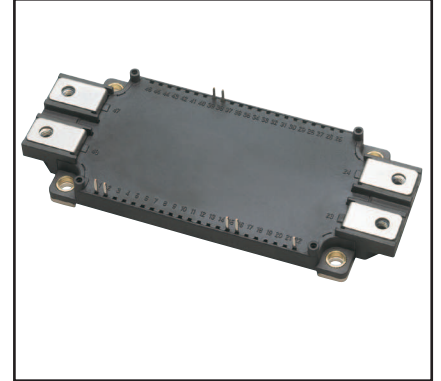
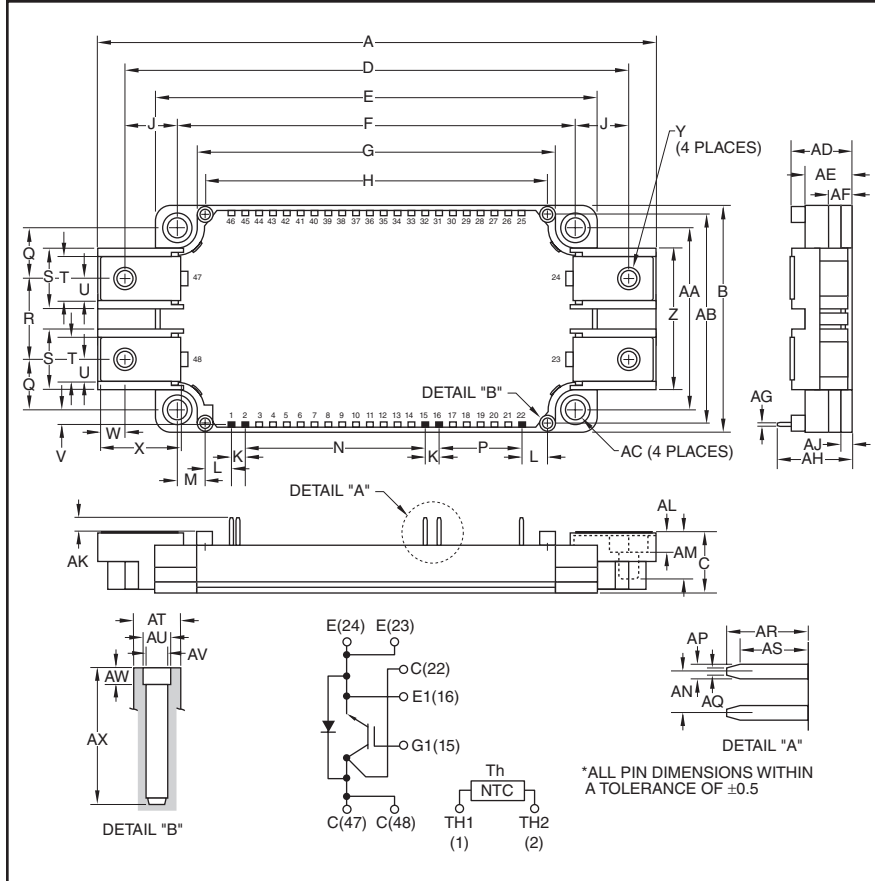


Single IGBTMOD™ NX-Series Module 600 Amperes/600 Volts



Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor in a single configuration with 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:

- AISiC Baseplate
- 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

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

QIS0660004
Single IGBTMOD™ NX-Series Module
 600 Amperes/600 Volts

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

Characteristics	Symbol	QIS0660004	Units
Power Device Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to 130	$^\circ\text{C}$
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M6 Main Terminal Screws	—	40	in-lb
Module Weight (Typical)	—	220	Grams
Baseplate Flatness, On Centerline X, Y (See Below)	—	$\pm 0 \sim +100$	μm
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

Inverter Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current ($T_C = 55^\circ\text{C}$)*1*4*9	I_C	600	Amperes
Peak Collector Current (Pulse)*3	I_{CM}	1200	Amperes
Emitter Current ($T_C = 25^\circ\text{C}$)*1*4*9	I_E^{*2}	600	Amperes
Peak Emitter Current (Pulse)*3	I_{EM}^{*2}	1200	Amperes
Maximum Collector Dissipation ($T_C = 25^\circ\text{C}$)*1*4	P_C	1580	Watts

*1 Case temperature (T_C) and heatsink temperature (T_f) are defined on the surface of the baseplate and heatsink at just under the chip.

