}, V_{CIN} = 15V, T_j = 125°C	—	—	10	mA
Converter Part						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 50A, Pulsed, T_j = 25°C	—	1.5	—	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 50A, Pulsed, T_j = 125°C	—	1.55	—	Volts
Diode Forward Voltage	V_{EC}	$-I_C$ = 50A, V_{CIN} = 15V, V_D = 15V	—	2.2	3.3	Volts
Diode Forward Voltage	V_{FM}	I_F = 50A	—	1.7	2.7	Volts
Collector-Emitter Cutoff Current	I_{CES}	V_{CE} = V_{CES}, V_{CIN} = 15V, T_j = 25°C	—	—	1.0	mA
		V_{CE} = V_{CES}, V_{CIN} = 15V, T_j = 125°C	—	—	10	mA

Note 1: T_C (under the chip) Measurement Point

Package A



Package B



PM50B5LA060 / PM50B5LB060
Photo Voltaic IPM
H-Bridge + 1 Chopper
50 Amperes/600 Volts

Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Part						
Control Supply Voltage	V_D	Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{N1}- V_N	13.5	15.0	16.5	Volts
Circuit Current	I_D	V_D = 15V, V_{CIN} = 15V, V_{N1}-V_{NC}	—	20	30	mA
		V_D = 15V, V_{CIN} = 15V, V_{XP1}-V_{XPC}	—	5	10	mA
Input ON Threshold Voltage	$V_{th(on)}$	Applied between U_P-V_{UPC},	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{th(off)}$	V_P-V_{VPC}, U_N- V_N- W_N-Br-V_{NC}	1.7	2.0	2.3	Volts
Short Circuit Trip Level	SC	Inverter Part	100	—	—	Amperes
(-20°C ≤ T_j ≤ 125°C, V_D = 15V, Inductive Load per 1 Arm)		Brake Part	100	—	—	Amperes
Short Circuit Current Delay Time	$t_{off(SC)}$	V_D = 15V	—	10	—	µs
Over Temperature Protection*	OT	Trip Level	135	145	—	°C
(V_D = 15V)	OT_r	Reset Level	—	125	—	°C
Supply Circuit Under-voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
(T_j ≤ 125°C)	UV_r	Reset Level	12.0	12.5	13.0	Volts
Fault Output Current*	$I_{FO(H)}$	V_D = 15V, V_{FO} = 15V	—	—	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	—	10	15	mA
Fault Output Pulse Width*	t_{FO}	V_D = 15V	1.0	1.8	—	ms

*Fault output is given only when the internal SC, OT and UV protections schemes of either upper or lower devide operate to protect it.
Fault output of SC protection given pulse. Fault output of OT, UV protection given pulse while over trip level.

Thermal Characteristics, T_j = 25°C unless otherwise specified

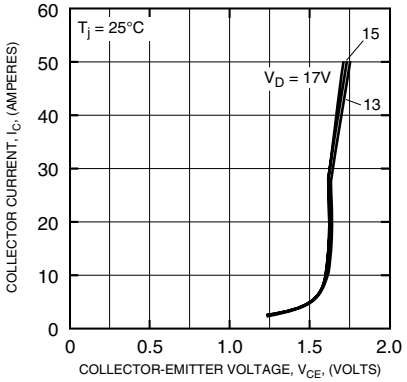
Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Inverter IGBT (Per 1 Element) (Note 1)	—	—	0.95	°C/Watt
	$R_{th(j-c)D}$	Inverter FWDi (Per 1 Element) (Note 1)	—	—	1.61	°C/Watt
	$R_{th(j-c)Q}$	Converter IGBT (Per 1 Element) (Note 1)	—	—	0.95	°C/Watt
	$R_{th(j-c)D}$	Converter FWDi Upper Arm (Per 1 Element) (Note 1)	—	—	0.95	°C/Watt
	$R_{th(j-c)D}$	Converter FWDi Lower Arm (Per 1 Element) (Note 1)	—	—	1.61	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin (Per 1 Element), Thermal Grease Applied	—	—	0.038	°C/Watt

