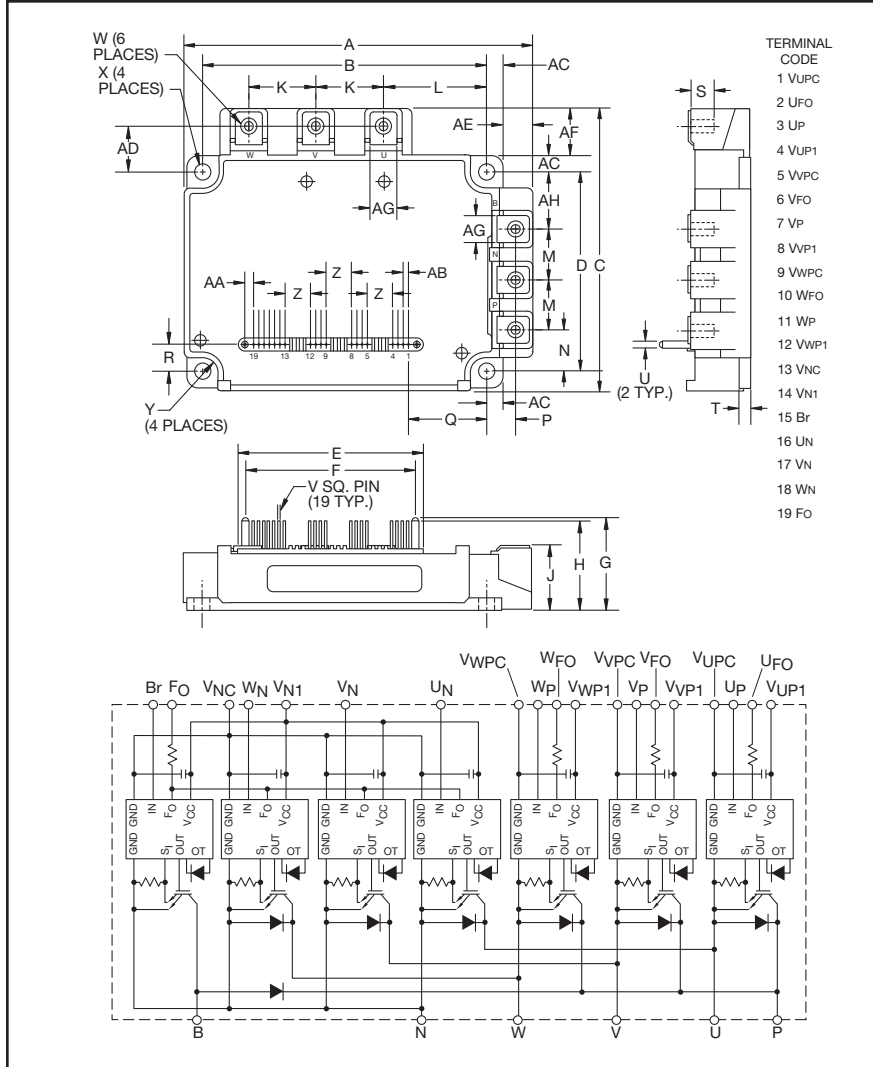


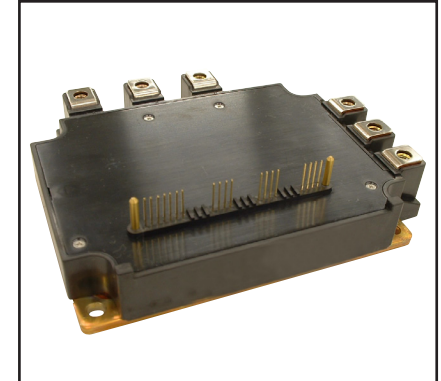
### Intellimod™ L1-Series Three Phase IGBT Inverter + Brake 150 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.31	135.0
B	4.33±0.02	110±0.5
C	4.33	110.0
D	3.07	78.0±0.5
E	2.81	71.5
F	2.62	66.5
G	1.37	34.7
H	1.32	33.6
J	0.95+0.04/-0.01	24.1+1.0/-0.5
K	1.02	26.0
L	1.59	40.5
M	0.79	20.0
N	0.65	16.5
P	0.43±0.01	11.0±0.3
Q	1.19	30.15
R	0.43	11.0

Dimensions	Inches	Millimeters
S	0.51	13.0
T	0.16	4.0
U	0.1 Dia.	Dia.2.5
V	0.02 Sq.	Sq. 0.5
W	M5 Metric	M5
X	0.22 Dia.	Dia. 5.5
Y	0.24 Rad.	Rad. 6
Z	0.39	10.0
AA	0.13	3.25
AB	0.08	2.0
AC	0.24	6.05
AD	0.71	18.0
AE	0.46	11.7
AF	0.74	18.7
AG	0.41	10.5
AH	0.85	21.5



#### 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 Full Gate CSTBT™ IGBT Chip

#### Applications:

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

#### Ordering Information:

Example: Select the complete part number from the table below -i.e. PM150RL1A120 is a 1200V, 150 Ampere Intellimod™ Intelligent Power Module.

