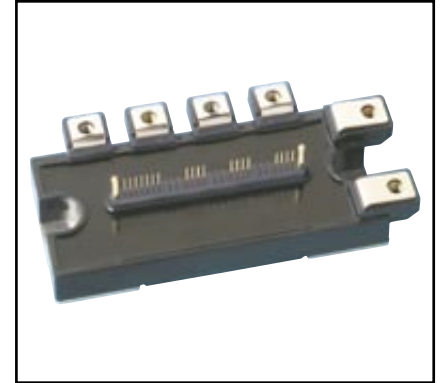
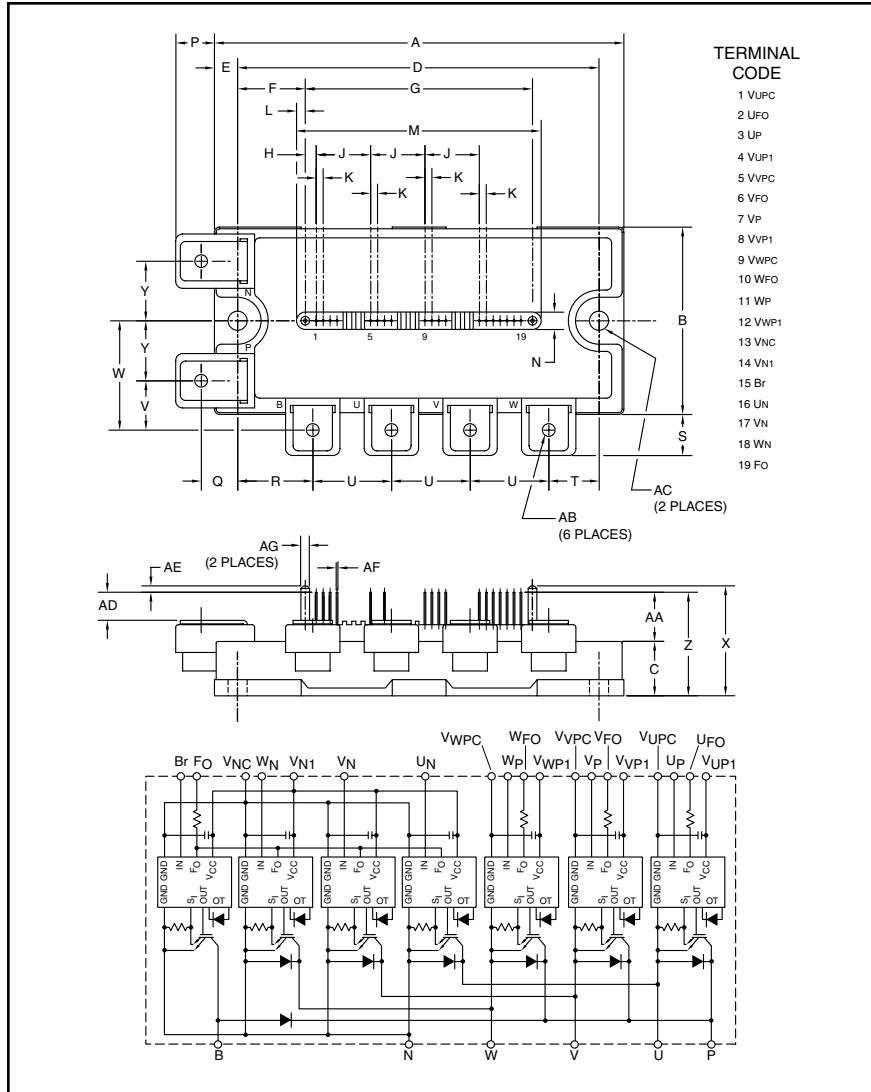


Intellimod™ L-Series

Three Phase

IGBT Inverter + Brake

150 Amperes/600 Volts



Description:

Powerex Intellimod™ Intelligent Power Modules are isolated base modules designed for power switching applications operating at frequencies to 20kHz. 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:

- ☐ Inverters
- ☐ UPS
- ☐ Motion/Servo Control
- ☐ Power Supplies

Ordering Information:

Example: Select the complete part number from the table below -i.e. PM150RLA060 is a 600V, 150 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V _{CE} Volts (x 10)
PM	150	60

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



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

PM150RLA060
Intellimod™ L-Series
Three Phase IGBT Inverter + Brake
150 Amperes/600 Volts

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

Characteristics	Symbol	PM150RLA060	Units
Power Device Junction Temperature	T_j	-20 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws	—	31	in-lb
Module Weight (Typical)	—	380	Grams
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	550	Volts
Self-protection Supply Voltage Limit (Short Circuit protection Capability)*	$V_{\text{CC(prot.)}}$	400	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

