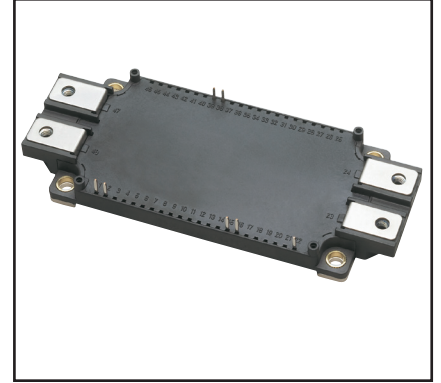
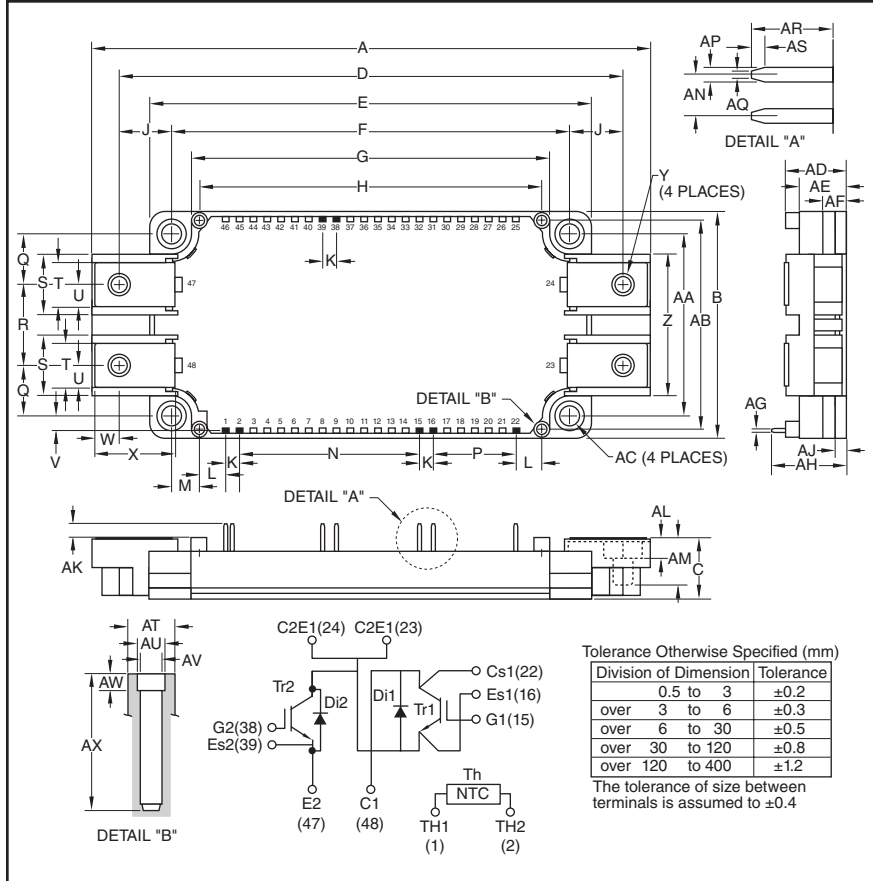


### Dual IGBTMOD™ NX-S Series Module 150 Amperes/1200 Volts



#### 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. CM150DX-24S is a 1200V ( $V_{CES}$ ), 150 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+0.04/-0.02	17.0+1.0/-0.5
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	3.81
L	0.28	7.25
M	0.30	7.75
N	1.95	49.53
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	0.26	6.5
AM	0.53	13.5
AN	0.15	3.81
AP	0.05	1.15
AQ	0.025	0.65
AR	0.29	7.4
AS	0.05	1.2
AT	0.17 Dia.	4.3 Dia.
AU	0.102 Dia.	2.6 Dia.
AV	0.088 Dia.	2.25 Dia.
AW	0.12	3.0
AX	0.49	12.5

Tolerance Otherwise Specified (mm)

Division of Dimension	Tolerance
0.5 to 3	±0.2
over 3 to 6	±0.3
over 6 to 30	±0.5
over 30 to 120	±0.8
over 120 to 400	±1.2

