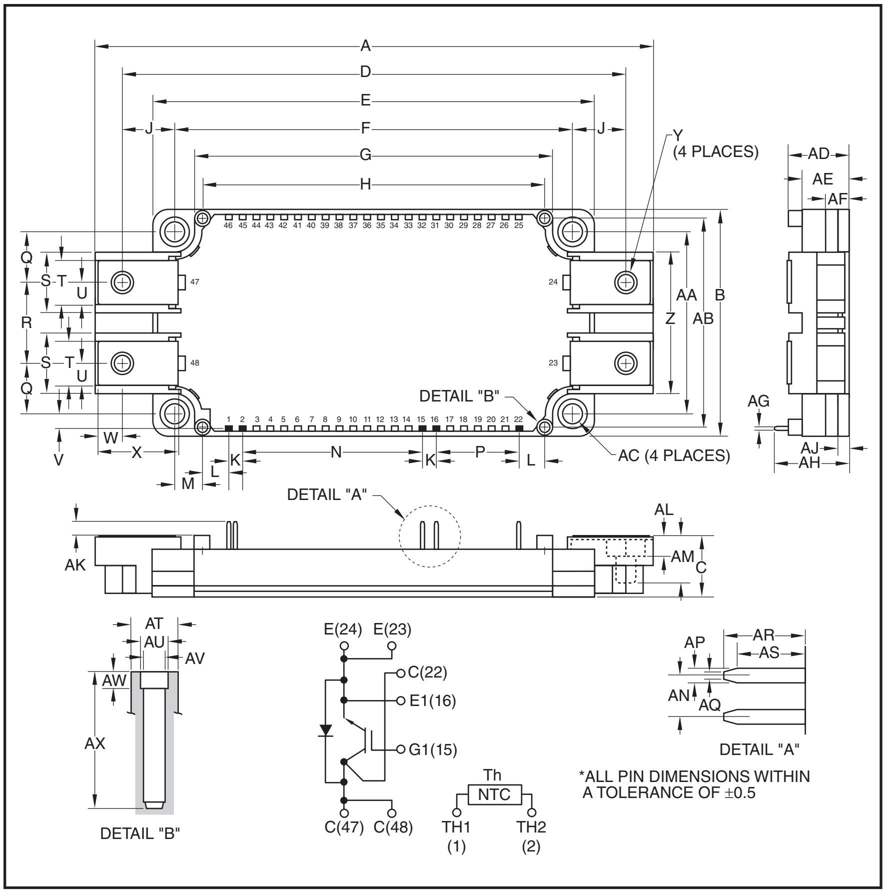
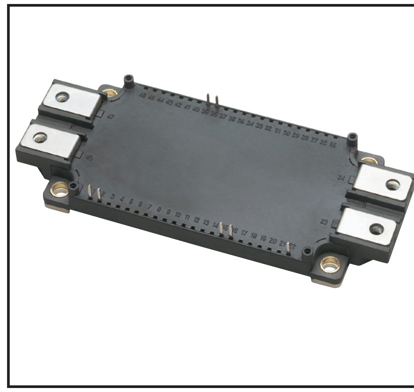
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

Single IGBT
NX-Series Module
600 Amperes/600 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 IGBT 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:

- ☐ AlSiC 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

Preliminary

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QIS0660004
Single IGBT NX-Series Module
600 Amperes/600 Volts

Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

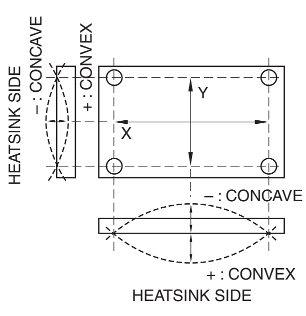
Characteristics	Symbol	QIS0660004	Units
Power Device Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-55 to 130	°C
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M6 Main Terminal Screws	—	40	in-lb
Module Weight (Typical)	—	220	Grams
Baseplate Flatness, On Centerline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

Inverter Sector

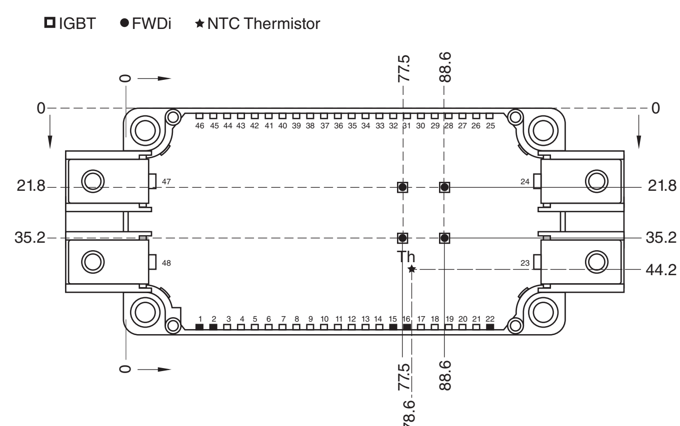
Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 55°C)*1*4*9	I_C	600	Amperes
Peak Collector Current (Pulse)*3	I_{CM}	1200	Amperes
Emitter Current (T_C = 25°C)*1*4*9	I_E *2	600	Amperes
Peak Emitter Current (Pulse)*3	I_{EM} *2	1200	Amperes
Maximum Collector Dissipation (T_C = 25°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: ±1mm)

