

CUSTOM MODULES (Commercial / Moisture Resistant / Hermetic)

Capabilities:

Customers looking for application specific custom power modules benefit from Powerex's years of experience in chip manufacturing and design / engineering. Powerex custom power modules employ performance proven features. Soldered-down and wire bonding fabrication and compression bonded encapsulation (CBE) of SCR / Diode elements offer increased switching speeds, lower losses, more efficient cooling and higher power handling capabilities.

Reliability / Qualification Testing:

Reliability and qualification testing can be performed in accordance to military specifications, including Group A, B and C and specific customer requirements.

Features:

- Extended Temperature Range, -55°C to 200°C
- Moisture Resistance
- Hermetic Modules
- Different Circuit Configurations (i.e. Common Emitter, Chopper)
- High Voltage Isolation
- Low Module Weight
- Larger Free-wheel Diodes
- Package Height, Width and Length
- Integrated Heatsinks – Both Air and Liquid Cooled by Eliminating the Baseplate
- Over-current Shutdown
- Temperature and Current Sense
- Different Termination Styles (i.e. Thicker Bus Bars, D-sub Connectors, Press On Pins, etc.)

Substrates:

- Alumina
- Aluminum Nitride
- BeO
- IMS

Packages:

- Standard IGBT Cases
- Picture Frame
- Custom Package Development for Both Plastic and Hermetic Packages

Die Technology:

- IGBT
- MOSFET
- SCR
- SiC MOSFET
- SiC Diode
- Bipolar
- Diode
- FR Diode
- GTO
- HVIGBT

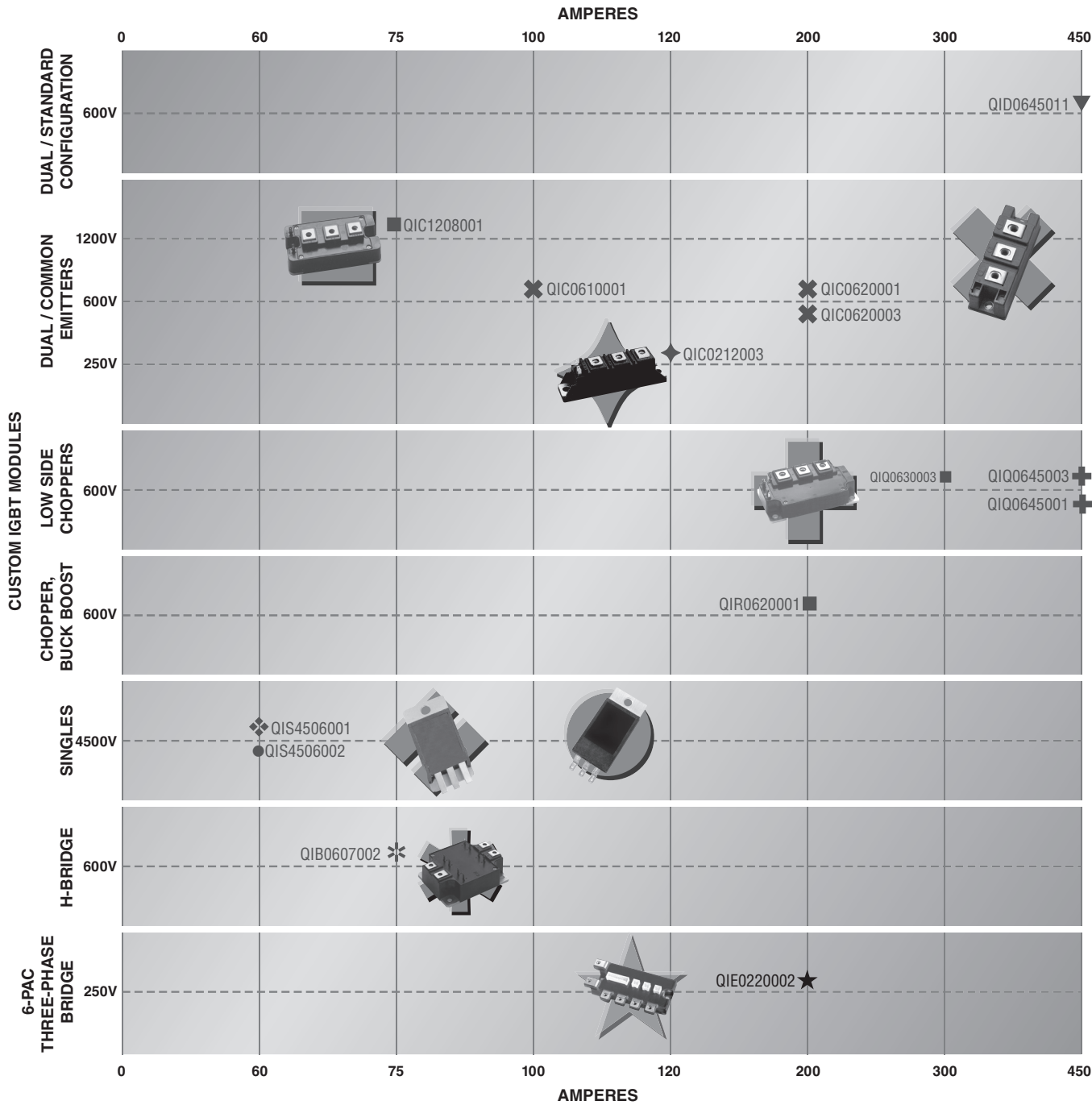
TABLE OF CONTENTS

Numbering System	M-2
Product Overview	M-2
Custom IGBT Modules	M-4
Custom MOSFET Modules	M-6
Custom Fast Diode Modules	M-6
Outline Drawings	M-7



