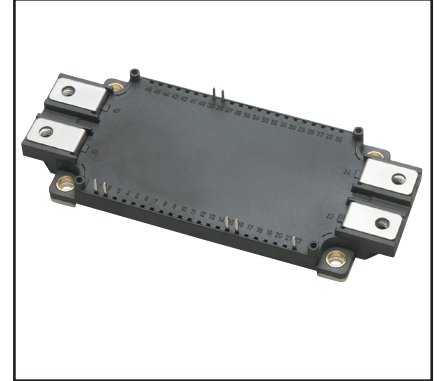
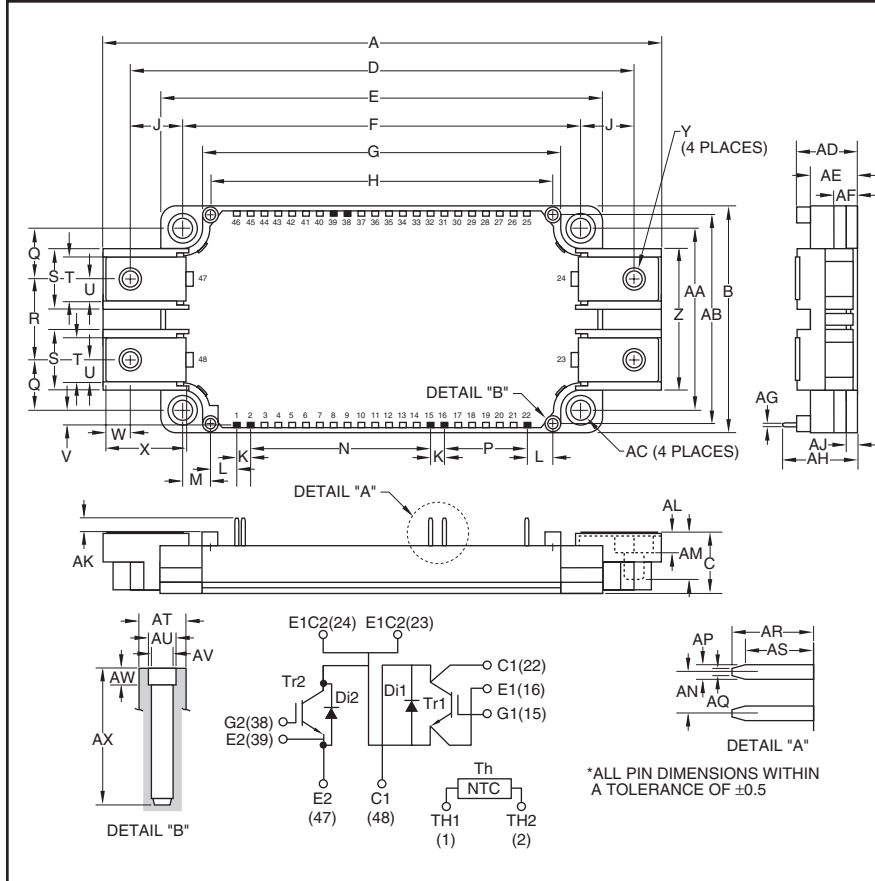


### Dual IGBTMOD™ NX-S Series Module 450 Amperes/1200 Volts



#### Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of two IGBT Transistors in a half-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 Free-Wheel Diode
- Isolated Baseplate for Easy Heat Sinking

#### Applications:

- AC Motor Control
- Motion/Servo Control
- Photovoltaic/Fuel Cell

#### Ordering Information:

Example: Select the complete module number you desire from the table below -i.e. CM450DX-24S is a 1200V ( $V_{CES}$ ), 450 Ampere Dual IGBTMOD™ Power Module.

#### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.98	152.0
B	2.44	62.0
C	0.67	17.0
D	5.39	137.0
E	4.79	121.7
F	4.33±0.02	110.0±0.5
G	3.89	99.0
H	3.72	94.5
J	0.53	13.5
K	0.15	3.8
L	0.28	7.25
M	0.30	7.75
N	1.95	49.54
P	0.9	22.86
Q	0.55	14.0
R	0.87	22.0
S	0.67	17.0
T	0.48	12.0
U	0.24	6.0
V	0.16	4.2
W	0.37	6.5
X	0.83	21.14
Y	M6	M6

Dimensions	Inches	Millimeters
Z	1.53	39.0
AA	1.97±0.02	50.0±0.5
AB	2.26	57.5
AC	0.22 Dia.	5.5 Dia.
AD	0.67+0.04/-0.02	17.0+1.0/-0.5
AE	0.51	13.0
AF	0.27	7.0
AG	0.03	0.8
AH	0.81	20.5
AJ	0.12	3.0
AK	0.14	3.5
AL	0.21	5.4
AM	0.49	12.5
AN	0.15	3.81
AP	0.05	1.15
AQ	0.025	0.65
AR	0.29	7.4
AS	0.24	6.2
AT	0.17 Dia.	4.3 Dia.
AU	0.10 Dia.	2.5 Dia.
AV	0.08 Dia.	2.1 Dia.
AW	0.06	1.5
AX	0.49	12.5

Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	450	24



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**CM450DX-24S**  
**Dual IGBTMOD™ NX-S Series Module**  
450 Amperes/1200 Volts

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

Characteristics	Symbol	CM450DX-24S	Units
Maximum Junction Temperature	$T_{j(\max)}$	+175	$^\circ\text{C}$
Operating Power Device Junction Temperature	$T_{j(\text{op})}$	-40 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, M6 Main Terminal Screws	—	40	in-lb
Module Weight (Typical)	—	330	Grams
Isolation Voltage (Terminals to Baseplate, $f = 60\text{Hz}$ , AC 1 minute)	$V_{\text{ISO}}$	2500	$V_{\text{rms}}$

### Inverter Sector

Collector-Emitter Voltage ( $V_{\text{GE}} = 0\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Gate-Emitter Voltage ( $V_{\text{CE}} = 0\text{V}$ )	$V_{\text{GES}}$	$\pm 20$	Volts
Collector Current (DC, $T_C = 119^\circ\text{C}$ ) <sup>*1,*5</sup>	$I_C$	450	Amperes
Collector Current (Pulse) <sup>*4</sup>	$I_{\text{CRM}}$	900	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) <sup>*1,*5</sup>	$P_{\text{tot}}$	3400	Watts
Emitter Current, Free Wheeling Diode Forward Current ( $T_C = 25^\circ\text{C}$ ) <sup>*1,*5</sup>	$I_E^{*3}$	450	Amperes
Emitter Current, Free Wheeling Diode Forward Current (Pulse) <sup>*4</sup>	$I_{\text{ERM}}^{*3}$	900	Amperes

\*1 Case temperature ( $T_C$ ) and heatsink temperature ( $T_f$ ) measured point is just under the chips.

\*3 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).

\*4 Pulse width and repetition rate should be such that device junction temperature ( $T_j$ ) does not exceed  $T_{j(\max)}$  rating.

\*5 Junction temperature ( $T_j$ ) should not increase beyond maximum junction temperature ( $T_{j(\max)}$ ) rating.

