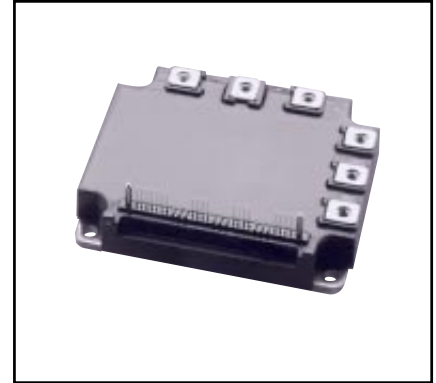
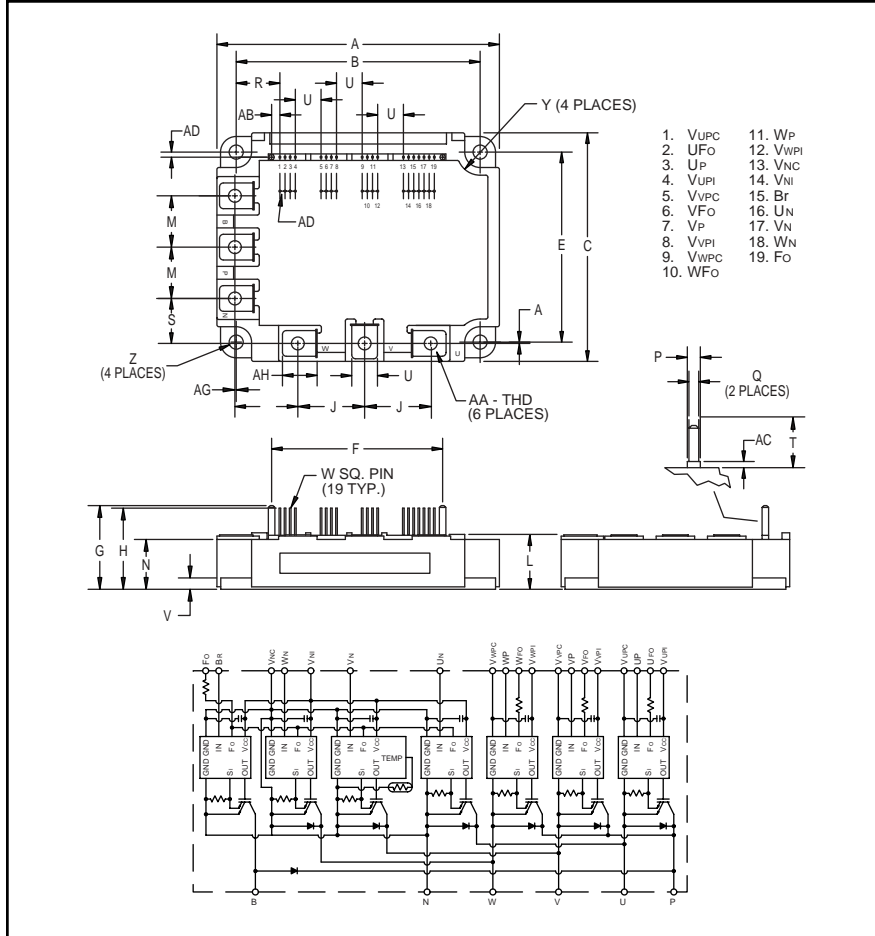


### Intellimod™ Module Three Phase + Brake IGBT Inverter Output 50 Amperes/1200 Volts



#### 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 Current
  - Over Temperature
  - Under Voltage
- Low Loss Using 4th 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. PM50RSD120 is a 1200V, 50 Ampere Intellimod™ Intelligent Power Module.

