

International zî?R Rectifier

IRK.41, .56 SERIES

THYRISTOR/ DIODE and
THYRISTOR/ THYRISTOR

ADD-A-pak GEN V Power Modules

Features

- B High Voltage
- B Industrial Standard Package
- M Thick Al metal die and double stick Landing
- B Thick copper baseplate
- B UL E789@ approved
- B 3500V isolating voyage

Benefits

- Up to 1600V
- Full compatible TO-240AA
- High Surge capability
- Easy Mounting on heatsink
- Al₂O DBC insulator
- Heatsink grounded

45 A
60 A

Mechanical Description

The Generation V of Add-A-pak module combine the excellent thermal performance obtained by the usage of Direct Banded Copper substrate with superior mechanical ruggedness, thanks to the insertion of a solid Copper baseplate at the bottom side of the device. The Cu baseplate allow an easier mounting on the majority of heatsink with increased tolerance of surface roughness and improve thermal spread.

The Generation V of AAP module is manufactured without hard mold, eliminating in this way any possible direct stress on the leads.

The electrical terminals are secured against axial pull-out. they are fixed to the module housing via a click-stop feature already tested and proved as reliable on other IR modules.

Electrical Description

These modules are intended for general purpose high voltage applications such as high voltage regulated power supplies, lighting circuits, temperature and motor speed control circuits, UPS and battery charger.

Major Ratings and Characteristics

Parameters	IRK.41	IRK.56	Units
$I_{T(AV)}$ or $I_{F(AV)}$ @85°C	45	60	A
$I_{O(AV)}$ "t	100	135	A
$U_S @ 50Hz$	850	1310	A
$I @ 60Hz$	890	1370	A
$I^2_t @ 50Hz$	3.61	8.50	KA ² S
$I^2_t @ 60Hz$	3.30	7.82	KA ² S
$I^2_{\backslash t}$	36.1	85.0	A ² s
V_{RRM} range	400 to 1600		V
T_{STG}	-40 to 125		°C
T_p	-40 to 125		°C

(") As AC switch.

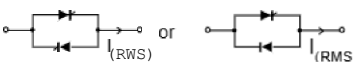


ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V _{rrm} , maximum repetitive peak reverse voltage V	V _p , maximum non-repetitive peak reverse voltage V	V _{ro} , max. repetitive peak off-state voltage, gate open circuit V	I _{lt} 125°C mA
IRK.41 / .56	04	400	500	400	15
	06	600	700	600	
	08	800	900	800	
	10	1000	1100	1000	
	12	1200	1300	1200	
	14	1400	1500	1400	
	16	1600	1700	1600	

On-state Conduction

Parameters	IR441	IR156	Units	Condions			
$I_{T(AV)}$ Max. average on-state current (Thyristors)	45	60	A	180° conduction, half sine wave, $T = 85^{\circ}C$			
$I_{F(AV)}$ Maximum average forward current (Diodes)	45	60					
$I_{O(RMS)}$ Max. continuous RMS on-state current. As AC swtch	100	135					
I_{TSM} Max. peak, onecycle non-repetitive on-state or forward current I_{FSM}	850	1310		$t=10ms$	No voltage reapplied	Sinusoidal half wave, Initial $T = T_{max}$.	
	890	1370		$t=8.3ms$	100%V _{pp} reapplied		
	715	1100		$t=10ms$	$T = 25^{\circ}C$,	reapplied	
	750	1150		$t=8.3ms$	no voltage		
	940	1450	$t=10ms$	no voltage			
985	1520	$t=8.3ms$	no voltage				
I^2t Max. I^2t for fusing	3.61	8.56	KA ² s	$t=10ms$	No voltage	Initial $T = T_{max}$.	
	3.30	7.82		$t=8.3ms$	reapplied		
	2.56	6.05		$t=10ms$	100%V _{qpy}	reapplied	
	2.33	5.53		$t=8.3ms$	reapplied		
	4.42	10.05		$t=10ms$	$T = 25^{\circ}C$,		reapplied
	4.03	9.60		$t=8.3ms$	no voltage		
I^2t_{th} Max. I^2t for fusing (1)	36.1	85.6	KACs	$t=0.1$ to $10ms$, no volta ge reapplied			
V_{ivo} Max. value of threshold vorage (2)	0.88	0.85	V	Low level (3)	$T = T_{max}$		
	0.91	0.88		High level (4)			
F_t Max. value of on-state sloperesistance (2)	5.90	3.53	mΩ	Low level (3)	$T = T_{max}$		
	5.74	3.41		High level (4)			
V_{TM} - V_{FM} Max. peak on-state or forward voltage	1.81	1.54	V	$V_{TM} = I_{T(AV)}$	$T = 25^{\circ}C$		
				$V_{FM} = I_{F(AV)}$			
di/dt Max. non-repetive rate of rise of turned on current	150		A/ps	$T = 25^{\circ}C$, from 0.67 V _{rrm} \,, $I_{TM} = \pi \times I_{T(AV)}$, $I_g = 500mA$, $t_r < 0.5ps$, $t_{th} > 6Us$			
Max. holding current	200		mA	$T = 25^{\circ}C$, anode supply = 6V, resistive load, gate open circuit			
I_L Max. latching current	400			$T = 25^{\circ}C$, anode supply = 6V, resistive load			