Electrical and Mechanical Characteristics, T_j = 25°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°C*5	—	1.7	2.1	Volts
			I_C = 600A, V_{GE} = 15V, T_j = 125°C*5	—	1.9	—	Volts
			I_C = 600A, V_{GE} = 15V, Chip	—	1.6	—	Volts
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	69.0	nF
Output Capacitance		C_{oes}		—	—	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} = ±15V,	—	—	700	ns
Time	Turn-off Fall Time	t_f	R_G = 1.0Ω, 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°C*5	—	2.0	2.8	Volts
			I_E = 600A, V_{GE} = 0V, T_j = 125°C*5	—	1.95	—	Volts
			I_E = 600A, V_{GE} = 0V, Chip	—	1.9	—	Volts

Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

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

NTC Thermistor Sector, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R	T_C = 25°C*1	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T_C = 100°C, R_{100} = 493Ω*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°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(°C) + 273.15
*7 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

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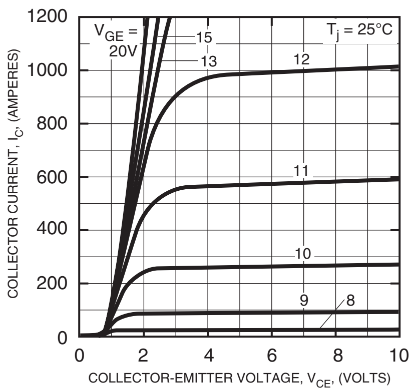
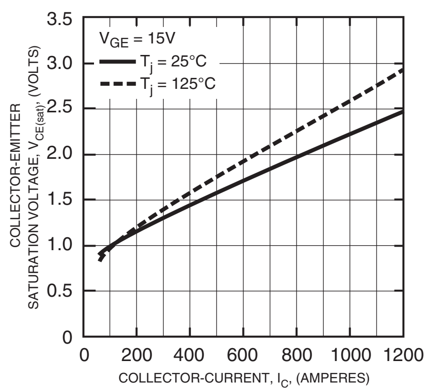
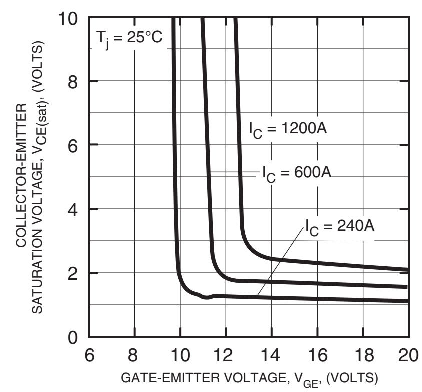
OUTPUT CHARACTERISTICS (INVERTER PART - TYPICAL)



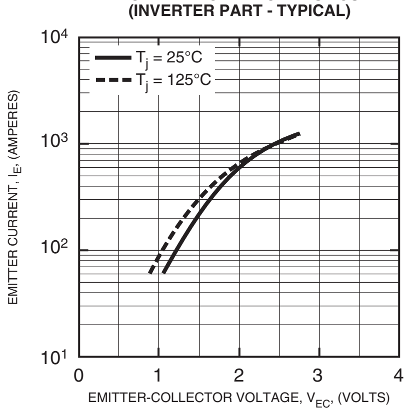
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



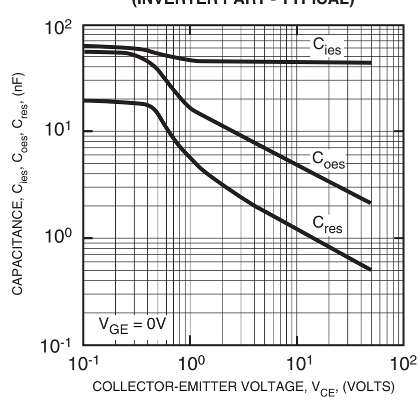
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