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters	Dimensions	Inches	Millimeters
A	4.33±0.04	110.0±1.0	R	0.67	17.02
B	3.74±0.02	95.0±0.5	S	0.67	17.02
C	3.50±0.04	89.0±1.0	T	0.52	13.2
E	2.91±0.02	74.0±0.5	U	0.39	10.0
F	2.62	66.44	V	0.16	4.0
G	1.28	32.6	W	0.02	0.5
H	1.24	31.6	Y	0.24 Rad.	Rad. 6.0
J	1.02	26.0	Z	0.22 Dia.	Dia. 5.5
K	0.94	24.0	AA	M5	M5
L	0.87 +0.04/-0.02	22.0 +1.0/-0.5	AB	0.13	3.22
M	0.79	20.0	AC	0.06	1.6
N	0.76	19.4	AD	0.08±0.02	2.0±0.5
P	0.18	4.5	AG	0.020.01	0.5±0.3
Q	0.10	2.54	AH	0.47	12.0

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	50	120

**PM50RSD120**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**50 Amperes/1200 Volts**

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

Characteristics	Symbol	PM50RSD120	Units
Power Device Junction Temperature	$T_j$	-20 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-40 to 125	$^\circ\text{C}$
Case Operating Temperature*	$T_C$	-20 to 100	$^\circ\text{C}$
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws	—	31	in-lb
Module Weight (Typical)	—	560	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part) $T_j = 125^\circ\text{C}$ Start	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	$V_{\text{ISO}}$	2500	Volts

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	50	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	100	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	800	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	328	Watts

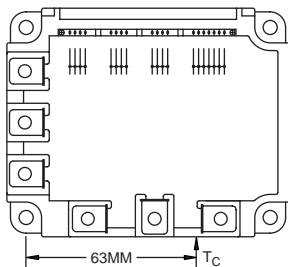
**IGBT Brake Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_C$	15	Amperes
Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	30	Amperes
FWDi Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )	$V_{\text{R(DC)}}$	1200	Volts
FWDi Forward Current ( $T_C = 25^\circ\text{C}$ )	$I_F$	15	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_C$	201	Watts

**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 ( $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N$ , $V_N$ , $W_N$ , $B_r-V_{\text{NC}}$ )	$V_{\text{CIN}}$	20	Volts
Fault Output Supply Voltage Applied between ( $U_{\text{FO}}-V_{\text{UPC}}$ , $V_{\text{FO}}-V_{\text{VPC}}$ , $W_{\text{FO}}-V_{\text{WPC}}$ , $F_O-V_{\text{NC}}$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current ( $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ , $F_O$ )	$I_{\text{FO}}$	20	mA

\* $T_C$  Measure Point



**PM50RSD120**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**50 Amperes/1200 Volts**

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>IGBT Inverter Sector</b>						
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C}, V_D = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}, V_D = 15\text{V}$	—	—	10	mA
Diode Forward Voltage	$V_{EC}$	$-I_C = 50\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A},$ Pulsed, $T_j = 25^\circ\text{C}$	—	2.4	3.2	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A},$ Pulsed, $T_j = 125^\circ\text{C}$	—	2.1	2.8	Volts
Inductive Load Switching Times	$t_{on}$		0.5	1.0	2.5	$\mu\text{S}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$	—	0.15	0.3	$\mu\text{S}$
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 50\text{A}$	—	0.4	1.0	$\mu\text{S}$
	$t_{off}$	$T_j = 125^\circ\text{C},$ Inductive Load	—	2.5	3.5	$\mu\text{S}$
	$t_{C(off)}$		—	0.7	1.2	$\mu\text{S}$
<b>IGBT Brake Sector</b>						
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C}, V_D = 15\text{V}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}, V_D = 15\text{V}$	—	—	10	mA
FWDi Forward Voltage	$V_{FM}$	$I_F = 15\text{A}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A},$ Pulsed, $T_j = 25^\circ\text{C}$	—	2.5	3.3	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 15\text{A},$ Pulsed, $T_j = 125^\circ\text{C}$	—	2.2	3.2	Volts
<b>Control Sector</b>						
Over Current Trip Level Inverter Part ( $V_D = 15\text{V}$ )	OC	$T_j = 25^\circ\text{C}$	93	157	—	Amperes
		$T_j = 125^\circ\text{C}$	59	—	—	Amperes
Over Current Trip Level Brake Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}, V_D = 15\text{V}$	22	—	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}, V_D = 15\text{V}$	—	183	—	Amperes
Short Circuit Trip Level Brake Part			—	95	—	Amperes
Over Current Delay Time	$t_{off(OC)}$	$V_D = 15\text{V}$	—	10	—	$\mu\text{S}$
Over Temperature Protection ( $V_D = 15\text{V}$ ) (Lower Arm)	OT	Trip Level	111	118	125	$^\circ\text{C}$
	$OT_R$	Reset Level	—	100	—	$^\circ\text{C}$
Supply Circuit Under Voltage Protection ( $-20 \leq T_j \leq 125^\circ\text{C}$ )	UV	Trip Level	11.5	12.0	12.5	Volts
	$UV_R$	Reset Level	—	12.5	—	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}, V_{CIN} = 15\text{V}, V_{N1}-V_{NC}$	—	44	60	mA
		$V_D = 15\text{V}, V_{CIN} = 15\text{V}, V_{XP1}-V_{XPC}$	—	13	18	mA
Input ON Threshold Voltage	$V_{CIN(on)}$	Applied between $U_P-V_{UPC}, V_P-V_{VPC},$	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{CIN(off)}$	$W_P-V_{WPC}, U_N, V_N, W_N, B_r-V_{NC}$	1.7	2.0	2.3	Volts
Fault Output Current*	$I_{FO(H)}$	$V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	—	0.01	mA
	$I_{FO(L)}$	$V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width*	$t_{FO}$	$V_D = 15\text{V}$	1.0	1.8	—	mS