* $V_D = 13.5 \sim 16.5\text{V}$, Inverter Part, $T_j = 125^\circ\text{C}$

IGBT Inverter Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{CES}	600	Volts
Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_C$	150	Amperes
Peak Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_{\text{CP}}$	300	Amperes
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	480	Watts

IGBT Brake Sector

Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$)	V_{CES}	600	Volts
Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_C$	75	Amperes
Peak Collector Current ($T_C = 25^\circ\text{C}$)	$\pm I_{\text{CP}}$	150	Amperes
Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	300	Watts
Diode Rated DC Reverse Voltage ($T_C = 25^\circ\text{C}$)	$V_{\text{R(DC)}}$	600	Volts
Diode Forward Current	I_F	75	Amperes

Control Sector

Supply Voltage (Applied between $V_{\text{UP1}}-V_{\text{UPC}}$, $V_{\text{VP1}}-V_{\text{VPC}}$, $V_{\text{WP1}}-V_{\text{WPC}}$, $V_{\text{N1}}-V_{\text{NC}}$)	V_D	20	Volts
Input Voltage (Applied between U_P-V_{UPC} , V_P-V_{VPC} , W_P-V_{WPC} , U_N-V_N , W_N , $Br-V_{\text{NC}}$)	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between $U_{\text{FO}}-V_{\text{UPC}}$, $V_{\text{FO}}-V_{\text{VPC}}$, $W_{\text{FO}}-V_{\text{WPC}}$, F_O-V_{NC})	V_{FO}	20	Volts
Fault Output Current (U_{FO} , V_{FO} , W_{FO} , F_O Terminals)	I_{FO}	20	mA

PM150RLA060
Intellimod™ L-Series
Three Phase IGBT Inverter + Brake
150 Amperes/600 Volts

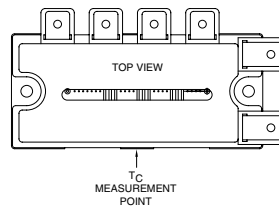
Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Forward Voltage	V_{EC}	$-I_C = 150\text{A}, V_{CIN} = 15\text{V}, V_D = 15\text{V}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 150\text{A}, T_j = 25^\circ\text{C}$	—	1.6	2.1	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 150\text{A}, T_j = 125^\circ\text{C}$	—	1.5	2.0	Volts
Inductive Load Switching Times	t_{on}	$V_D = 15\text{V}, V_{CIN} = 0 \Leftrightarrow 15\text{V}$ $V_{CC} = 300\text{V}, I_C = 150\text{A}$ $T_j = 125^\circ\text{C}$	0.5	1.0	2.4	μs
	t_{rr}		—	0.2	0.4	μs
	$t_{C(on)}$		—	0.4	1.0	μs
	t_{off}		—	1.2	2.5	μs
	$t_{C(off)}$		—	0.5	1.0	μs

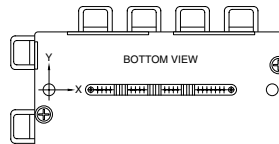
IGBT Brake Sector

Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Forward Voltage	V_{FM}	$I_F = 75\text{A}$	—	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A}, T_j = 25^\circ\text{C}$	—	1.6	2.1	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A}, T_j = 125^\circ\text{C}$	—	1.5	2.0	Volts

Note 1: T_C (Base Plate) Measurement Point



Note 2: T_C (Under the Chip) Measurement Point



Arm Axis	UP		VP		WP		UN		VN		WN		Br	
	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi	IGBT	FWDi
X	28.3	28.3	65.0	65.0	87.0	87.0	39.3	39.3	54.0	54.0	76.0	76.0	18.1	18.1
Y	-7.7	2.4	-7.7	2.4	-7.7	2.4	5.7	-4.4	5.7	-4.4	5.7	-4.4	-10.5	4.0