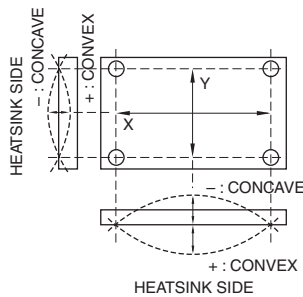
*2 I_E , I_{EM} , V_{EC} , t_{rr} and Q_{rr} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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

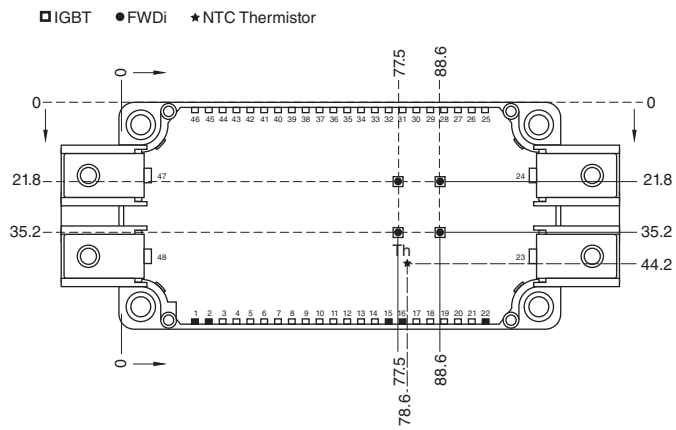
*4 Junction temperature (T_j) should not increase beyond $T_{j(max)}$ rating.

*9 Use both of each main terminal (collector and emitter) to connect external wiring.

BASEPLATE FLATNESS MEASUREMENT POINT



CHIP LOCATION (TOP VIEW)



Dimensions in mm (Tolerance: $\pm 1\text{mm}$)

QIS0660004
Single IGBTMOD™ NX-Series Module
 600 Amperes/600 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}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 60mA, V_{CE} = 10V$	5	6	7	Volts
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	μA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 600A, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*5}$	—	1.7	2.1	Volts
		$I_C = 600A, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*5}$	—	1.9	—	Volts
		$I_C = 600A, V_{GE} = 15V, \text{Chip}$	—	1.6	—	Volts
Input Capacitance	C_{ies}		—	—	69.0	nF
Output Capacitance	C_{oes}	$V_{CE} = 10V, V_{GE} = 0V$	—	—	8.0	nF
Reverse Transfer Capacitance	C_{res}		—	—	2.4	nF
Total Gate Charge	Q_G	$V_{CC} = 300V, I_C = 600A, V_{GE} = 15V$	—	1600	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$	—	—	700	ns
Load	Turn-on Rise Time	t_r	$V_{CC} = 300V, I_C = 600A,$		250	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V,$		700	ns
Time	Turn-off Fall Time	t_f	$R_G = 1.0\Omega, I_E = 600A,$		600	ns
Reverse Recovery Time	t_{rr}^{*2}	Inductive Load Switching Operation	—	—	300	ns
Reverse Recovery Charge	Q_{rr}^{*2}		—	11	—	μC
Emitter-Collector Voltage	V_{EC}^{*2}	$I_E = 600A, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*5}$	—	2.0	2.8	Volts
		$I_E = 600A, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*5}$	—	1.95	—	Volts
		$I_E = 600A, V_{GE} = 0V, \text{Chip}$	—	1.9	—	Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Module Lead Resistance	R_{lead}	Main Terminals-Chip (Per Switch)	—	0.6	—	m Ω
Thermal Resistance, Junction to Case**	$R_{th(j-c)Q}$	Per IGBT*1	—	—	0.079	$^\circ\text{C}/W$
Thermal Resistance, Junction to Case**	$R_{th(j-c)D}$	Per FWDi*1	—	—	0.132	$^\circ\text{C}/W$
Contact Thermal Resistance**	$R_{th(c-f)}$	Case to Heatsink (Per 1 Module) Thermal Grease Applied*1*7	—	0.015	—	$^\circ\text{C}/W$
Internal Gate Resistance	R_{Gint}	$T_C = 25^\circ\text{C}$	2.1	3.0	3.9	Ω
		$T_C = 125^\circ\text{C}$	4.2	6.0	7.8	Ω
External Gate Resistance	R_G		1.0	—	10	Ω