Recommended Conditions for Use

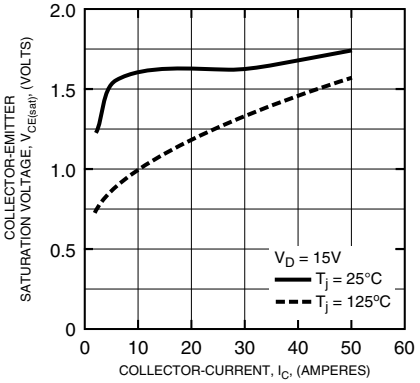
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	V_{CC}	Applied across P-N Terminals	≤400	Volts
Control Supply Voltage	V_D	Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{N1}-V_{NC}	15.0 ± 1.5	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between U_P-V_{UPC},	≤0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	V_P-V_{VPC}, U_N- V_N- W_N-Br-V_{NC}	≥9.0	Volts
PWM Input Frequency	f_{PWM}	Using Application Circuit	≤30	kHz
Arm Shoot-through Blocking Time	t_{DEAD}	Using Application Circuit of IPM's Input Signal of Each Arm	≥2.0	µs

PM50B5LA060 / PM50B5LB060
Photo Voltaic IPM
H-Bridge + 1 Chopper
50 Amperes/600 Volts

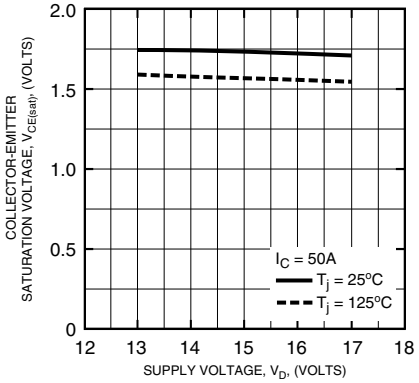
OUTPUT CHARACTERISTICS (TYPICAL - INVERTER PART)



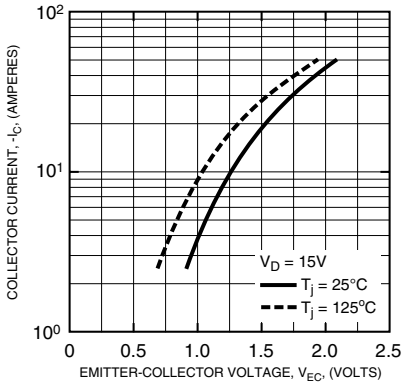
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL - INVERTER PART)



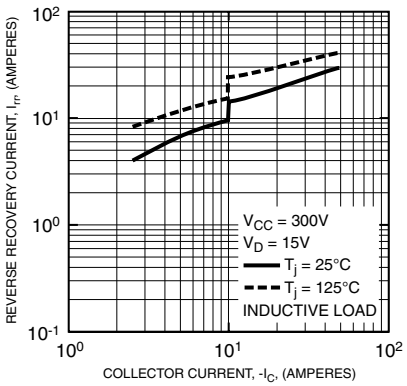
COLLECTOR-EMITTER SATURATION VOLTAGE VS. SUPPLY VOLTAGE CHARACTERISTICS (TYPICAL - INVERTER PART)



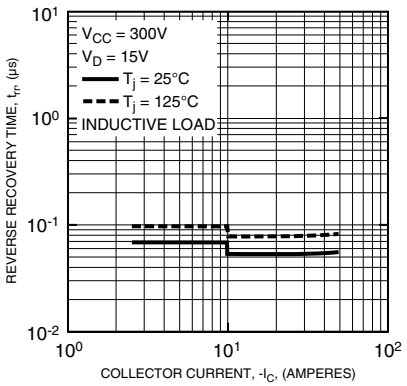
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL - INVERTER PART)