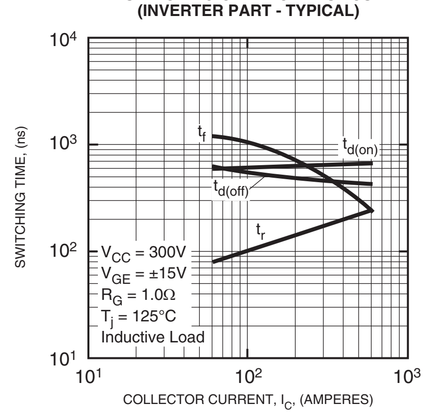
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (INVERTER PART - TYPICAL)



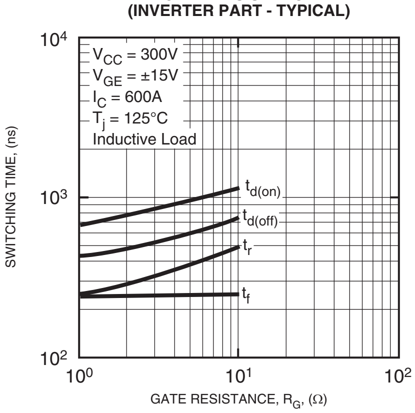
CAPACITANCE VS. V_{CE} (INVERTER PART - TYPICAL)



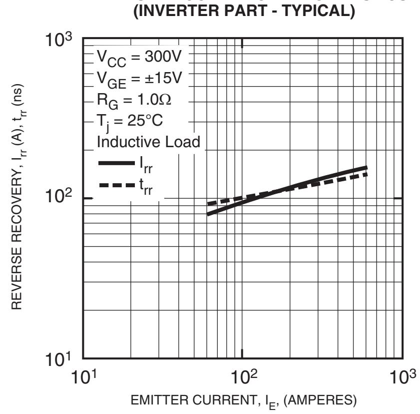
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



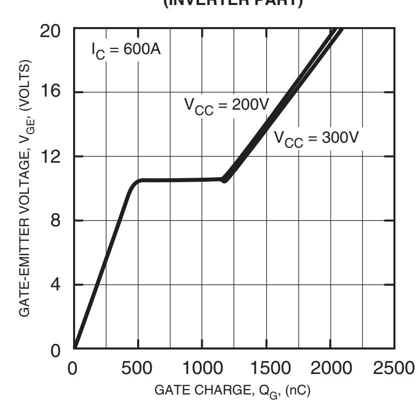
SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)



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



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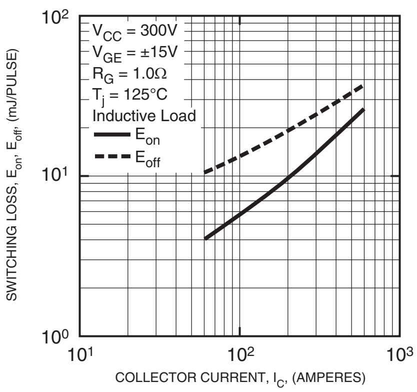
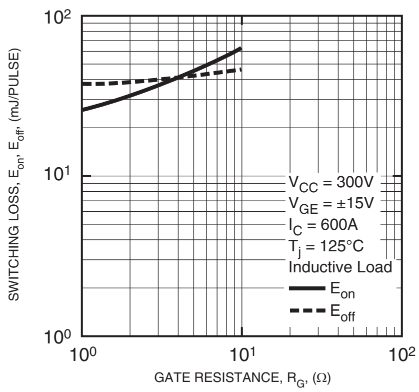
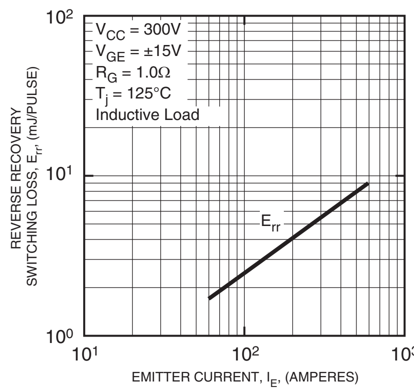
SWITCHING LOSS VS. COLLECTOR CURRENT (INVERTER PART - TYPICAL)



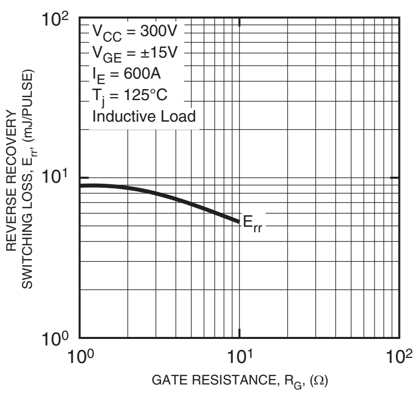
SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



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)