VOLTAGE: 30V TO 15,000V
CURRENT: 50A TO 1500A

Product Overview



Numbering System

QRS4506002 is a 4500V, 60A Custom Single Fast Diode Module

Q R S 45 06 0 02
 (1) (2) (3) (4) (5) (6) (7)

Serial Designation (STANDARD)

QID0645011 is a 600V, 450A Custom IGBT Dual Module

Q I D 06 45 0 1 1
 (1) (2) (3) (4) (5) (8) (9) (10)

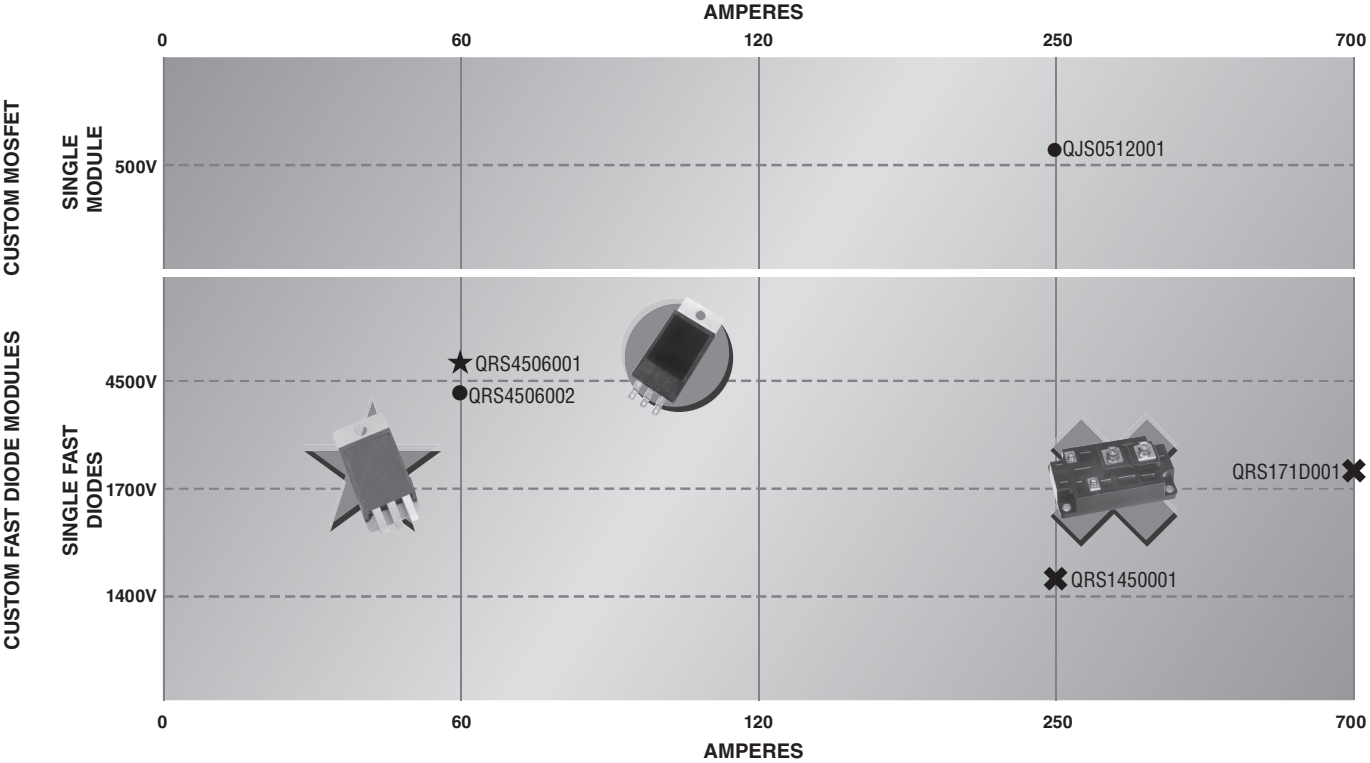
Serial Designation (SPECIAL)

(1) Product Line:
 Q = Custom Module

(2) Device:
 G = GTO
 I = IGBT
 J = MOSFET
 K = Transistor
 R = Rectifier
 T = Thyristor
 U = Gate Driver

(Continued on page M-3)

Product Overview



(Continued from page M-2)