**CM450DX-24S**  
**Dual IGBTMOD™ NX-S Series Module**  
 450 Amperes/1200 Volts

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

**Inverter Sector**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1	mA
Gate Leakage Current	$I_{GES}$	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 45\text{mA}, V_{CE} = 10V$	5.4	6	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Chip)	$I_C = 450\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_C = 450\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}$	—	1.9	—	Volts
		$I_C = 450\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}$	—	1.95	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Terminal)	$I_C = 450\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.95	2.4	Volts
		$I_C = 450\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	2.15	—	Volts
		$I_C = 450\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	2.2	—	Volts
Input Capacitance	$C_{ies}$		—	—	45	nF
Output Capacitance	$C_{oes}$	$V_{GE} = 0V, V_{CE} = 10V$	—	—	9.0	nF
Reverse Transfer Capacitance	$C_{res}$		—	—	0.75	nF
Total Gate Charge	$Q_G$	$V_{CC} = 600V, I_C = 450\text{A}, V_{GE} = 15V$	—	1050	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$	—	—	800	ns
	Turn-on Rise Time	$t_r$	$V_{CC} = 600V, I_C = 450\text{A}, ^{*7}$		200	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V,$		600	ns
	Turn-off Fall Time	$t_f$	$R_G = 1.6\Omega, \text{ Inductive Load},$		300	ns
Reverse Recovery Time	$t_{rr}^{*3}$	$I_E = 450\text{A}$	—	—	300	ns
Reverse Recovery Charge	$Q_{rr}^{*3}$		—	24	—	$\mu\text{C}$
Turn-on Switching Loss per Pulse	$E_{on}$	$V_{CC} = 600V, I_C (I_E) = 450\text{A}, ^{*7}$	—	55	—	mJ
Turn-off Switching Loss per Pulse	$E_{off}$	$V_{GE} = \pm 15V, R_G = 1.6\Omega,$	—	48	—	mJ
Reverse Recovery Loss per Pulse	$E_{rec}^{*3}$	$T_j = 150^\circ\text{C}, \text{ Inductive Load}$	—	27	—	mJ
Emitter-Collector Voltage	$V_{EC}^{*3}$ (Chip)	$I_E = 450\text{A}, V_{GE} = 0V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_E = 450\text{A}, V_{GE} = 0V, T_j = 125^\circ\text{C}$	—	1.7	—	Volts
		$I_E = 450\text{A}, V_{GE} = 0V, T_j = 150^\circ\text{C}$	—	1.7	—	Volts
Emitter-Collector Voltage	$V_{EC}^{*3}$ (Terminal)	$I_E = 450\text{A}, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.95	2.4	Volts
		$I_E = 450\text{A}, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.95	—	Volts
		$I_E = 450\text{A}, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	1.95	—	Volts

**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 <sup>*1</sup>	$R_{th(j-c)Q}$	Per IGBT	—	—	0.044	K/W
Thermal Resistance, Junction to Case <sup>*1</sup>	$R_{th(j-c)D}$	Per FWDi	—	—	0.78	K/W
Internal Gate Resistance	$r_g$	Per Switch	—	4.3	—	$\Omega$

<sup>\*1</sup> Case temperature ( $T_C$ ) and heatsink temperature ( $T_H$ ) measured point is just under the chips.

<sup>\*3</sup> Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).

<sup>\*6</sup> Pulse width and repetition rate should be such as to cause negligible temperature rise.

<sup>\*7</sup> Recommended maximum collector supply voltage  $V_{CC}$  is  $800V_{dc}$ .



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**CM450DX-24S**  
**Dual IGBTMOD™ NX-S Series Module**  
 450 Amperes/1200 Volts

**NTC Thermistor Sector,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R	$T_C = 25^\circ\text{C}$	4.85	5.00	5.15	k $\Omega$
Deviation of Resistance	$\Delta R/R$	$T_C = 100^\circ\text{C}$ , $R_{100} = 493\Omega$	-7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	Approximate by Equation <sup>9</sup>	—	3375	—	K
Power Dissipation	$P_{25}$	$T_C = 25^\circ\text{C}$	—	—	10	mW

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Lead Resistance (Main Terminals-Chip)	$R_{\text{lead}}$	$T_C = 25^\circ\text{C}$ (Per Switch)	—	—	0.7	m $\Omega$
Contact Thermal Resistance <sup>*1</sup> (Case to Heatsink)	$R_{\text{th}(c-f)}$	Thermal Grease Applied (Per 1 Module) <sup>*2</sup>	—	0.015	—	K/W

\*1 Case temperature ( $T_C$ ) and heatsink temperature ( $T_f$ ) measured point is just under the chips.