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R	$T_C = 25^\circ\text{C}^{*1}$	4.85	5.00	5.15	k Ω
Deviation of Resistance	$\Delta R/R$	$T_C = 100^\circ\text{C}, R_{100} = 493\Omega^{*1}$	-7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	$B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)^{*6}$	—	3375	—	K
Power Dissipation	P_{25}	$T_C = 25^\circ\text{C}^{*1}$	—	—	10	mW

*1 Case temperature (T_C) and heatsink temperature (T_f) are defined on the surface of the baseplate and heatsink at just under the chip.

*2 $I_E, I_{EM}, V_{EC}, t_{rr}$ and Q_{rr} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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

*6 R_1 : Resistance at Absolute Temperature $T_1(K), R_2$: Resistance at Absolute Temperature $T_2(K), T(K) = T(^{\circ}\text{C}) + 273.15$

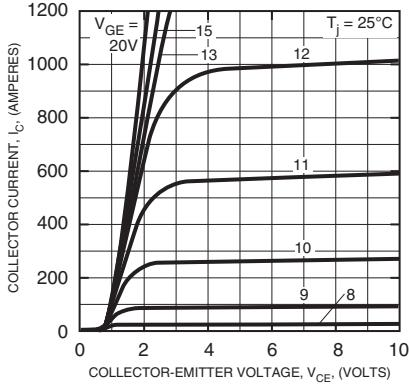
*7 Typical value is measured by using thermally conductive grease of $\lambda = 0.9 [W/(m \cdot K)]$.

QIS0660004

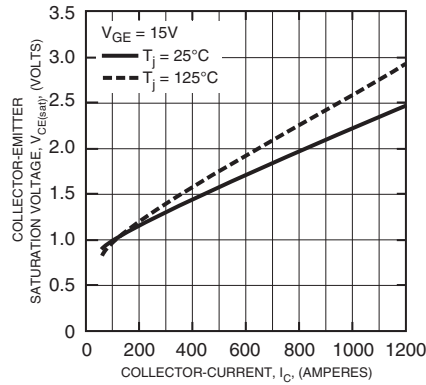
Single IGBTMOD™ NX-Series Module

600 Amperes/600 Volts

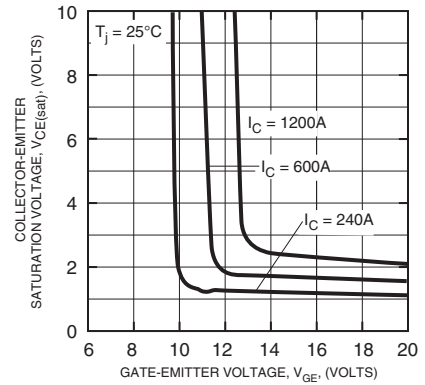
**OUTPUT CHARACTERISTICS
(INVERTER PART - TYPICAL)**



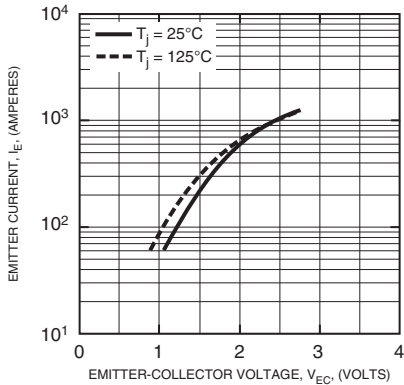
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS
(INVERTER PART - TYPICAL)**