Type	Current Rating Amperes	V <sub>CEs</sub> Volts (x 10)
PM	150	120

**PM150RL1A120**  
**Intellimod™ L1-Series**  
**Three Phase IGBT Inverter + Brake**  
 150 Amperes/1200 Volts

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

Characteristics	Symbol	PM150RL1A120	Units
Power Device Junction Temperature	$T_j$	-20 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-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)	—	800	Grams
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	1000	Volts
Self-protection Supply Voltage Limit (Short Circuit protection Capability)*	$V_{\text{CC(prot.)}}$	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 ( $T_C = 25^\circ\text{C}$ ) (Note 1)	$\pm I_C$	150	Amperes
Peak Collector Current ( $T_C = 25^\circ\text{C}$ )	$\pm I_{\text{CP}}$	300	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ ) (Note 1)	$P_C$	833	Watts

**IGBT Brake Sector**

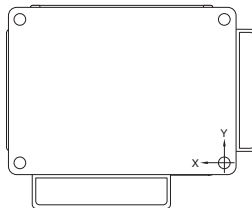
Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current ( $T_C = 25^\circ\text{C}$ ) (Note 1)	$\pm I_C$	75	Amperes
Peak Collector Current ( $T_C = 25^\circ\text{C}$ )	$\pm I_{\text{CP}}$	150	Amperes
Collector Dissipation ( $T_C = 25^\circ\text{C}$ ) (Note 1)	$P_C$	595	Watts
Diode Forward Current	$I_F$	75	Amperes
Diode Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )	$V_{\text{R(DC)}}$	1200	Volts

**Control Sector**

Supply Voltage (Applied between $V_{\text{UP1-VUPC}}$ , $V_{\text{VP1-VVPC}}$ , $V_{\text{WP1-VWPC}}$ , $V_{\text{UN1-VNC}}$ )	$V_D$	20	Volts
Input Voltage (Applied between $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N-V_N-W_N-Br-V_{\text{Nc}}$ )	$V_{\text{CIN}}$	20	Volts
Fault Output Supply Voltage (Applied between $U_{\text{FO-VUPC}}$ , $V_{\text{FO-VVPC}}$ , $W_{\text{FO-VWPC}}$ , $F_O-V_{\text{Nc}}$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current ( $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ , $F_O$ Terminals)	$I_{\text{FO}}$	20	mA

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

Note 1:  $T_C$  (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	25.2	25.2	58.8	58.8	88.8	88.8	37.2	37.3	70.8	70.8	88.8	88.8	11.4	7.5
Y	57.1	46.8	57.1	46.80	57.1	46.8	28.4	38.6	28.4	38.6	28.4	38.6	28.0	60.8

**PM150RL1A120**  
**Intellimod™ L1-Series**  
**Three Phase IGBT Inverter + Brake**  
**150 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-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 150\text{A}, T_j = 25^\circ\text{C}$	—	1.65	2.15	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 150\text{A}, T_j = 125^\circ\text{C}$	—	1.85	2.35	Volts
Diode Forward Voltage	$V_{EC}$	$-I_C = 150\text{A}, V_{CIN} = 15\text{V}, V_D = 15\text{V}$	—	2.3	3.3	Volts
Inductive Load Switching Times	$t_{on}$		0.3	0.8	2.0	$\mu\text{s}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \Leftrightarrow 15\text{V}$	—	0.3	0.8	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 150\text{A}$	—	0.4	1.0	$\mu\text{s}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	1.2	2.8	$\mu\text{s}$
	$t_{C(off)}$		—	0.4	1.2	$\mu\text{s}$
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
<b>IGBT Brake Sector</b>						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A}, T_j = 25^\circ\text{C}$	—	1.65	2.15	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 50\text{A}, T_j = 125^\circ\text{C}$	—	1.85	2.35	Volts
Forward Voltage	$V_{FM}$	$I_F = 50\text{A}$	—	2.3	3.3	Volts
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
<b>Control Sector</b>						
Circuit Current	$I_D$	$V_D = 15\text{V}, V_{CIN} = 15\text{V}, V_{N1}-V_{NC}$	—	8	16	mA
		$V_D = 15\text{V}, V_{CIN} = 15\text{V}, V_{XP1}-V_{XPC}$	—	2	4	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	$V_{th(off)}$	$V_P-V_{VPC}, W_P-V_{WPC}, U_N-V_{N-}, W_N-Br-V_{NC}$	1.7	2.0	2.3	Volts
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	$t_{off(SC)}$	$V_D = 15\text{V}$	—	0.2	—	$\mu\text{s}$
Over Temperature Protection	OT	Trip Level	135	—	—	$^\circ\text{C}$
(Detect $T_j$ of IGBT Chip)	$OT(hys)$	Reset Level	—	20	—	$^\circ\text{C}$
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
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
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 arm device operates to protect it.



