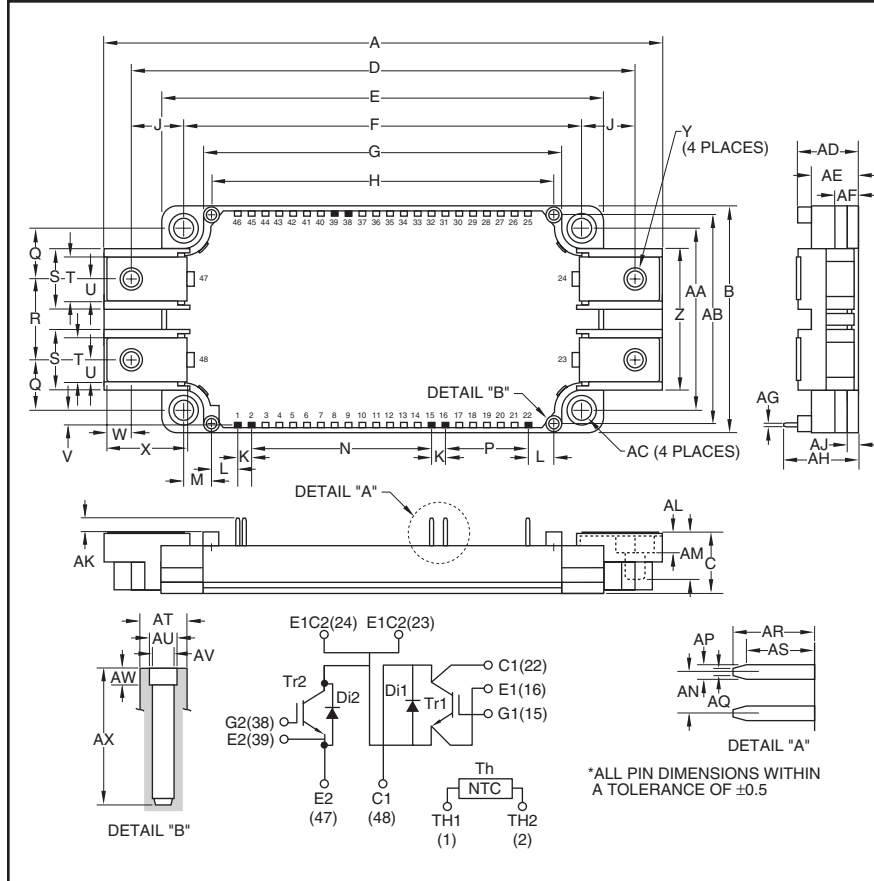


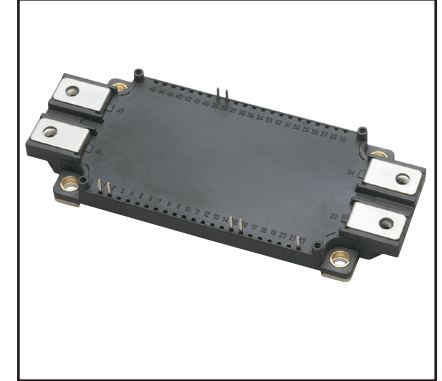
Dual IGBTMOD™ NX-S Series Module 450 Amperes/1200 Volts



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



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.

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

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_{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_{ISO}	2500	V_{rms}