Numbering System

- (3) Configuration:
- B = H-Bridge (Single-phase Bridge)
 - C = Common Emitter (Cathode)
 - D = Double / Dual
 - E = Three-phase Full Wave
 - F = Common Anode
 - G = Converter Inverter
 - H = Three-Phase Half-wave
 - P = Asymmetrical Half-bridge
 - Q = Low Side Chopper
 - R = High Side Chopper
 - S = Single
 - T = Two Individual

- (4) Voltage:
- A1 = 10
 - A2 = 20
 - A3 = 30
 - A4 = 40
 - A5 = 50
 - A6 = 60
 - A7 = 70
 - A8 = 80
 - A9 = 90
- (5) Current:
- 1K = 1000
 - 1D = 1200
 - 1E = 1500
 - 1M = 1600
 - 1S = 1800
 - 2K = 2000
 - 2D = 2200
 - 2E = 2500
 - 2M = 2600
 - 2S = 2800
 - 3K = 3000
 - 3D = 3200
 - 3E = 3500
 - 3M = 3600
 - 3S = 3800

01 to 99 X 100

01 to 99 X 10

Serial Designation

- STANDARD:
- (6) T = Terminal Height
 - (7) 0 - 99 Terminal Height (mm)

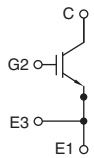
- SPECIAL:
- (8) 0 - 9 (Numbered from 001 - 999 for
 - (9) 0 - 9 each individual combination of
 - (10) 0 - 9 7 previous digits.)

Custom IGBT Modules, (Refer to device datasheets at www.pwr.com for test conditions.)

MAXIMUM RATINGS						ELECTRICAL CHARACTERISTICS											FREE-WHEEL DIODE			THERMAL CHARACTERISTICS		Weight Grams	Outline Drawings																					
Type	V _{CES} Volts	I _C Amperes	I _{CM} Amperes	T _{J(MAX)} °C	V _{RMS} Isolation Volts	Static Test Conditions		T _J = 25°C		Dynamic				Resistive Load Switching Times				I _{FM} Amperes	V _{FM} Volts	t _{rr} ns	IGBT (Max.) R _{th(j-c)} °C/W		Diode (Max.) R _{th(j-c)} °C/W	Number	Page																			
						I _C Amperes	V _{GE} Volts	V _{CES(SAT)} Volts	V _{CES(SAT)} Volts	V _{CE(SAT)} Test Cond.	C _{ies} nF	C _{oes} nF	C _{res} nF	t _{d(on)} ns	t _r ns	t _{d(off)} ns	t _r ns																											
Single Custom IGBT Modules																																												
QIS4506001	4500	60	120	150	TBD	60	6.0	3.0	3.9	10	10	0.7	0.2	2400	2400	6000	1200	—	—	—	0.05 Typ.	—	21	6	M-8																			
QIS4506002	4500	60	120	150	TBD	60	6.0	3.0	3.9	10	10	0.7	0.2	2400	2400	6000	1200	—	—	—	0.05 Typ.	—	21	8	M-9																			
Dual / Standard Configuration Custom IGBT Modules																																												
QID0645011	600	450	900	150	2500	450	6.0	2.3	2.6	25	TBD	TBD	TBD	900	700	2100	300	450	2.6	170	0.08	0.144	270	1	M-7																			
Dual / Common Emitter Custom IGBT Modules																																												
QIC0212003	250	120	240	150	2500	120	4.0	1.2	1.7	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	0.24	TBD	110	2	M-7																			
QIC0610001	600	100	TBD	150	2500	100	TBD	2.3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	0.31	TBD	500	3	M-7																			
QIC0620001	600	200	TBD	150	2500	200	TBD	2.3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	0.17	TBD	500	3	M-7																			
QIC0620003	600	200	400	150	2500	200	TBD	2.1	2.1	10	20	7.0	4	200	550	300	330	50	2.8	110	0.14 Typ.	0.7 Typ.	500	3	M-7																			
QIC1208001	1200	75	TBD	150	2500	75	6.0	2.5	2.5	10	15	5.3	3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	0.21	0.3	190	4	M-8																			
Low Side Chopper Custom IGBT Modules																																												
QIQ0630003	600	300	600	125	2000	300	6.0	2.1	2.8	10	30	10.5	6	350	600	350	300	300	2.2	110	0.11	0.11	270	4	M-8																			
QIQ0645001	600	450	900	125	2000	450	6.0	2.1	2.8	10	45	15.9	9	350	600	350	300	450	2.2	110	0.075	0.075	400	5	M-8																			
QIQ0645003	600	450	900	125	2000	450	6.0	2.1	2.8	10	45	15.9	9	350	600	350	300	450	2.2	110	0.045	0.045	400	5	M-8																			