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**PM150RL1A120**  
**Intellimod™ L1-Series**  
**Three Phase IGBT Inverter + Brake**  
**150 Amperes/1200 Volts**

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
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**Thermal Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	IGBT (Per 1 Element) (Note 1)	—	—	0.15*	$^\circ\text{C/Watt}$
Inverter Part	$R_{th(j-c)D}$	FWDi (Per 1 Element) (Note 1)	—	—	0.23*	$^\circ\text{C/Watt}$
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	IGBT (Note 1)	—	—	0.21*	$^\circ\text{C/Watt}$
Brake Part	$R_{th(j-c)D}$	FWDi (Note 1)	—	—	0.36*	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied (Note 1)	—	—	0.027	$^\circ\text{C/Watt}$

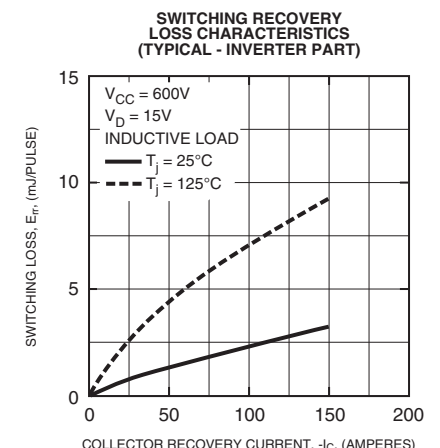
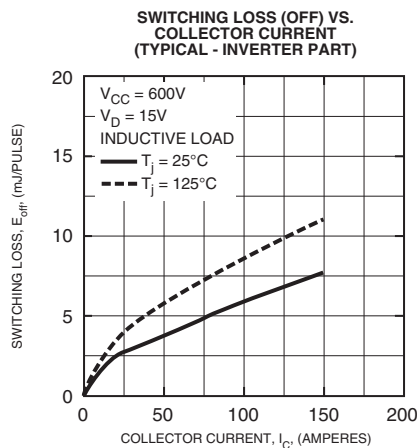
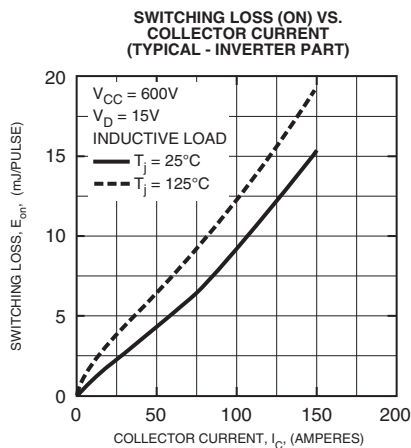
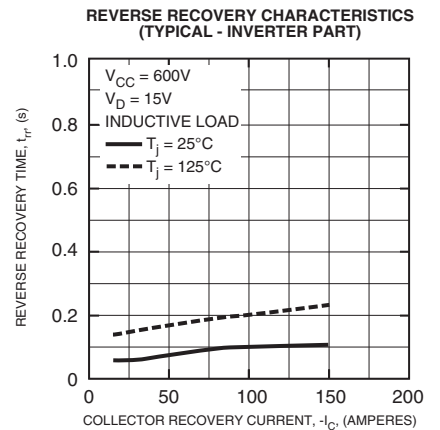
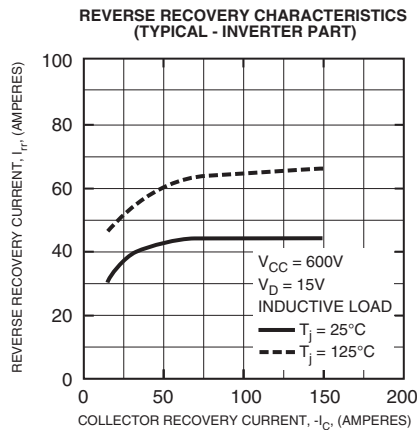
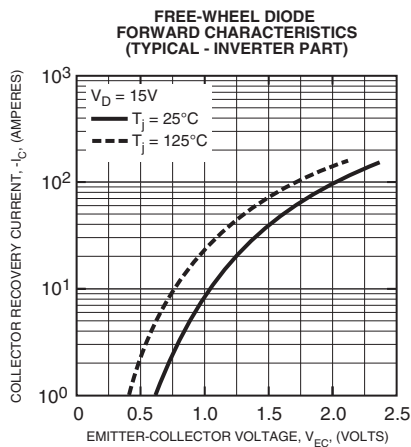
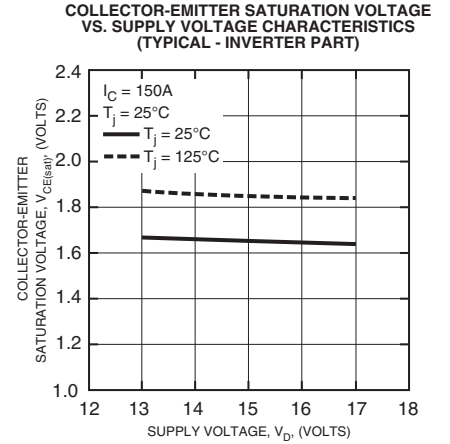
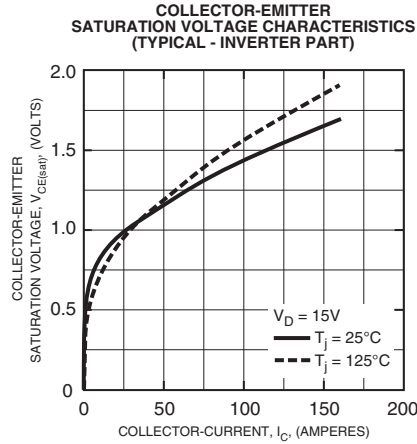
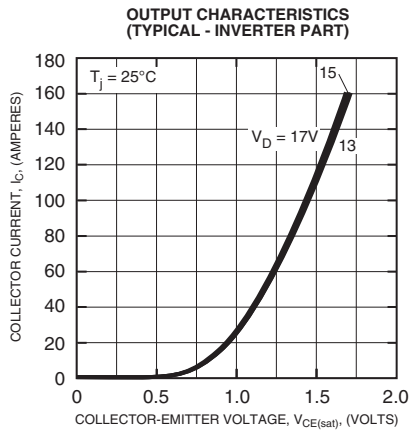
**Recommended Conditions for Use**