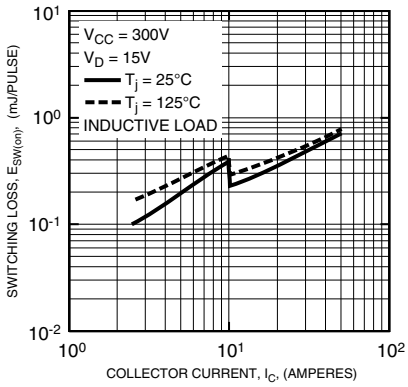
REVERSE RECOVERY CHARACTERISTICS (TYPICAL - INVERTER PART)



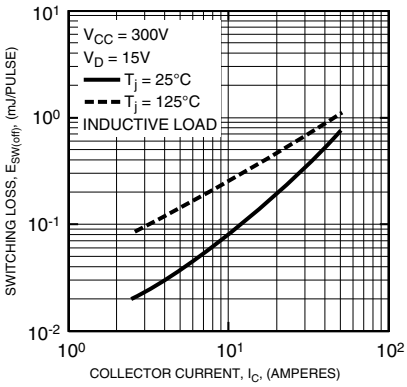
REVERSE RECOVERY CHARACTERISTICS (TYPICAL - INVERTER PART)



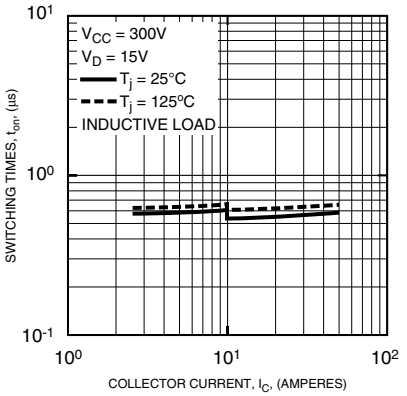
SWITCHING LOSS (ON) VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



SWITCHING LOSS (OFF) VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)

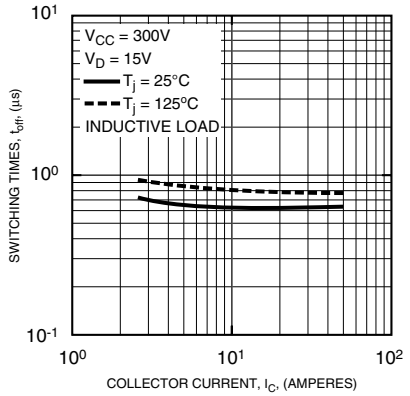


SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)

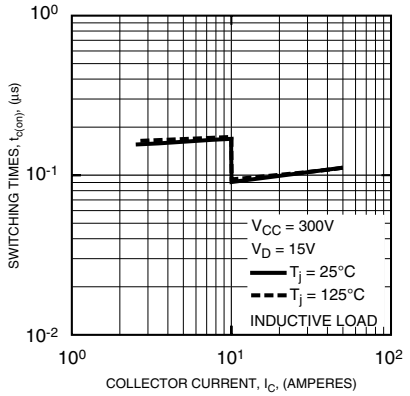


PM50B5LA060 / PM50B5LB060
Photo Voltaic IPM
H-Bridge + 1 Chopper
50 Amperes/600 Volts

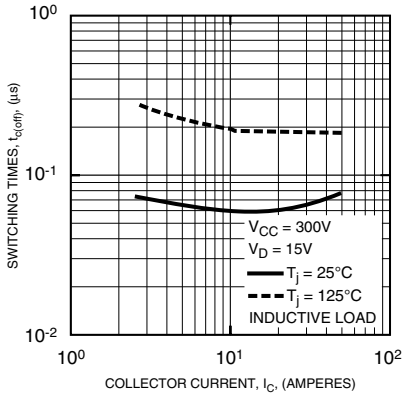
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



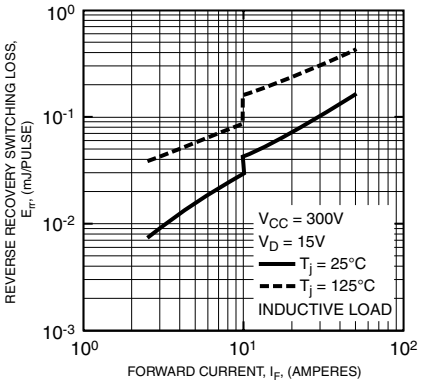
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