PM150RLA060
Intellimod™ L-Series
Three Phase IGBT Inverter + Brake
150 Amperes/600 Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Short Circuit Trip Level	SC	Inverter Part	300	—	—	Amperes
($-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$)		Brake Part	150	—	—	Amperes
Short Circuit Current Delay Time	$t_{\text{off(SC)}}$	$V_D = 15\text{V}$	—	0.2	—	μs
Over Temperature Protection	OT	Trip Level	135	145	155	$^\circ\text{C}$
(Detect T_j of IGBT Chip)	OT_R	Reset Level	—	125	—	$^\circ\text{C}$
Supply Circuit Under-voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
($-20 \leq T_j \leq 125^\circ\text{C}$)	UV_R	Reset Level	—	12.5	—	Volts
Circuit Current	I_D	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{N1}-V_{\text{NC}}$	—	20	30	mA
		$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{XP1}}-V_{\text{XPC}}$	—	5	10	mA
Input ON Threshold Voltage	$V_{\text{th(on)}}$	Applied between U_P-V_{UPC} .	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{th(off)}}$	V_P-V_{VPC} , W_P-V_{WPC} , U_N-V_N , $W_N-\text{Br}-V_{\text{NC}}$	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$	—	10	15	mA
Fault Output Pulse Width*	t_{FO}	$V_D = 15\text{V}$	1.0	1.8	—	ms

*Fault output is given only when the internal SC, OT and UV protections schemes of either upper or lower device operate to protect it.

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

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{\text{th(j-c)Q}}$	Inverter IGBT (Per 1/6 Module) (Note 1)	—	—	0.26	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)D}}$	Inverter FWDi (Per 1/6 Module) (Note 1)	—	—	0.43	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)Q}}$	Brake IGBT (Per 1/6 Module) (Note 1)	—	—	0.42	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)D}}$	Brake FWDi (Per 1/6 Module) (Note 1)	—	—	0.69	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)Q}}$	Inverter IGBT (Per 1/6 Module) (Note 2)	—	—	0.20	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)D}}$	Inverter FWDi (Per 1/6 Module) (Note 2)	—	—	0.33	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)Q}}$	Brake IGBT (Per 1/6 Module) (Note 2)	—	—	0.32	$^\circ\text{C/Watt}$
	$R_{\text{th(j-c)D}}$	Brake FWDi (Per 1/6 Module) (Note 2)	—	—	0.53	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{\text{th(c-f)}}$	Case to Fin Per Module, Thermal Grease Applied (Note 1)	—	—	0.038	$^\circ\text{C/Watt}$

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 $V_{\text{UP1}}-V_{\text{UPC}}$, $V_{\text{VP1}}-V_{\text{VPC}}$, $V_{\text{WP1}}-V_{\text{WPC}}$, $V_{N1}-V_{\text{NC}}$	15.0 ± 1.5	Volts
Input ON Voltage	$V_{\text{CIN(on)}}$	Applied between U_P-V_{UPC} .	≤ 0.8	Volts
Input OFF Voltage	$V_{\text{CIN(off)}}$	V_P-V_{VPC} , W_P-V_{WPC} , U_N-V_N , $W_N-\text{Br}-V_{\text{NC}}$	≥ 9.0	Volts
PWM Input Frequency	f_{PWM}		≤ 20	kHz
Arm Shoot-through Blocking Time	t_{DEAD}	Input Signal	≥ 2.0	μs