The tolerance of size between terminals is assumed to be ±0.4

Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	150	24

**CM150DX-24S**  
**Dual IGBTMOD™ NX-S Series Module**  
 150 Amperes/1200 Volts

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

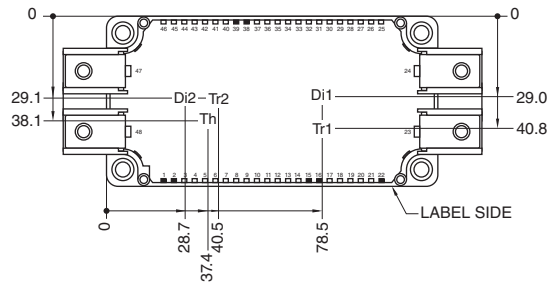
**Inverter Part IGBT/FWDi**

Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage ( $V_{GE} = 0V$ )	$V_{CES}$	1200	Volts
Gate-Emitter Voltage ( $V_{CE} = 0V$ )	$V_{GES}$	$\pm 20$	Volts
Collector Current (DC, $T_C = 120^\circ\text{C}$ ) <sup>*2</sup>	$I_C$	150	Amperes
Collector Current (Pulse, Repetitive) <sup>*3</sup>	$I_{CRM}$	300	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) <sup>*2,*4</sup>	$P_{tot}$	1150	Watts
Emitter Current ( $T_C = 25^\circ\text{C}$ ) <sup>*2,*4</sup>	$I_E^{*1}$	150	Amperes
Emitter Current (Pulse, Repetitive) <sup>*3</sup>	$I_{ERM}^{*1}$	300	Amperes

**Module**

Characteristics	Symbol	Rating	Units
Maximum Junction Temperature	$T_{j(max)}$	175	$^\circ\text{C}$
Maximum Case Temperature <sup>*2</sup>	$T_{C(max)}$	125	$^\circ\text{C}$
Operating Junction Temperature	$T_{j(op)}$	-40 to +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to +125	$^\circ\text{C}$
Isolation Voltage (Terminals to Baseplate, $f = 60\text{Hz}$ , AC 1 minute)	$V_{ISO}$	2500	Volts

- \*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
- \*2 Case temperature ( $T_C$ ) and heatsink temperature ( $T_s$ ) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.
- \*3 Pulse width and repetition rate should be such that device junction temperature ( $T_j$ ) does not exceed  $T_{j(max)}$  rating.
- \*4 Junction temperature ( $T_j$ ) should not increase beyond maximum junction temperature ( $T_{j(max)}$ ) rating.



Tr1 / Tr2: IGBT, Di1 / Di2: FWDi, Th: NTC Thermistor  
 Each mark points to the center position of each chip.