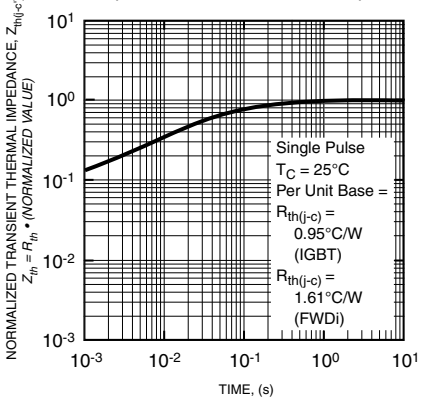
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - INVERTER PART)



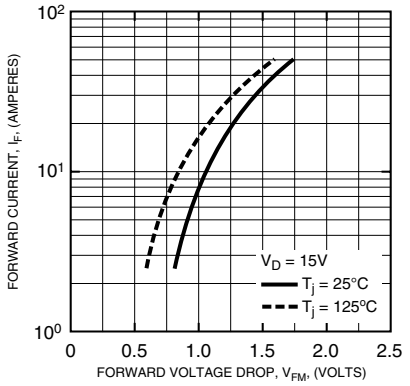
REVERSE RECOVERY LOSS CHARACTERISTICS (TYPICAL - INVERTER PART)



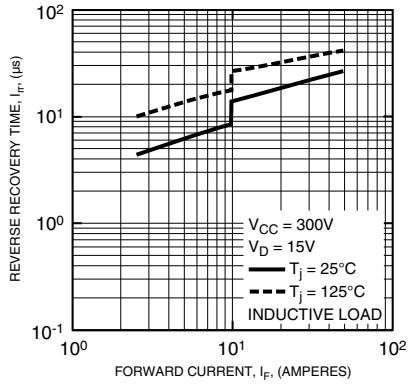
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi - INVERTER PART)



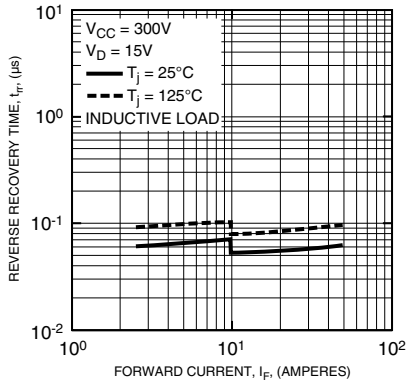
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL - UPPER ARM OF CONVERTER PART)



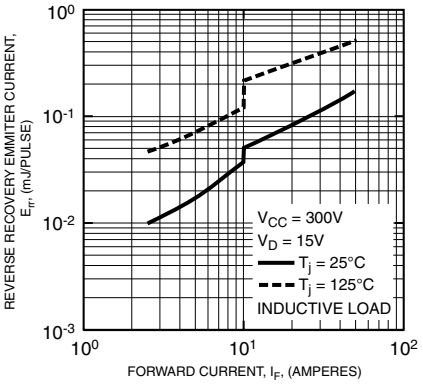
REVERSE RECOVERY CHARACTERISTICS (TYPICAL - UPPER ARM OF CONVERTER PART)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL - UPPER ARM OF CONVERTER PART)

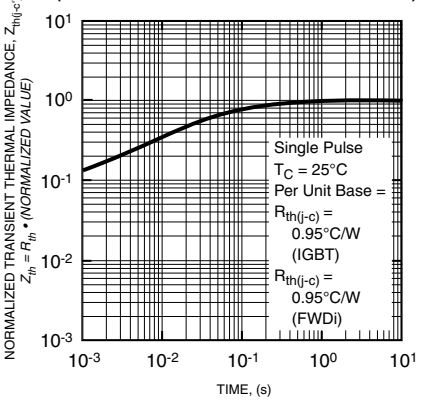


REVERSE RECOVERY LOSS CHARACTERISTICS (TYPICAL - UPPER ARM OF CONVERTER PART)