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	$\leq 800$	Volts
Control Supply Voltage**	$V_D$	Applied between $V_{UP1}$ - $V_{UPC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$ , $V_{N1}$ - $V_{NC}$	$15.0 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between $U_P$ - $V_{UPC}$ ,	$\leq 0.8$	Volts
Input OFF Voltage	$V_{CIN(off)}$	$V_P$ - $V_{VPC}$ , $W_P$ - $V_{WPC}$ , $U_N$ - $V_N$ - $W_N$ -Br- $V_{NC}$	$\geq 9.0$	Volts
PWM Input Frequency	$f_{PWM}$	—	$\leq 20$	kHz
Arm Shoot-through Blocking Time	$t_{DEAD}$	Input Signal	$\geq 2.5$	$\mu\text{s}$

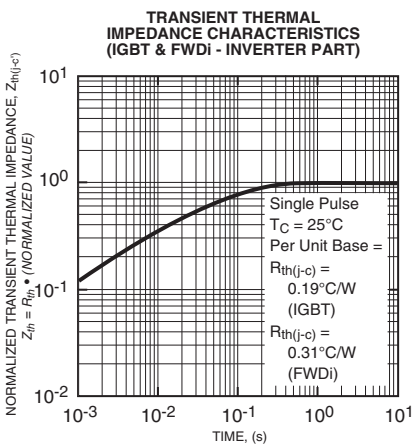
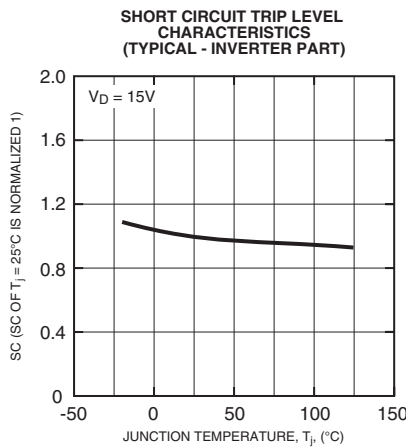
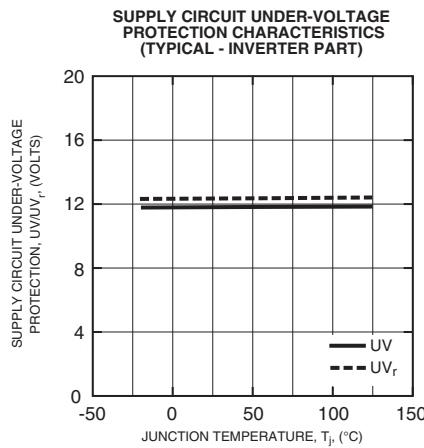
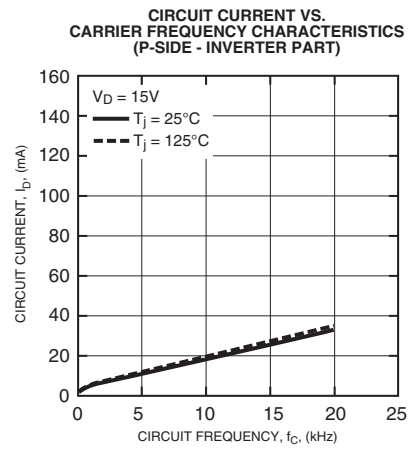
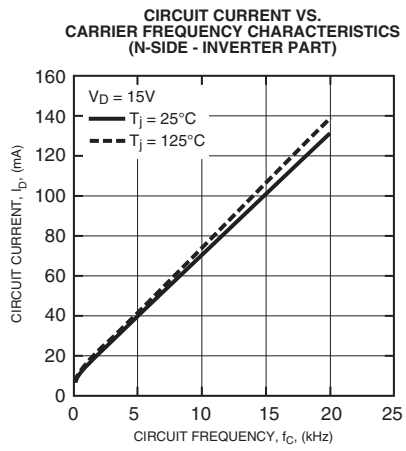
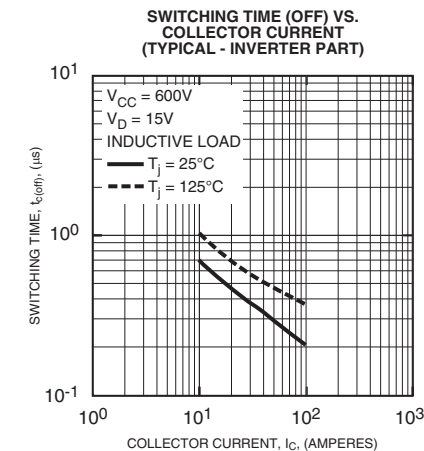
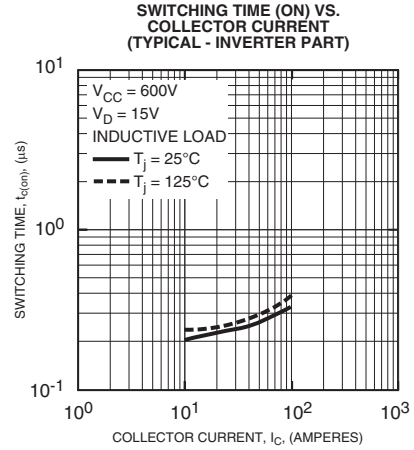
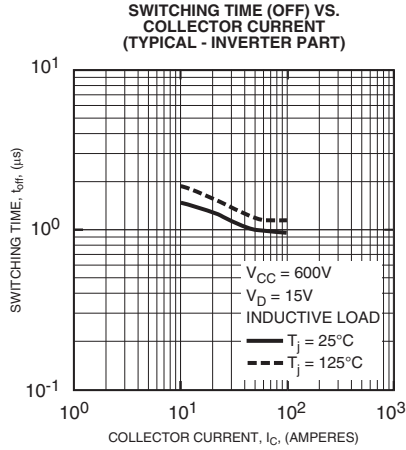
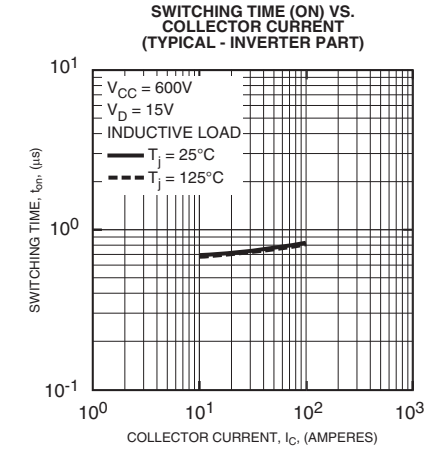
\* If you use this value,  $R_{th(f-a)}$  should be measured just under the chips.

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

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