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



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

**PM50RSD120**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**50 Amperes/1200 Volts**

### Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.38	°C/Watt
Inverter Part	$R_{th(j-c)F}$	Each FWDi	—	—	0.70	°C/Watt
	$R_{th(j-c')Q}$	Each IGBT*	—	—	0.23**	°C/Watt
	$R_{th(j-c')F}$	Each FWDi*	—	—	0.36**	°C/Watt
	Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.62
Brake Part	$R_{th(j-c)F}$	Each FWDi	—	—	1.33	°C/Watt
	$R_{th(j-c')Q}$	Each IGBT*	—	—	0.40**	°C/Watt
	$R_{th(j-c')F}$	Each FWDi*	—	—	0.77**	°C/Watt
	Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.027

\* $T_C$  measured point is just under the chips.

\*\*If you use this value,  $R_{th(f-a)}$  should be measured just under the chips.

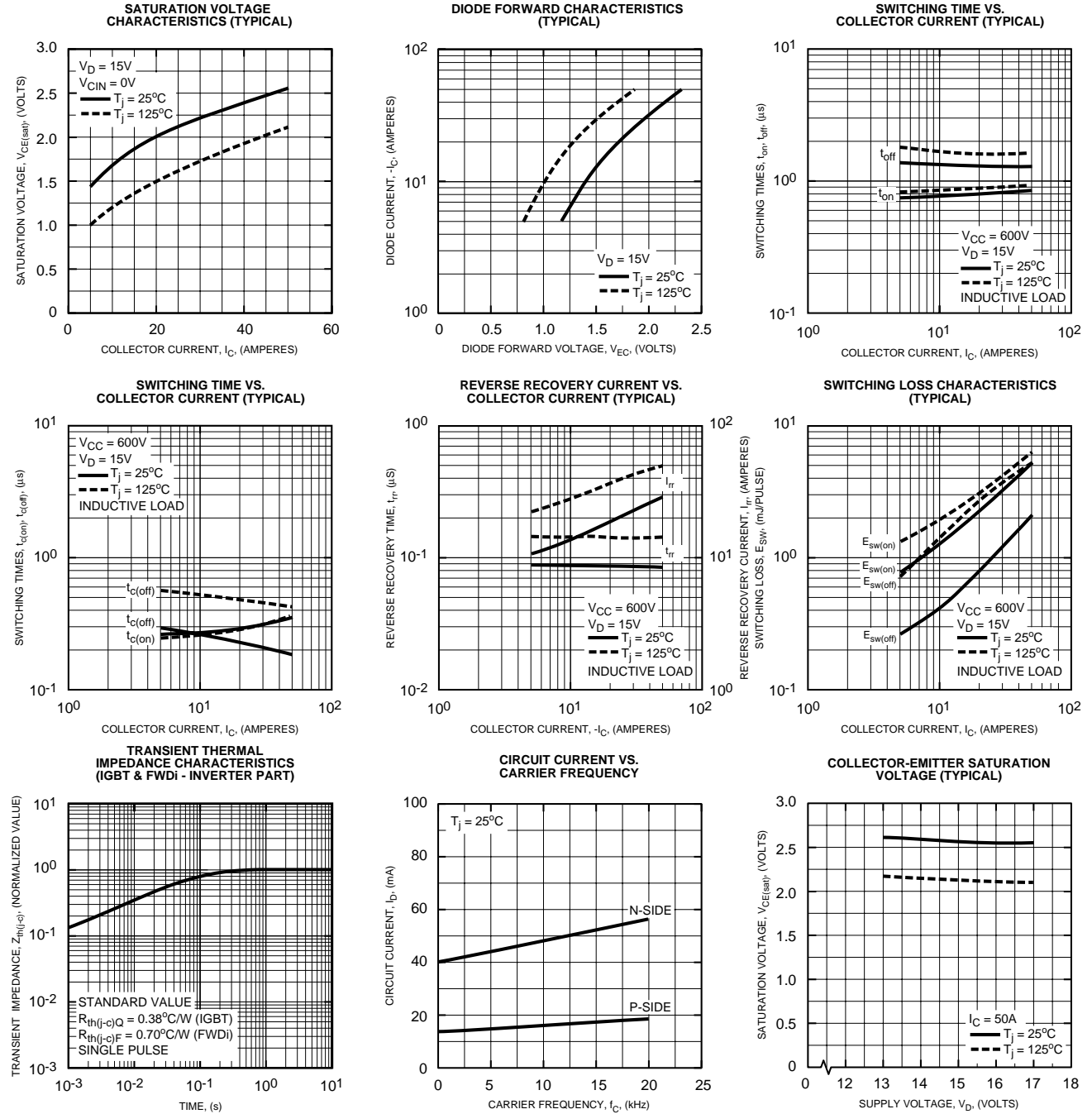
### Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	0 ~ 800	Volts