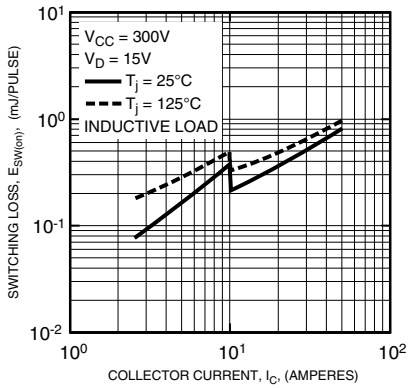


PM50B5LA060 / PM50B5LB060
Photo Voltaic IPM
H-Bridge + 1 Chopper
50 Amperes/600 Volts

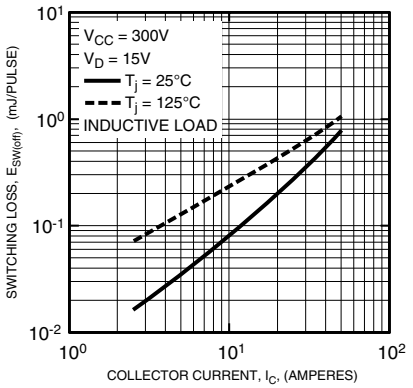
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi UPPER ARM CONVERTER PART)



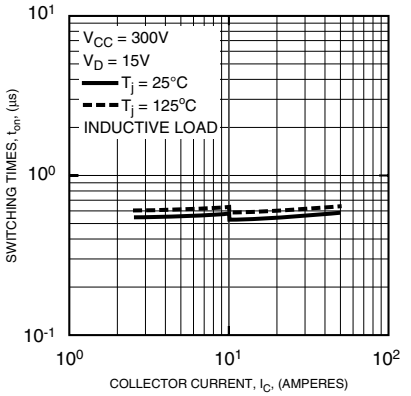
SWITCHING LOSS (ON) VS. COLLECTOR CURRENT (TYPICAL - LOWER ARM OF CONVERTER PART)



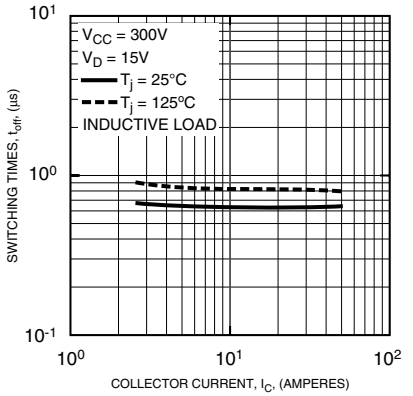
SWITCHING LOSS (ON) VS. COLLECTOR CURRENT (TYPICAL - LOWER ARM OF CONVERTER PART)



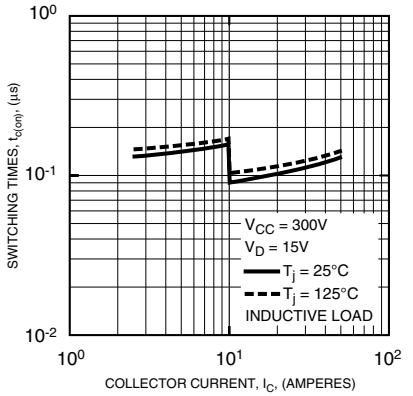
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - LOWER ARM OF CONVERTER PART)



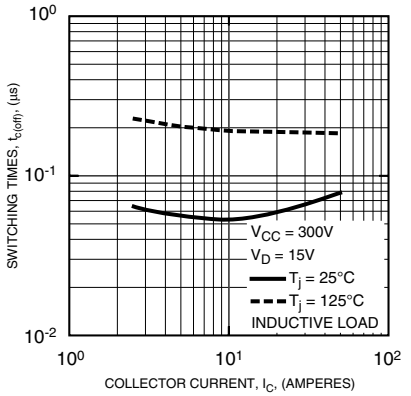
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - LOWER ARM OF CONVERTER PART)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - LOWER ARM OF CONVERTER PART)



SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL - LOWER ARM OF CONVERTER PART)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi LOWER ARM CONVERTER PART)