**CM150DX-24S**  
**Dual IGBTMOD™ NX-S Series Module**  
 150 Amperes/1200 Volts

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

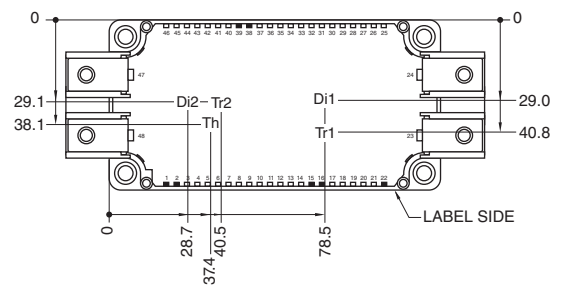
**Inverter Part IGBT/FWDi**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1	mA
Gate-Emitter Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 15\text{mA}, V_{CE} = 10V$	5.4	6	6.6	Volts
Collector-Emitter Saturation Voltage (Terminal)	$V_{CE(sat)}$	$I_C = 150\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^5$	—	1.80	2.25	Volts
		$I_C = 150\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^5$	—	2.00	—	Volts
		$I_C = 150\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}^5$	—	2.05	—	Volts
Collector-Emitter Saturation Voltage (Chip)	$V_{CE(sat)}$	$I_C = 150\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^5$	—	1.70	2.15	Volts
		$I_C = 150\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^5$	—	1.90	—	Volts
		$I_C = 150\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}^5$	—	1.95	—	Volts
Input Capacitance	$C_{ies}$		—	—	15	nF
Output Capacitance	$C_{oes}$	$V_{CE} = 10V, V_{GE} = 0V$	—	—	3.0	nF
Reverse Transfer Capacitance	$C_{res}$		—	—	0.25	nF
Gate Charge	$Q_G$	$V_{CC} = 600V, I_C = 150\text{A}, V_{GE} = 15V$	—	350	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	800	ns
Rise Time	$t_r$	$V_{CC} = 600V, I_C = 150\text{A}, V_{GE} = \pm 15V,$	—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 0\Omega, \text{ Inductive Load}$	—	—	600	ns
Fall Time	$t_f$		—	—	300	ns
Emitter-Collector Voltage (Terminal)	$V_{EC}^{*1}$	$I_E = 150\text{A}, V_{GE} = 0V, T_j = 25^\circ\text{C}^5$	—	1.80	2.25	Volts
		$I_E = 150\text{A}, V_{GE} = 0V, T_j = 125^\circ\text{C}^5$	—	1.80	—	Volts
		$I_E = 150\text{A}, V_{GE} = 0V, T_j = 150^\circ\text{C}^5$	—	1.80	—	Volts
Emitter-Collector Voltage (Chip)	$V_{EC}^{*1}$	$I_E = 150\text{A}, V_{GE} = 0V, T_j = 25^\circ\text{C}^5$	—	1.70	2.15	Volts
		$I_E = 150\text{A}, V_{GE} = 0V, T_j = 125^\circ\text{C}^5$	—	1.70	—	Volts
		$I_E = 150\text{A}, V_{GE} = 0V, T_j = 150^\circ\text{C}^5$	—	1.70	—	Volts
Reverse Recovery Time	$t_{rr}^{*1}$	$V_{CC} = 600V, I_E = 150\text{A}, V_{GE} = \pm 15V$	—	—	300	ns
Reverse Recovery Charge	$Q_{rr}^{*1}$	$R_G = 0\Omega, \text{ Inductive Load}$	—	8.0	—	$\mu\text{C}$
Turn-on Switching Energy per Pulse	$E_{on}$	$V_{CC} = 600V, I_C = I_E = 150\text{A},$	—	24.2	—	mJ
Turn-off Switching Energy per Pulse	$E_{off}$	$V_{GE} = \pm 15V, R_G = 0\Omega,$	—	16.0	—	mJ
Reverse Recovery Energy per Pulse	$E_{rr}^{*1}$	$T_j = 150^\circ\text{C}, \text{ Inductive Load}$	—	12.2	—	mJ
Internal Lead Resistance	$R_{CC} + EE'$	Main Terminals-Chip, Per Switch, $T_C = 25^\circ\text{C}^2$	—	—	1.8	m $\Omega$
Internal Gate Resistance	$r_g$	Per Switch	—	13	—	$\Omega$

\*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).

\*2 Case temperature ( $T_C$ ) and heatsink temperature ( $T_S$ ) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.

\*5 Pulse width and repetition rate should be such as to cause negligible temperature rise.



Tr1 / Tr2: IGBT, Di1 / Di2: FWDi, Th: NTC Thermistor  
 Each mark points to the center position of each chip.

**CM150DX-24S**  
**Dual IGBTMOD™ NX-S Series Module**  
 150 Amperes/1200 Volts

**Electrical Characteristics, T<sub>j</sub> = 25°C unless otherwise specified (continued)**

**NTC Thermistor Part**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R <sub>25</sub>	T <sub>C</sub> = 25°C*2	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T <sub>C</sub> = 100°C, R <sub>100</sub> = 493Ω	-7.3	—	+7.8	%
B Constant	B <sub>(25/50)</sub>	Approximate by Equation*6	—	3375	—	K
Power Dissipation	P <sub>25</sub>	T <sub>C</sub> = 25°C*2	—	—	10	mW

**Thermal Resistance Characteristics**

Thermal Resistance, Junction to Case*2	R <sub>th(j-c)Q</sub>	Per Inverter IGBT	—	—	0.13	K/W
Thermal Resistance, Junction to Case*2	R <sub>th(j-c)D</sub>	Per Inverter FWDi	—	—	0.23	K/W
Contact Thermal Resistance, Case to Heatsink*2	R <sub>th(c-f)</sub>	Thermal Grease Applied (Per 1 Module)*7	—	0.015	—	K/W