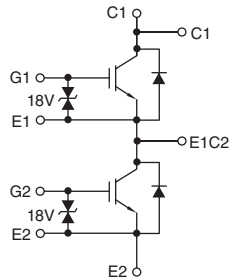
Single Custom IGBT Modules

QIS4506001, QIS4506002



Dual / Standard Configuration Custom IGBT Modules

QID0645011

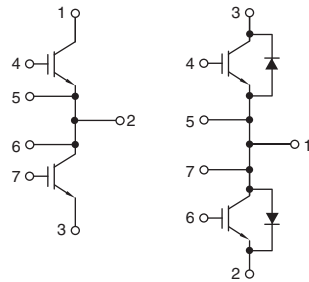


Dual / Common Emitter Custom IGBT Modules

QIC0212003

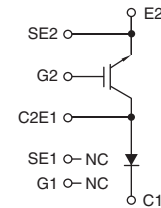
QIC0610001, QIC0620001, QIC0620003

QIC1208001



Low Side Chopper Custom IGBT Modules

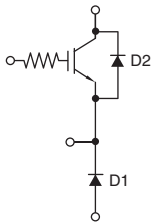
QIQ0630003, QIQ0645001, QIQ0645003



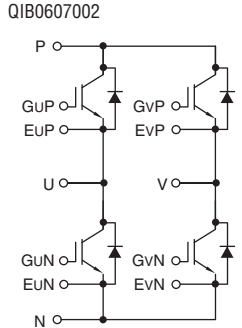
Custom IGBT Modules, (Refer to device datasheets at www.pwr.com for test conditions.)

MAXIMUM RATINGS						ELECTRICAL CHARACTERISTICS										FREE WHEEL DIODE			THERMAL CHARACTERISTICS		Weight Grams	Outline Drawings			
Type	V _{CES} Volts	I _C Amperes	I _{CM} Amperes	T _{J(MAX)} °C	V _{RMS} Isolation Volts	Static Test				Dynamic						I _{FM} Amperes	V _{FM} Volts	t _{rr} ns	IGBT (Max.) R _{th(j-c)} °C/W	Diode (Max.) R _{th(j-c)} °C/W		Number	Page		
						Conditions	Typ.	T _J = 25°C		V _{GE} = 0V, f = 1KHz				Resistive Load Switching Times											
						I _C Amperes	V _{GE} Volts	V _{CES(SAT)} Volts	V _{CES(SAT)} Volts	V _{CES(SAT)} Test Cond.	C _{ies} nF	C _{oes} nF	C _{res} nF	t _{d(on)} ns	t _r ns	t _{d(off)} ns	t _r ns								
Chopper, Buck Boost Custom IGBT Module																									
QIR0620001	600	200	400	150	2500	200	6.0	2.1	2.8	10	20	7.0	4	200	550	300	300	300	2.8	110	0.16	0.16	—	4	M-8
H-Bridge Custom IGBT Module																									
QIB0607002	600	75	150	150	2500	75	15.0	1.7	2.2	10	11.3	1.4	0.45	120	100	300	300	150	2.8	100	0.29	0.51	390	9	M-9
6-Pac Three-Phase Bridge																									
QIE0220002	250	200	400	150	2500	200	—	1.2	1.7	10	66	3.0	2.3	700	1800	700	500	—	—	300	0.21	0.47	680	10	M-10

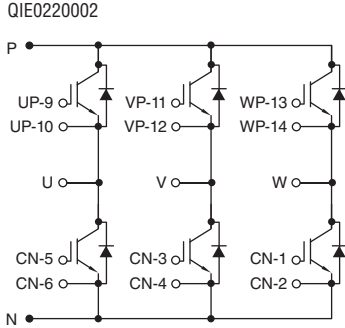
Chopper, Buck Boost Custom IGBT Module
QIR0620001



H-Bridge Custom IGBT Module



6-Pac Three-Phase Bridge

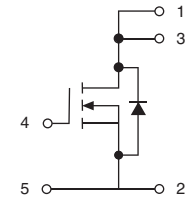


Custom MOSFET Module, (Refer to device datasheets at www.pwr.com for test conditions.)

MAXIMUM RATINGS						ELECTRICAL CHARACTERISTICS					THERMAL CHARACTERISTICS		Weight Grams	Outline Drawings Number Page		
Type	V_{DS} Volts	I_D Amperes $T_j = 25^\circ C$ (Typ.)	V_{RMS} Volts	$T_{j(MAX)}$ $^\circ C$	V_{RMS} Isolation Volts	Static					MOSFET (Typ.) $R_{th(j-c)}$ $^\circ C/W$	Module (Max.) $R_{th(c-f)}$ $^\circ C/W$				
						$R_{DS(on)}$ ($m\Omega$) (Typ.)	V_{DSS} Volts (Min.)	I_{DSS} (μA) (Max.)	V_{SD} Volts (Max.)	Q_g (nC) (Typ.)						
Single Custom MOSFET Module																
QJS0512001	500	120	2500	150	2500	22	500	20	1.5	380	0.1	0.075	500	3	M-7	