Inverter Sector

Collector-Emitter Voltage ($V_{\text{GE}} = 0\text{V}$)	V_{CES}	1200	Volts
Gate-Emitter Voltage ($V_{\text{CE}} = 0\text{V}$)	V_{GES}	± 20	Volts
Collector Current (DC, $T_C = 119^\circ\text{C}$)*1,*5	I_C	450	Amperes
Collector Current (Pulse)*4	I_{CRM}	900	Amperes
Total Power Dissipation ($T_C = 25^\circ\text{C}$)*1,*5	P_{tot}	3400	Watts
Emitter Current, Free Wheeling Diode Forward Current ($T_C = 25^\circ\text{C}$)*1,*5	I_E^{*3}	450	Amperes
Emitter Current, Free Wheeling Diode Forward Current (Pulse)*4	I_{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	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 45mA, V_{CE} = 10V$	5.4	6	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Chip)	$I_C = 450A, V_{GE} = 15V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_C = 450A, V_{GE} = 15V, T_j = 125^\circ\text{C}$	—	1.9	—	Volts
		$I_C = 450A, V_{GE} = 15V, T_j = 150^\circ\text{C}$	—	1.95	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Terminal)	$I_C = 450A, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.95	2.4	Volts
		$I_C = 450A, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	2.15	—	Volts
		$I_C = 450A, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	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	$V_{CC} = 600V, I_C = 450A, V_{GE} = 15V$	—	1050	—	nC
Inductive	Turn-on Delay Time	$V_{CC} = 600V, I_C = 450A, ^{*7}$ $V_{GE} = \pm 15V,$ $R_G = 1.6\Omega$, Inductive Load,	—	—	800	ns
Load	Turn-on Rise Time		—	—	200	ns
Switch	Turn-off Delay Time		—	—	600	ns
Time	Turn-off Fall Time		—	—	300	ns
Reverse Recovery Time	t_{rr}^{*3}	$I_E = 450A$	—	—	300	ns
Reverse Recovery Charge	Q_{rr}^{*3}		—	24	—	μC
Turn-on Switching Loss per Pulse	E_{on}	$V_{CC} = 600V, I_C (I_E) = 450A, ^{*7}$	—	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}	$T_j = 150^\circ\text{C}$, Inductive Load	—	27	—	mJ
Emitter-Collector Voltage	V_{EC}^{*3} (Chip)	$I_E = 450A, V_{GE} = 0V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_E = 450A, V_{GE} = 0V, T_j = 125^\circ\text{C}$	—	1.7	—	Volts
		$I_E = 450A, V_{GE} = 0V, T_j = 150^\circ\text{C}$	—	1.7	—	Volts
Emitter-Collector Voltage	V_{EC}^{*3} (Terminal)	$I_E = 450A, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.95	2.4	Volts
		$I_E = 450A, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.95	—	Volts
		$I_E = 450A, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	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 ^{*1}	$R_{th(j-c)}Q$	Per IGBT	—	—	0.044	K/W
Thermal Resistance, Junction to Case ^{*1}	$R_{th(j-c)}D$	Per FWDi	—	—	0.78	K/W
Internal Gate Resistance	r_g	Per Switch	—	4.3	—	Ω

^{*1} Case temperature (T_C) and heatsink temperature (T_H) measured point is just under the chips.

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

^{*6} Pulse width and repetition rate should be such as to cause negligible temperature rise.

^{*7} Recommended maximum collector supply voltage V_{CC} is 800V_{dc}.

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 Ω
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* ⁹	—	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_{lead}	$T_C = 25^\circ\text{C}$ (Per Switch)	—	—	0.7	m Ω
Contact Thermal Resistance* ¹ (Case to Heatsink)	$R_{\text{th}(c-f)}$	Thermal Grease Applied (Per 1 Module)* ²	—	0.015	—	K/W

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

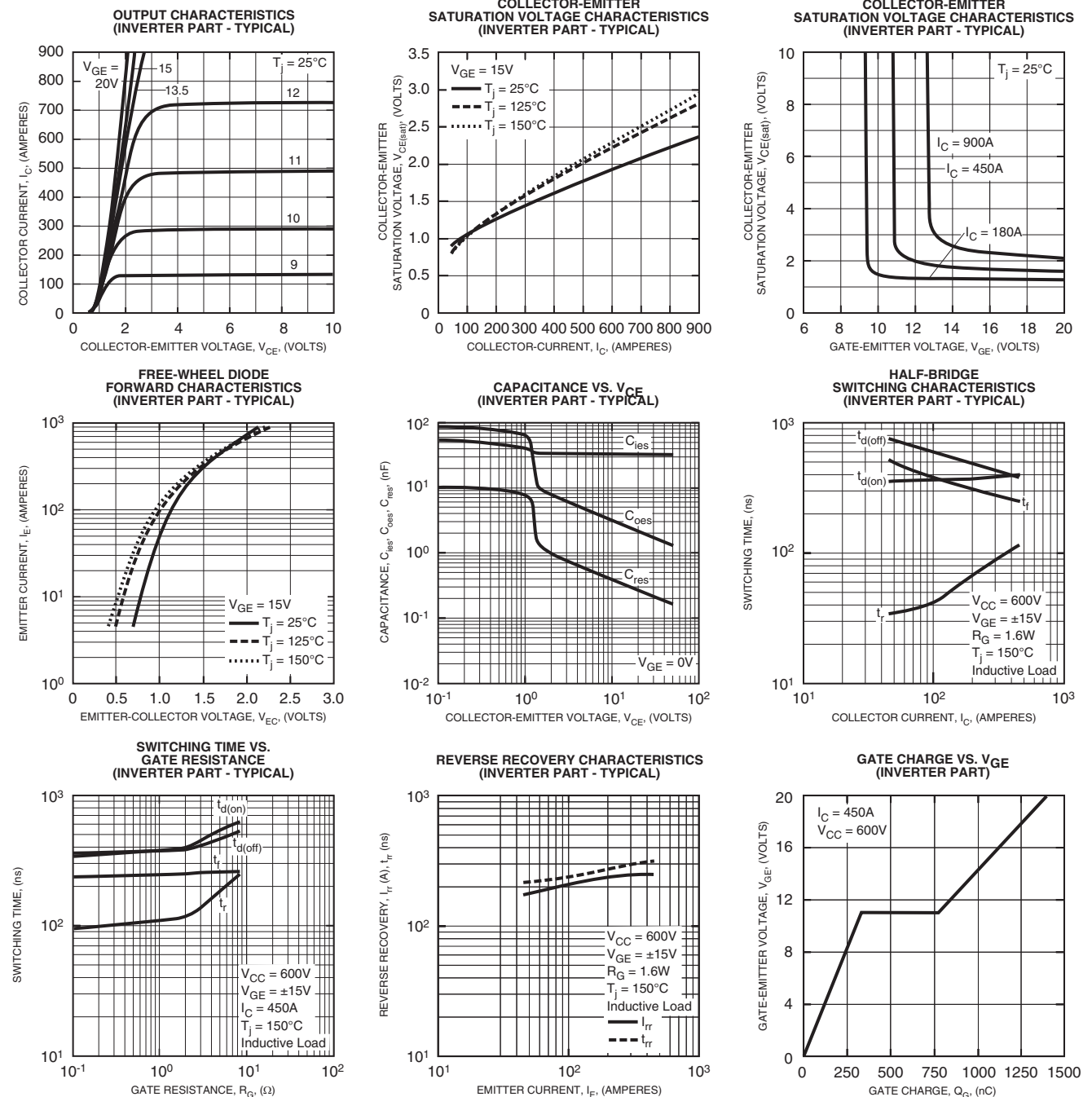
*² Typical value is measured by using thermally conductive grease of $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$.