**Mechanical Characteristics**

Mounting Torque	M <sub>t</sub>	Main Terminals, M6 Screw	31	35	40	in-lb
	M <sub>s</sub>	Mounting to Heatsink, M5 Screw	22	27	31	in-lb
Creepage Distance	d <sub>s</sub>	Terminal to Terminal	11.55	—	—	mm
		Terminal to Baseplate	12.32	—	—	mm
Clearance	d <sub>a</sub>	Terminal to Terminal	10.00	—	—	mm
		Terminal to Baseplate	10.85	—	—	mm
Weight	m		—	350	—	Grams
Flatness of Baseplate	e <sub>c</sub>	On Centerline X, Y*8	±0	—	±100	μm

**Recommended Operating Conditions, T<sub>a</sub> = 25°C**

(DC) Supply Voltage	V <sub>CC</sub>	Applied Across C1-E2	—	600	850	Volts
Gate (-Emitter Drive) Voltage	V <sub>GE(on)</sub>	Applied Across G1-Es1 / G2-Es2	13.5	15.0	16.5	Volts
External Gate Resistance	R <sub>G</sub>	Per Switch	0	—	30	Ω

\*2 Case temperature (T<sub>C</sub>) and heatsink temperature (T<sub>S</sub>) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.

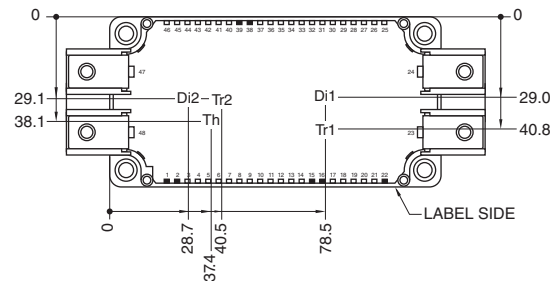
$$*6 B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$$

R<sub>25</sub>; Resistance at Absolute Temperature T<sub>25</sub> [K]; T<sub>25</sub> = 25 [°C] + 273.15 = 298.15 [K]

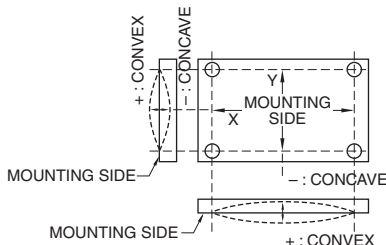
R<sub>50</sub>; Resistance at Absolute Temperature T<sub>50</sub> [K]; T<sub>50</sub> = 50 [°C] + 273.15 = 323.15 [K]