Single Custom MOSFET Module

QJS0512001



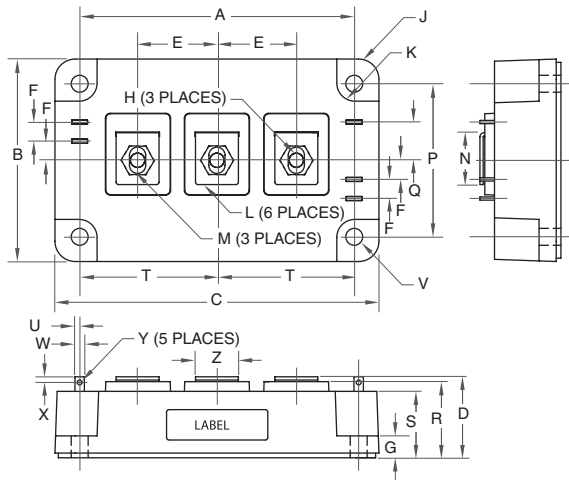
Custom Fast Diode Modules, (Refer to device datasheets at www.pwr.com for test conditions.)

Type	V_{RRM} Volts ($V_{RSM} = V_{RRM} + 100V$)	$I_{F(av)/TC}$ Amperes/ $^\circ C$ ($180^\circ \sin$)	NORTH AMERICAN		V_{FM}/I_{FM} Volts/Amperes ($T_j = 25^\circ C$)	t_{rr}			$R_{th(j-c)}$ $^\circ C/W$	$R_{th(c-s)}$ $^\circ C/W$	$T_{j(max)}$ $^\circ C$	Weight	Outline Drawings Number Page	
			I_{FSM} Amperes (8.3ms, $T_{j(max)}$, 100% V_{RRM} Reapplied)	i^2t $A^2 \text{ sec}$ (8.3ms, $T_{j(max)}$, 100% V_{RRM} Reapplied)		t_{rr} ns	at I_f Amperes	di/dt Amperes/ μs						
Single Fast Diode Modules														
QRS1450001	1400	250 / 90	3330	46,200	3.2 / 250	300	500	-1000	0.075	0.04	150	400	7	M-9
QRS171D001	1700	700 / 80	2400	24,000	2.5 / 700	2000	1200	-2400	0.04	0.04	150	400	7	M-9
QRS4506001	4500	60 / 100	120	1900	150	230	67	-800	0.12	TBD	150	21	6	M-8
QRS4506002	4500	60 / 100	120	1900	6.2 / 60	230	67	-800	0.12	TBD	150	21	8	M-9

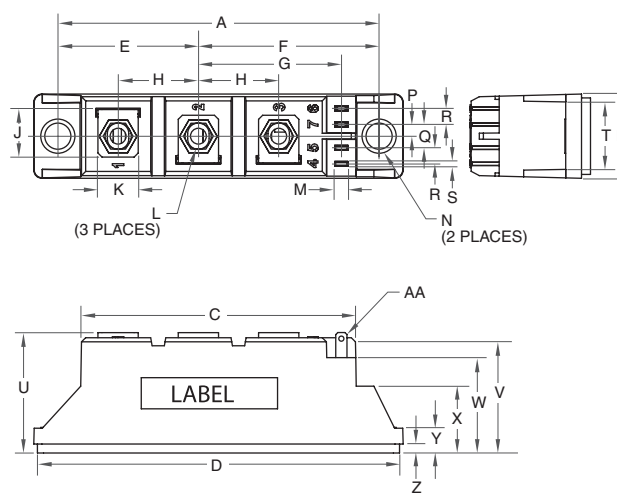
Single Fast Diode Modules

- QRS1450001,
- QRS171D001,
- QRS4506001,
- QRS4506002

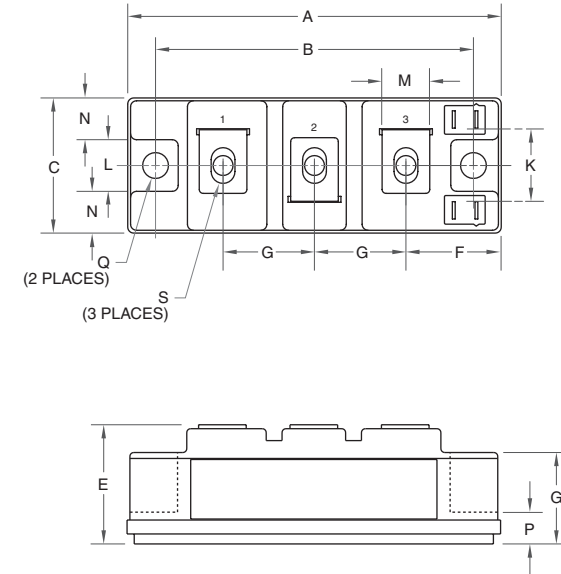
1 QID0645011



2 QIC0212003



3 QIC0610001, QIC0620001, QIC0620003, QJS0512001



Dim.	Inches	Millimeters
A	3.390	86.1
B	2.5 ±0.0004	63.5 ±0.01
C	4.0 ±0.0004	101.6 ±0.01
D	1.0 ±0.00042	25.4 ±0.015
E	0.98	24.9
F	0.236 ±0.02	6.0 ±0.05
G	0.27 ±0.00042	6.9 ±0.015
H	M6 Metric	M6
J	0.25 Rad.	6.4 Rad.
K	0.24 Rad.	6.1 Rad.
L	0.1 Min.	2.5 Min.
M	0.23 Dia.	5.8 Dia.