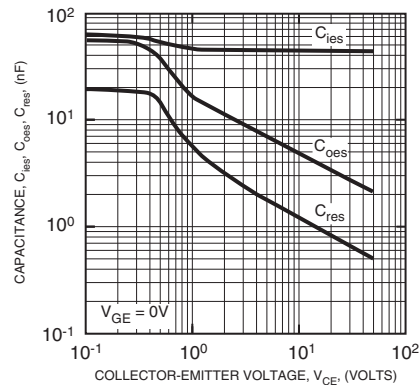
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS
(INVERTER PART - TYPICAL)**



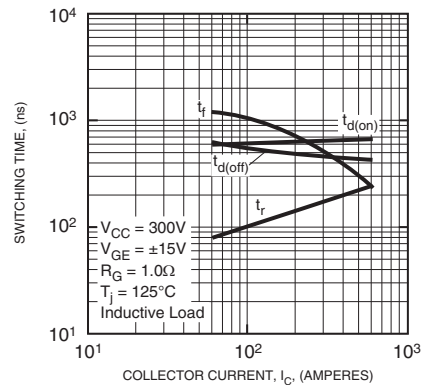
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS
(INVERTER PART - TYPICAL)**



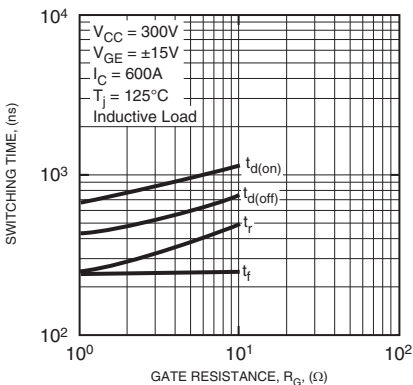
**CAPACITANCE VS. V_{CE}
(INVERTER PART - TYPICAL)**



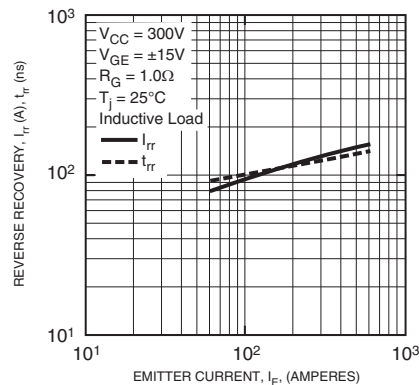
**HALF-BRIDGE SWITCHING CHARACTERISTICS
(INVERTER PART - TYPICAL)**



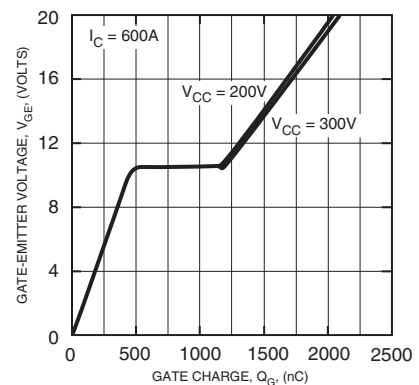
**SWITCHING TIME VS. GATE RESISTANCE
(INVERTER PART - TYPICAL)**



**REVERSE RECOVERY CHARACTERISTICS
(INVERTER PART - TYPICAL)**



**GATE CHARGE VS. V_{GE}
(INVERTER PART)**



QIS0660004

Single IGBTMOD™ NX-Series Module
600 Amperes/600 Volts