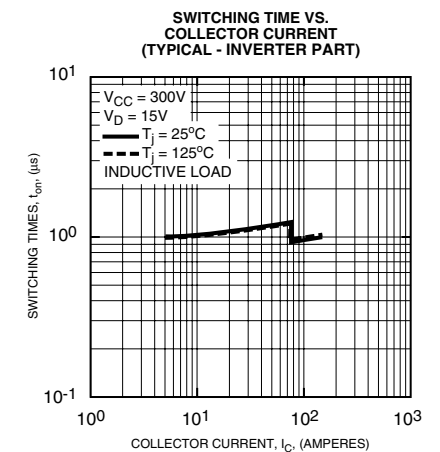
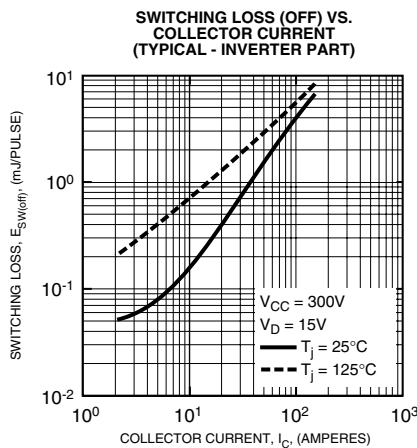
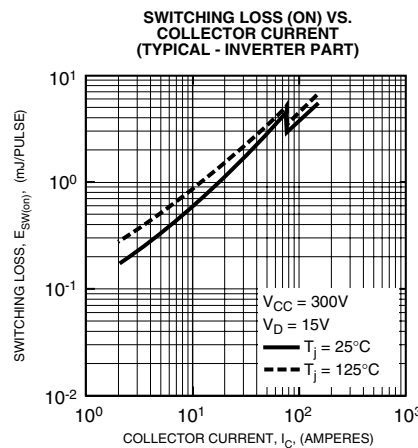
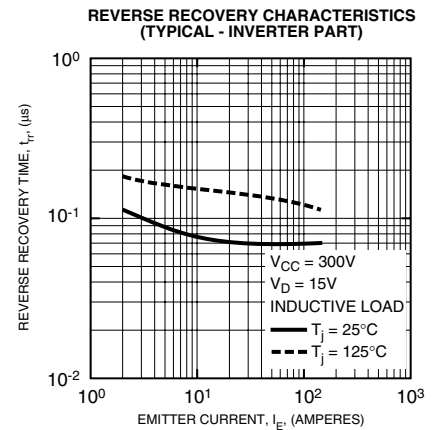
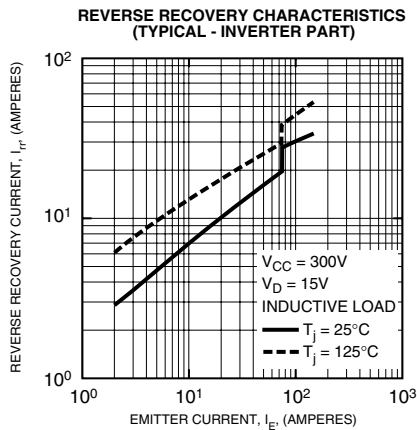
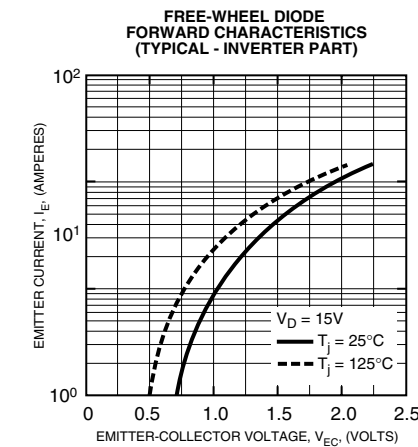
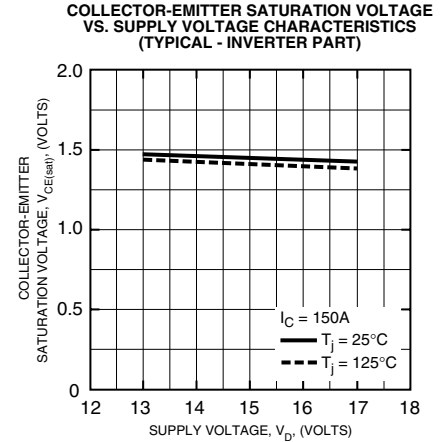
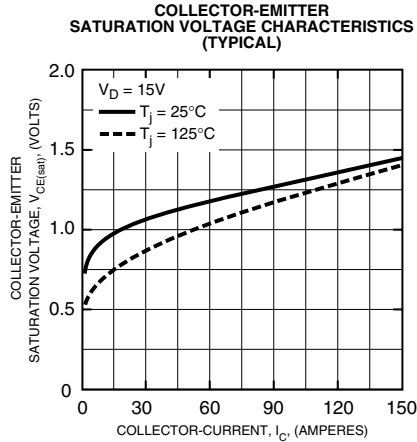
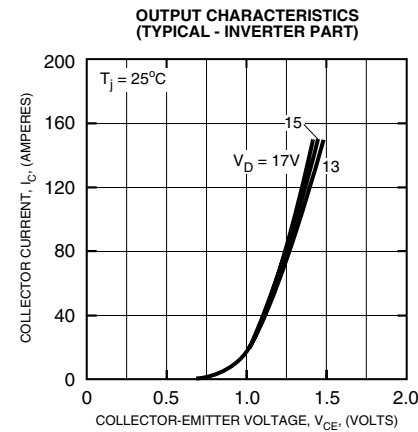
** With ripple satisfying the following conditions: dv/dt swing $\leq \pm 5\text{V}/\mu\text{s}$, Variation $\leq 2\text{V}$ peak to peak.