Dim.	Inches	Millimeters
N	0.64 ±0.00042	16.3 ±0.015
P	1.89	48.0
Q	0.472 ±0.02	12.0 ±0.05
R	0.94	23.9
S	0.82	20.8
T	1.695 ±0.02	43.1 ±0.05
U	0.58 ±0.0004	1.5 ±0.01
V	0.220 Dia.	5.7 Dia.
W	0.115 ±0.0004	2.90 ±0.01
X	0.07 ±0.0004	1.8 ±0.01
Y	0.05 ±0.0004 Dia.	1.3 ±0.01 Dia.
Z	0.53	13.5

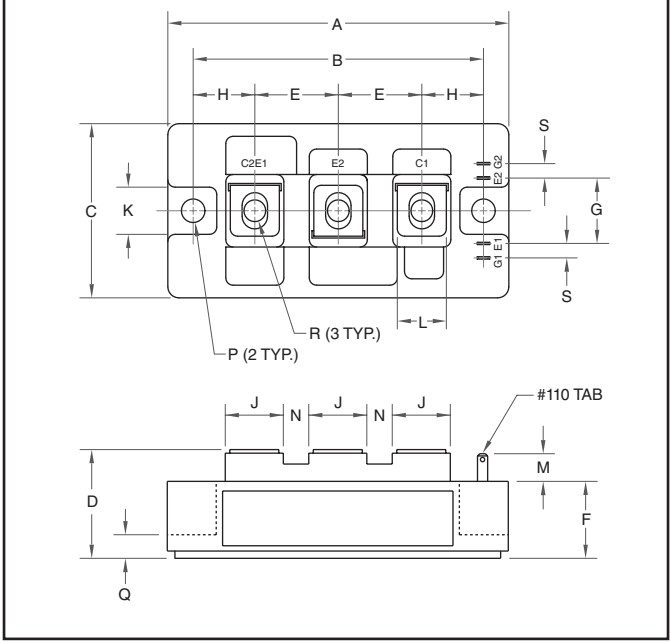
Dim.	Inches	Millimeters
A	3.15	80.0
B	0.83	21.0
C	2.69	68.2
D	3.62	92.0
E	1.378	35.0
F	1.772	45.0
G	1.402	35.6
H	0.787	20.0
J	0.47	11.8
K	0.395	10.0
L	M5 Metric	M5
M	0.11	2.8
N	7.256	76.5

Dim.	Inches	Millimeters
P	0.114	2.9
Q	0.228	5.8
R	0.157	4.0
S	0.032	0.8
T	0.66	46.8
U	1.18	30.0
V	1.09	27.7
W	0.93	23.7
X	0.66	16.6
Y	0.24	6.2
Z	0.09	2.2
AA	0.05 Dia.	1.3 Dia.

Dim.	Inches	Millimeters
A	3.721	94.51
B	3.155	80.14
C	1.349	34.26
E	1.201	30.51
F	0.95	24.13
G	0.911	23.14
K	0.65	16.51

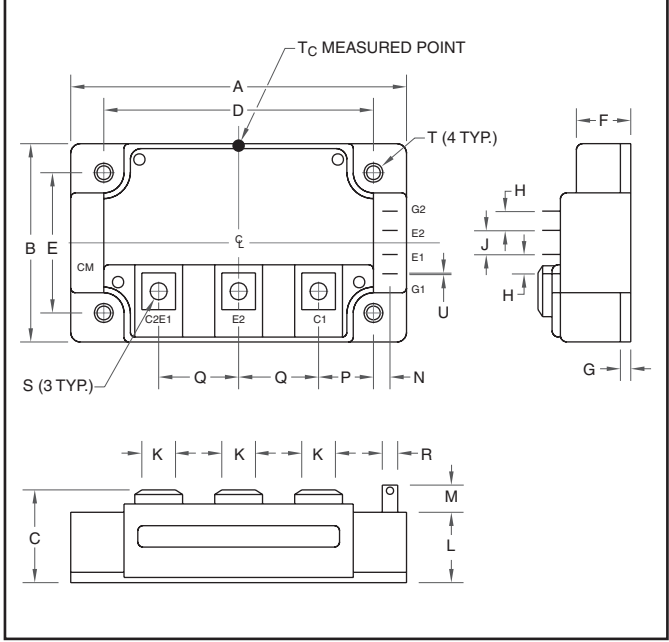
Dim.	Inches	Millimeters
L	0.522	13.26
M	0.48	12.19
N	0.423	10.74
P	0.325	8.26
Q	0.261	6.63
S	M6 Metric	M6