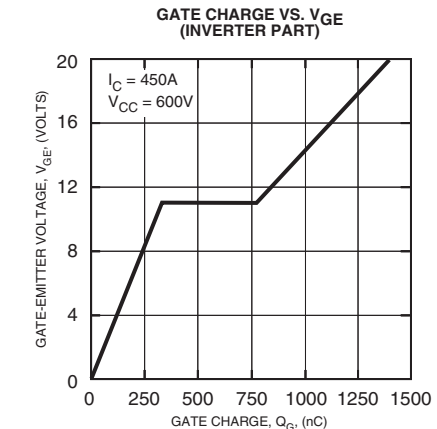
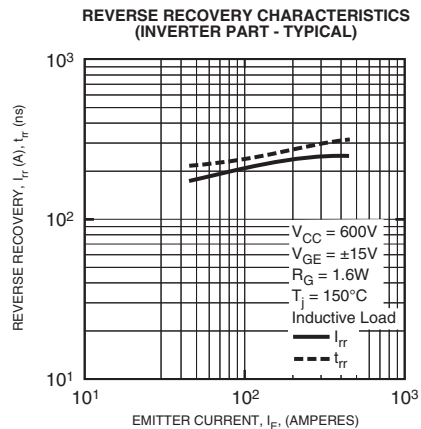
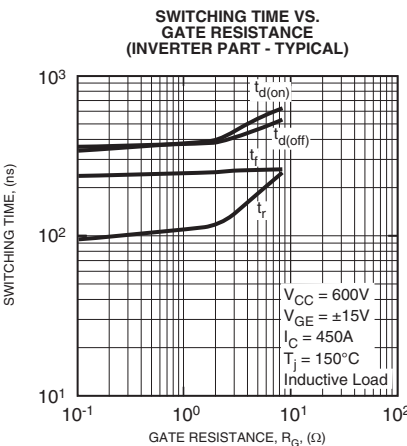
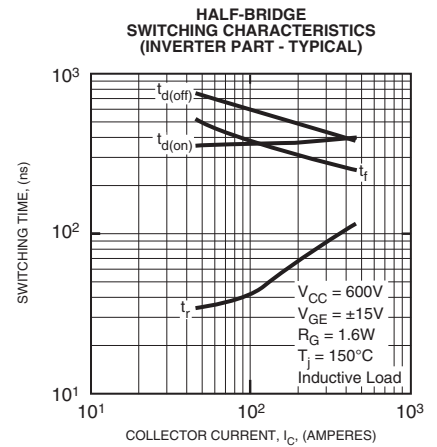
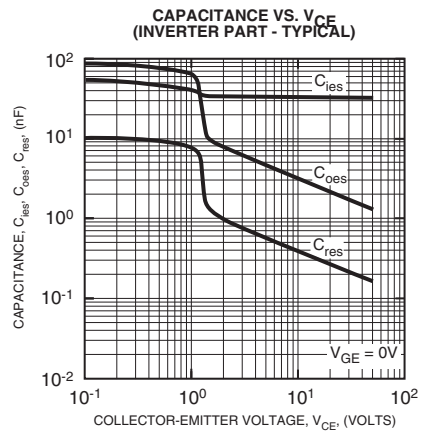
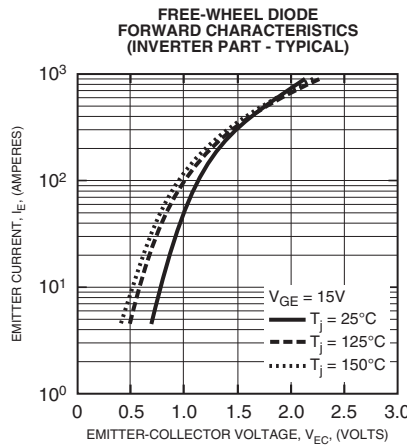
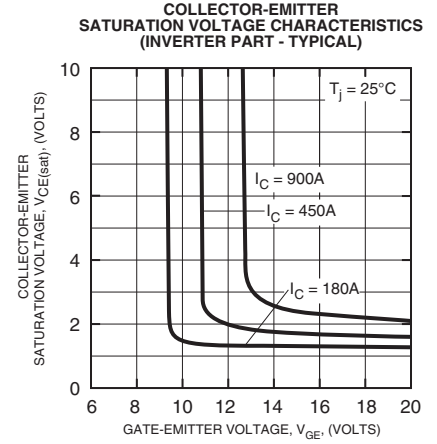
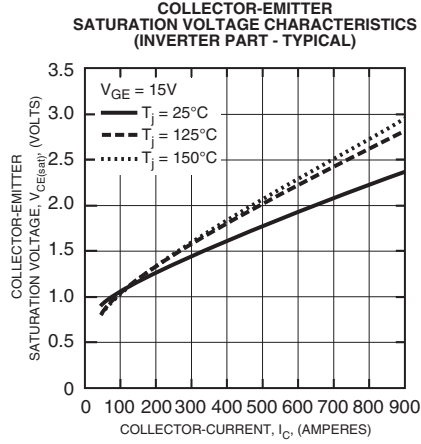
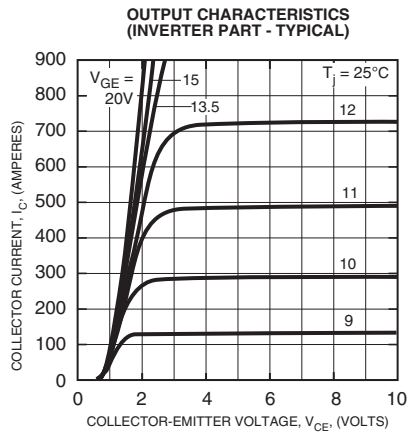
\*2 Typical value is measured by using thermally conductive grease of  $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$ .