PM150RLA060

Intellimod™ L-Series

Three Phase IGBT Inverter + Brake

150 Amperes/600 Volts



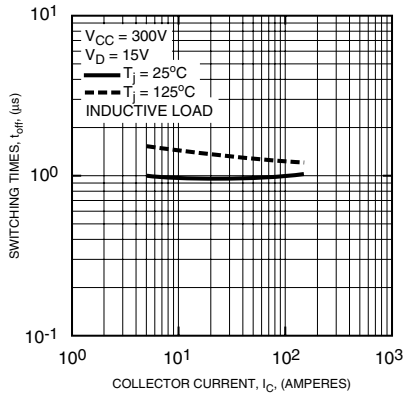
PM150RLA060

Intellimod™ L-Series

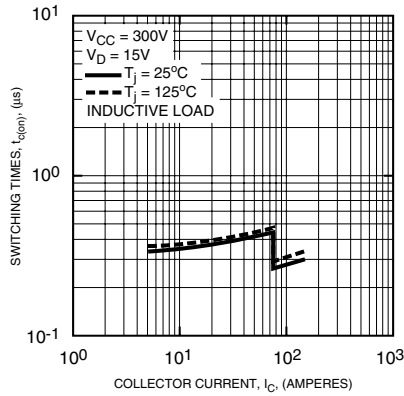
Three Phase IGBT Inverter + Brake

150 Amperes/600 Volts

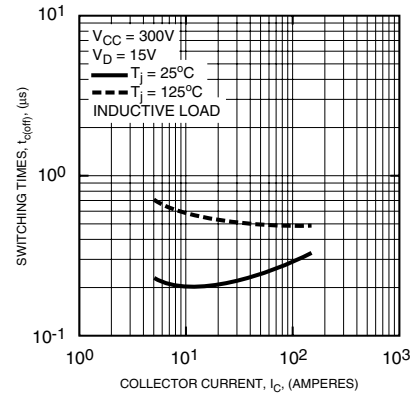
SWITCHING TIME VS.
COLLECTOR CURRENT
(TYPICAL - INVERTER PART)



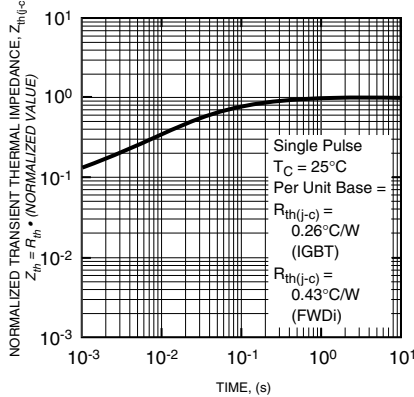
SWITCHING TIME VS.
COLLECTOR CURRENT
(TYPICAL - INVERTER PART)



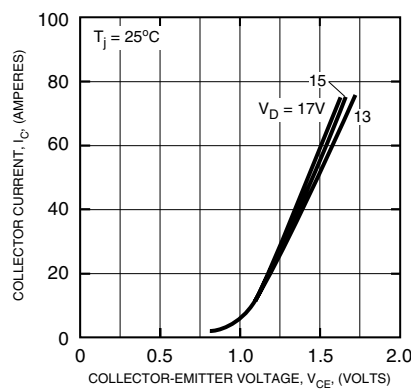
SWITCHING TIME VS.
COLLECTOR CURRENT
(TYPICAL - INVERTER PART)



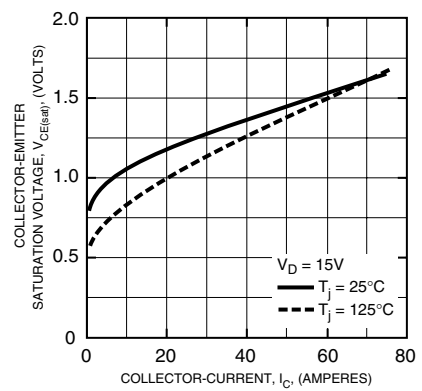
TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT & FWDI - INVERTER PART)



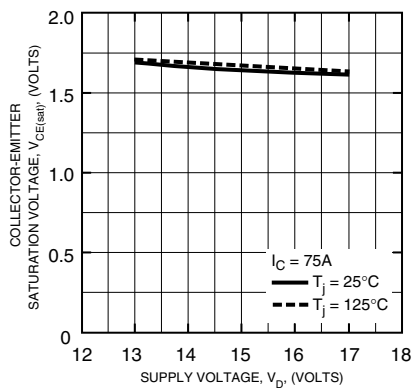
OUTPUT CHARACTERISTICS
(TYPICAL - BRAKE PART)



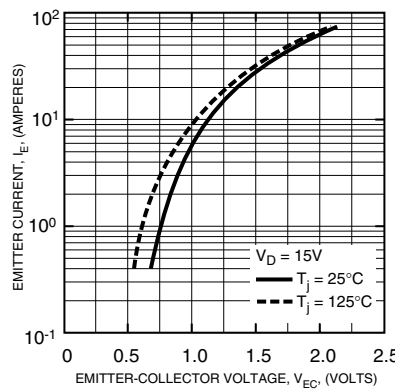
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL - BRAKE PART)



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



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



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT & FWDI - BRAKE PART)