4 QIC1208001, QIQ0630003, QIR0620001



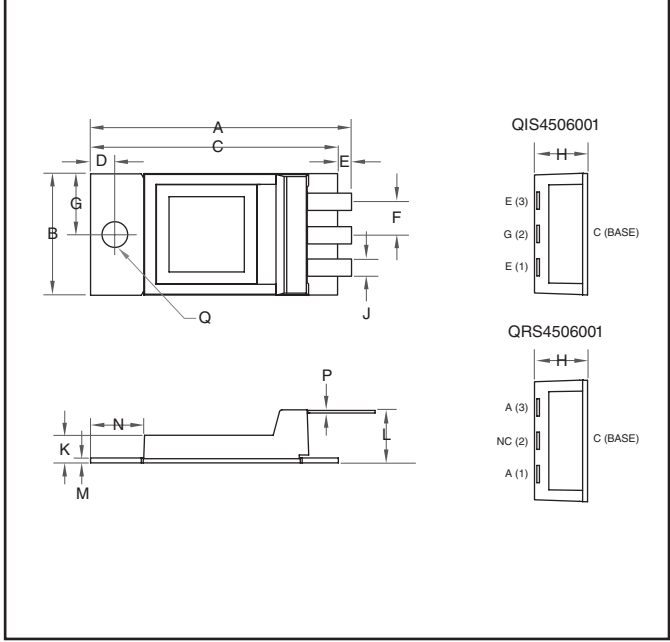
Dim.	Inches	Millimeters	Dim.	Inches	Millimeters
A	3.70	94.0	K	0.51	13.0
B	3.150±0.01	80.0±0.25	L	0.47	12.0
C	1.89	48.0	M	0.30	7.5
D	1.18 Max.	30.0 Max.	N	0.28	7.0
E	0.90	23.0	P	0.256 Dia.	6.5 Dia.
F	0.83	21.2	Q	0.26	6.5
G	0.71	18.0	R	M5 Metric	M5
H	0.67	17.0	S	0.16	4.0
J	0.63	16.0			

5 QIQ0645001, QIQ0645003



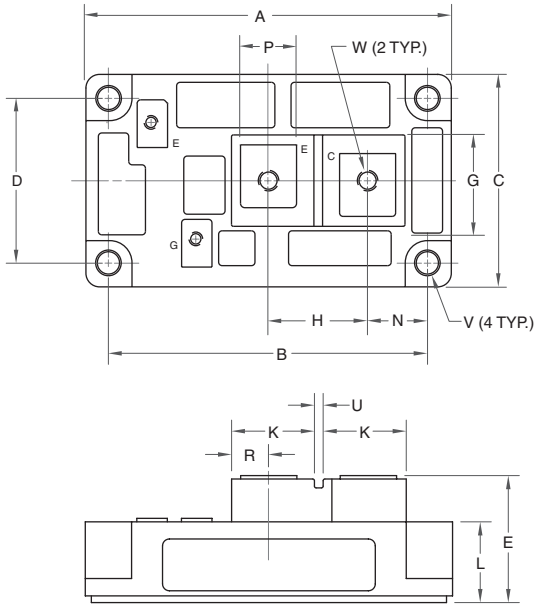
Dim.	Inches	Millimeters	Dim.	Inches	Millimeters
A	4.25	108.0	K	0.55	14.0
B	2.44	62.0	L	0.87	22.0
C	1.14+0.04/-0.02	29.0+1.0/-0.5	M	0.33	8.5
D	3.66±0.01	93.0±0.25	N	0.10	2.5
E	1.88±0.01	48.0±0.25	P	0.85	21.5
F	0.67	17.0	Q	0.98	25.0
G	0.16	4.0	R	0.11	2.8
H	0.24	6.0	S	M6 Metric	M6
J	0.59	15.0	T	0.25 Dia.	6.5 Dia.

6 QIS4506001, QRS4506001



Dim.	Inches	Millimeters	Dim.	Inches	Millimeters
A	2.31	58.6	J	0.14	3.6
B	0.98	25.0	K	0.22	5.7
C	2.01	51.0	L	0.43	10.8
D	0.2	5.0	M	0.04	1.0
E	0.1	2.5	N	0.43	10.9
F	0.27	6.9	P	0.02	0.5
G	0.49	12.5	Q	0.21 Dia.	5.3 Dia.
H	0.46 Max.	11.8 Max.			