*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],
 $T_{25} = 25 [^\circ\text{C}] + 273.15 = 298.15 \text{ [K]}$, $T_{50} = 50 [^\circ\text{C}] + 273.15 = 323.15 \text{ [K]}$

CM450DX-24S

Dual IGBTMOD™ NX-S Series Module

450 Amperes/1200 Volts

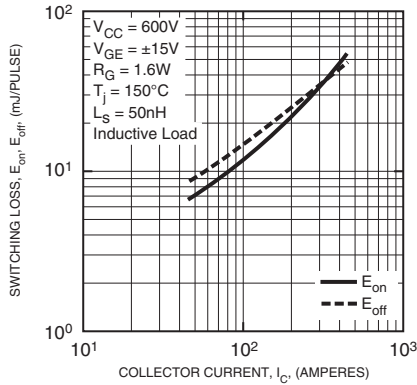


CM450DX-24S

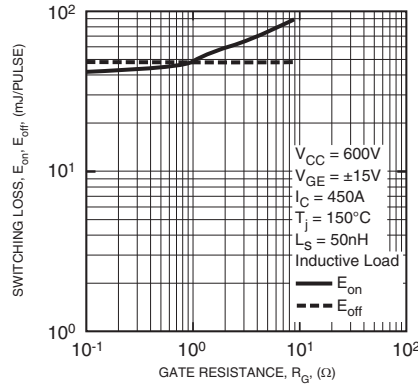
Dual IGBTMOD™ NX-S Series Module

450 Amperes/1200 Volts

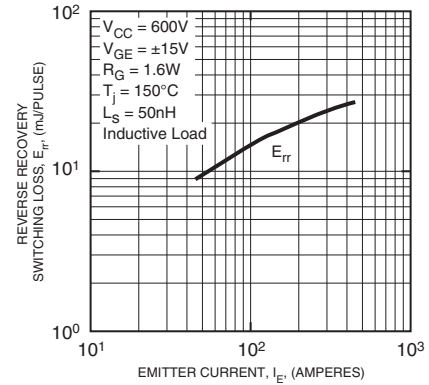
SWITCHING LOSS VS.
COLLECTOR CURRENT
(INVERTER PART - TYPICAL)



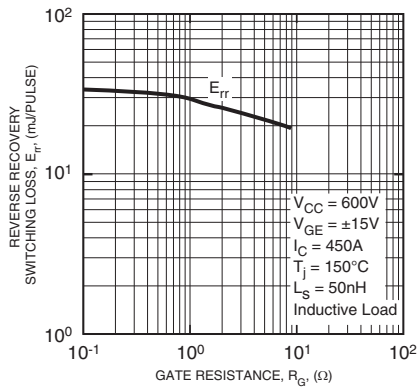
SWITCHING LOSS VS.
GATE RESISTANCE
(INVERTER PART - TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS.
EMITTER CURRENT
(INVERTER PART - TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS.
GATE RESISTANCE
(INVERTER PART - TYPICAL)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(INVERTER PART - TYPICAL)