\*7 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

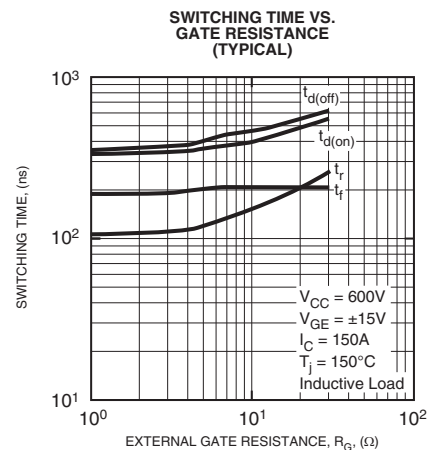
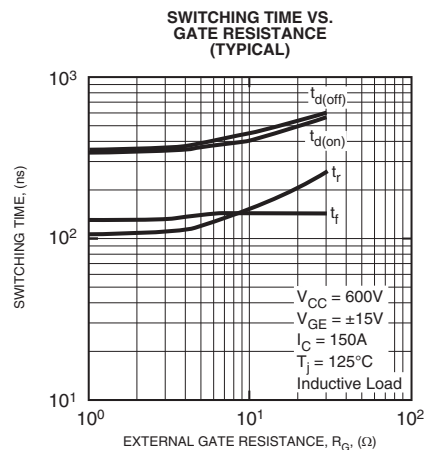
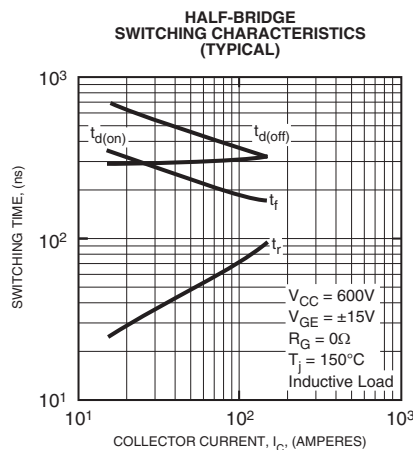
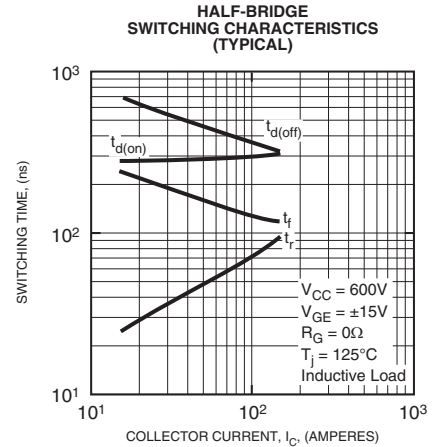
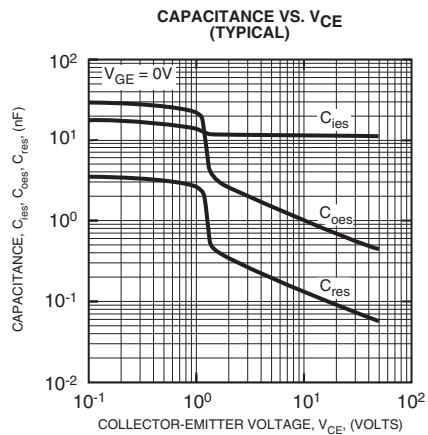
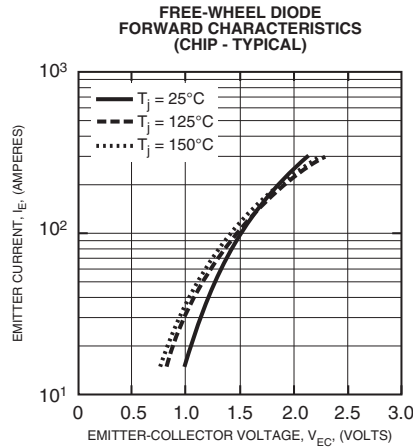
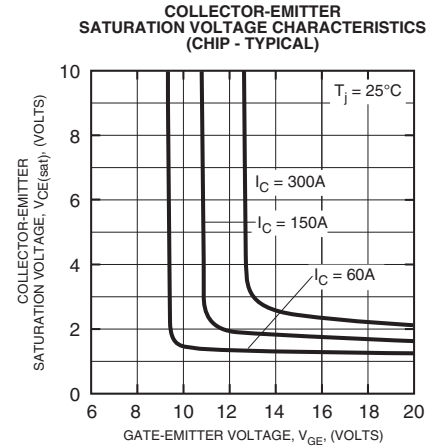
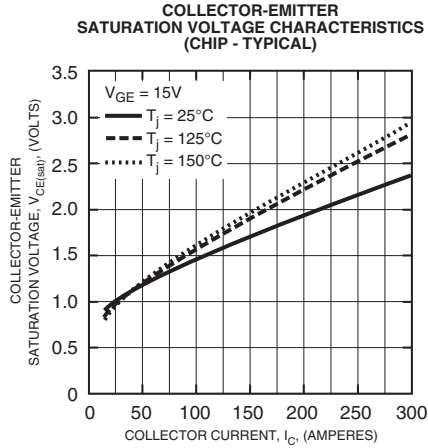
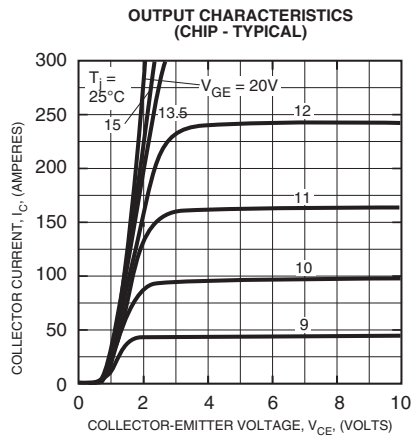
\*8 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.



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