Control Supply Voltage***	$V_D$	Applied between $V_{UP1}$ - $V_{UPC}$ , $V_{N1}$ - $V_{NC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between $U_P$ - $V_{UPC}$ , $V_P$ - $V_{VPC}$ ,	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	$W_P$ - $V_{WPC}$ , $U_N$ , $V_N$ , $W_N$ , $B_r$ - $V_{NC}$	$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	0 ~ 20	kHz
Minimum Dead Time	$t_{DEAD}$	Input Signal	$\geq 3.0$	$\mu S$

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

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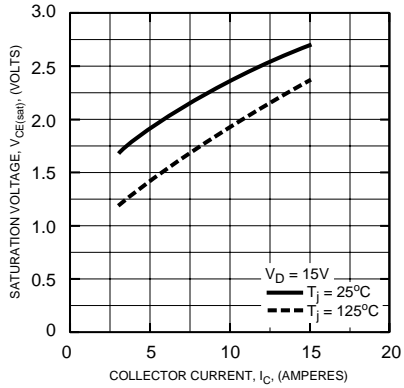
**Inverter Part**



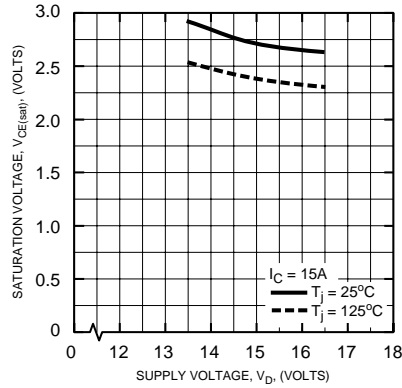
**PM50RSD120**  
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**Brake Part**

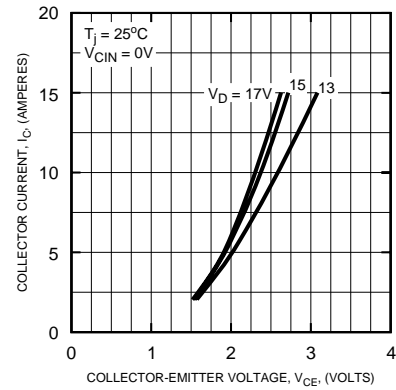
**COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)**



**COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)**



**OUTPUT CHARACTERISTICS (TYPICAL)**



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