\*9  $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$   $R_{25}$ : Resistance at Absolute Temperature  $T_{25}$  [K],  $R_{50}$ : resistance at Absolute Temperature  $T_{50}$  [K],  
 $T_{25} = 25 [^\circ\text{C}] + 273.15 = 298.15$  [K],  $T_{50} = 50 [^\circ\text{C}] + 273.15 = 323.15$  [K]

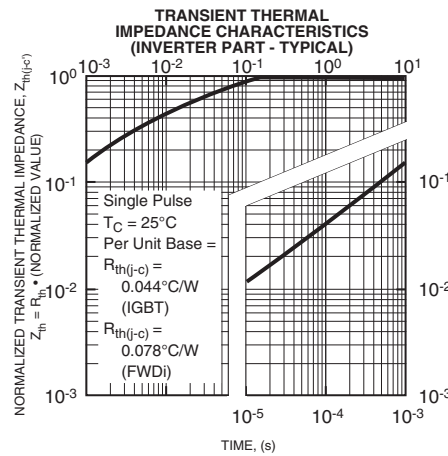
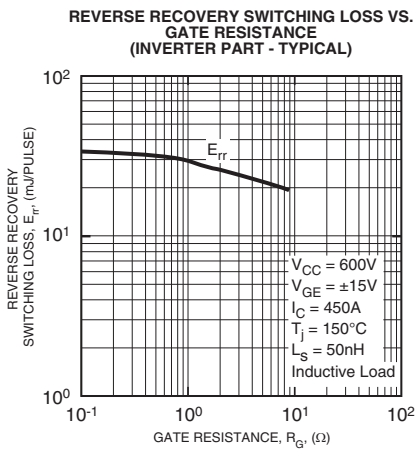
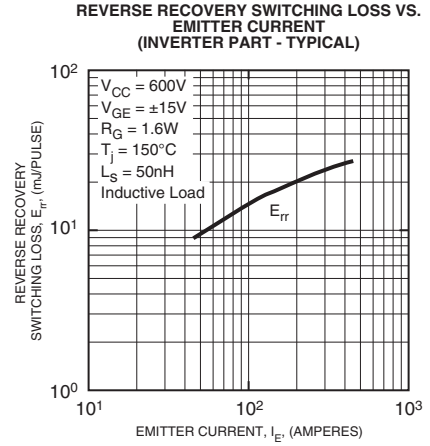
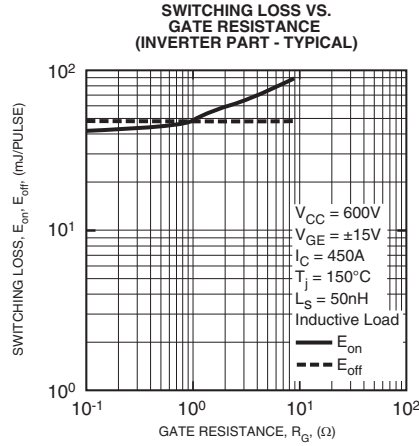
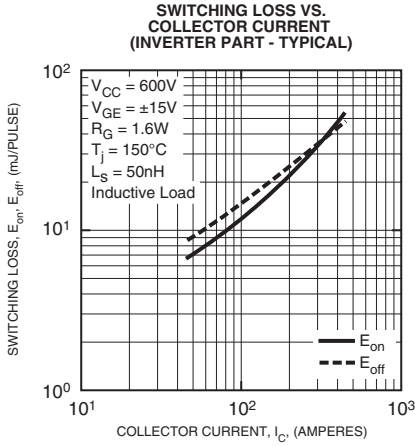


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