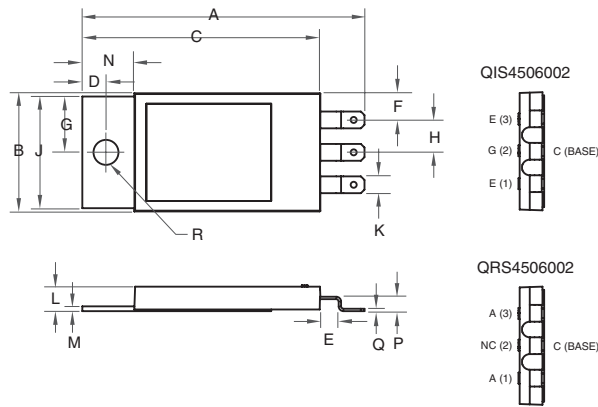
7 QRS1450001, QRS171D001



Dim.	Inches	Millimeters
A	4.21	107.0
B	3.661±0.01	93.0±0.25
C	2.44	62.0
D	1.89±0.01	48.0±0.25
E	1.42 Max.	36.0 Max.
G	1.18	30.0
H	1.14	29.0
K	0.94	24.0

Dim.	Inches	Millimeters
L	0.93	23.5
N	0.69	17.5
P	0.63	16.0
R	0.43	11.0
U	0.12	3.0
V	0.26 Dia.	6.6 Dia.
W	M6 Metric	M6

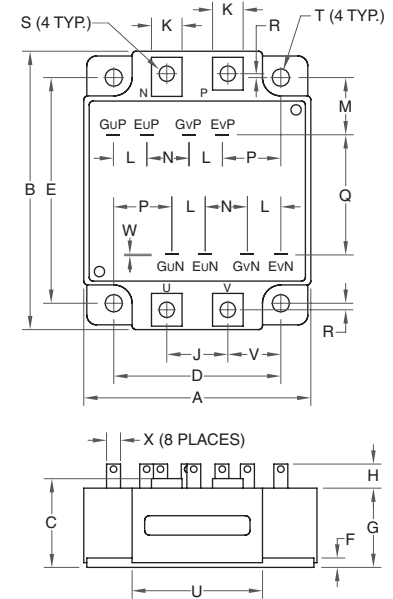
8 QIS4506002, QRS4506002



Dim.	Inches	Millimeters
A	2.35	59.7
B	0.98	25.0
C	1.98	50.3
D	0.197	5.0
E	0.22	5.5
F	0.22	5.6
G	0.465	11.8
H	0.27	6.9

Dim.	Inches	Millimeters
J	0.93	23.6
K	0.14	3.6
L	0.20	5.2
M	0.40	1.0
N	0.43	11.0
P	0.20	0.5
Q	0.12	3.0
R	0.208	5.3

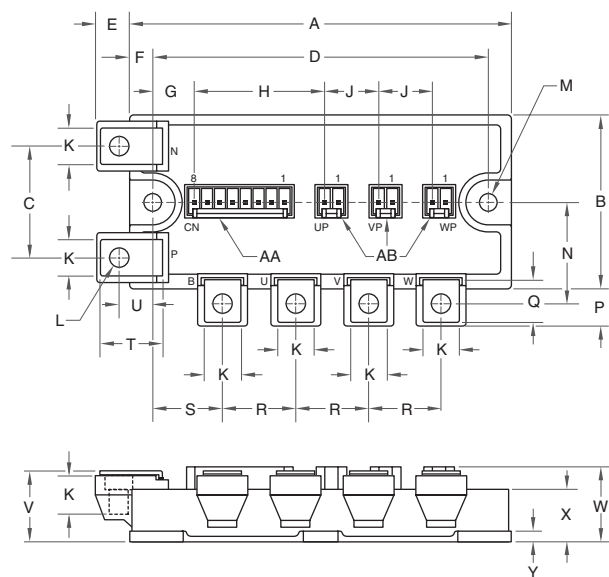
9 QIB0607002



Dim.	Inches	Millimeters
A	2.83	72.0
B	3.58	91.0
C	1.16 -0.04/-0.02	29.5 +1.0/-0.5
D	2.17±0.01	55.0±0.25
E	2.91±0.01	74.0±0.25
F	0.16	4.0
G	1.02	26.0
H	0.31	8.1
J	0.79	20.0
K	0.39	10.0
L	0.43	11.0

Dim.	Inches	Millimeters
M	0.74	18.7
N	0.75	19.1
P	0.57	14.43
Q	1.55	39.3
R	0.5	1.25
S	M4	M4
T	0.22 Dia.	5.5 Dia.
U	1.61	41.0
V	0.69	17.5
W	0.02	0.5
X	0.110	2.8

10 QIE0220002



Dim.	Inches	Millimeters	Dim.	Inches	Millimeters
A	4.72	120.0	N	1.23	32.0
B	2.17	55.0	P	0.47	11.75
C	1.39	35.0	Q	0.53	13.5
D	4.17±0.02	106.0±0.5	R	0.91	23.0
E	0.43	11.0	S	0.87	22.0
F	0.28	7.0	T	0.76	19.75
G	0.54	13.62	U	0.42	10.75
H	1.61	40.78	V	0.87+0.04/-0.02	22.0+1.0/-0.5
J	0.67	17.0	W	0.91	23.2
K	0.47	12.0	X	0.63	16.0
L	M5	M5	Y	0.12	3.0
M	0.27 Dia.	5.5 Dia.			

Housing Types (J.S.T. Mfg. Co. Ltd.)

AA – B8P-VH-FB-B

AB – B2P-VH-FB-B