(1) I_N for time t , $= I^2 t$ x Qt,(2) Average power = $V \times I_{yA} + r_f \times (I)^2$ (3) $16.7\% \times r \times I_A W < n \times I_A W$ (4) $I > r \times I_{lip}$

Triggering

Parameters		IRK.41	IR1C50	Units	Conditions	
P	Max. peak gate power	10	10	W		
P _{av}	Max. average gate power	2.5	2.5			
I _p	Max. peak gate current	2.5	25	A		
-V _{gk}	Max. peak negative gate voltage	10		V	Anode supply= 6V resistive load	
V _{gk}	Max. gate voltage required to trigger	4.0				
		2.5				
		1.7				
I _{gk}	Max. gate current required to trigger	270		mA	Anode supply= 6V resistive load	
		150				
		80				
V _{gk}	Max. gate voltage that will not trigger	0.25		V	T = 125°C, rated V _{gk} applied	
I _{gk}	Max. gate current that will not trigger	6		mA	T = 125°C, rated V _{gk} applied	

Blocking

Parameters	IRK.41	IRK.56	Units	Conditions
I _{rs} Max. peak reverse and off-state leakage current at V _{rs} mV	15		mA	T = 125 V, gate open circuit
V _{iso} RMS isolation voltage	2500 (1 min) 3500 (1 sec)		V	50 Hz, circuit to base, all terminals shorter
dv/dt Max. critical rate of rise of off-state voltage (5)			V/μs	T = 125°C, linear to 0.67 V _{rs} , gate open circuit

(5) Available with dv/dt = 1000V/ps, to complete code add S90 i.e. IRKT41/16AS90

Thermal and Mechanical Specifications

Parameters	IRK.41	IRK.56	Unrs	Conditions
T Junction operating temperature range	-40 to 125		°C	
T Storage temp. range	-40 to 125			
wp Max. internal thermal resistance, junction to case	0.23	0.20	K/W	Per module, DC operation
Rpg Typical thermal resistance case to heatsink	0.1			Mounting surface flat, smooth and greased
T Mounting torque to heatsink busbar	5		Nm	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound
	3			
M Approximate weight	110 (4)		gr (oz)	
Case style	TO-240AA		JEDEC	

AR Conduction (per Junction)

(The following table shows the increment of thermal resistance R_{θJA} when devices operate at different ambient temperature than DC)

Devices	Sine half wave conduction					Rect. wave conduction					Units
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
IRK.41	0.11	0.13	0.17	0.23	0.34	0.09	0.14	0.18	0.23	0.34	c/w
IRK.56	0.09	0.11	0.13	0.18	0.27	0.07	0.11	0.14	0.19	0.28	

IRK.41, .56 Series

Bulletin 127131 rev. G 10/02

International
z-z Rectifier

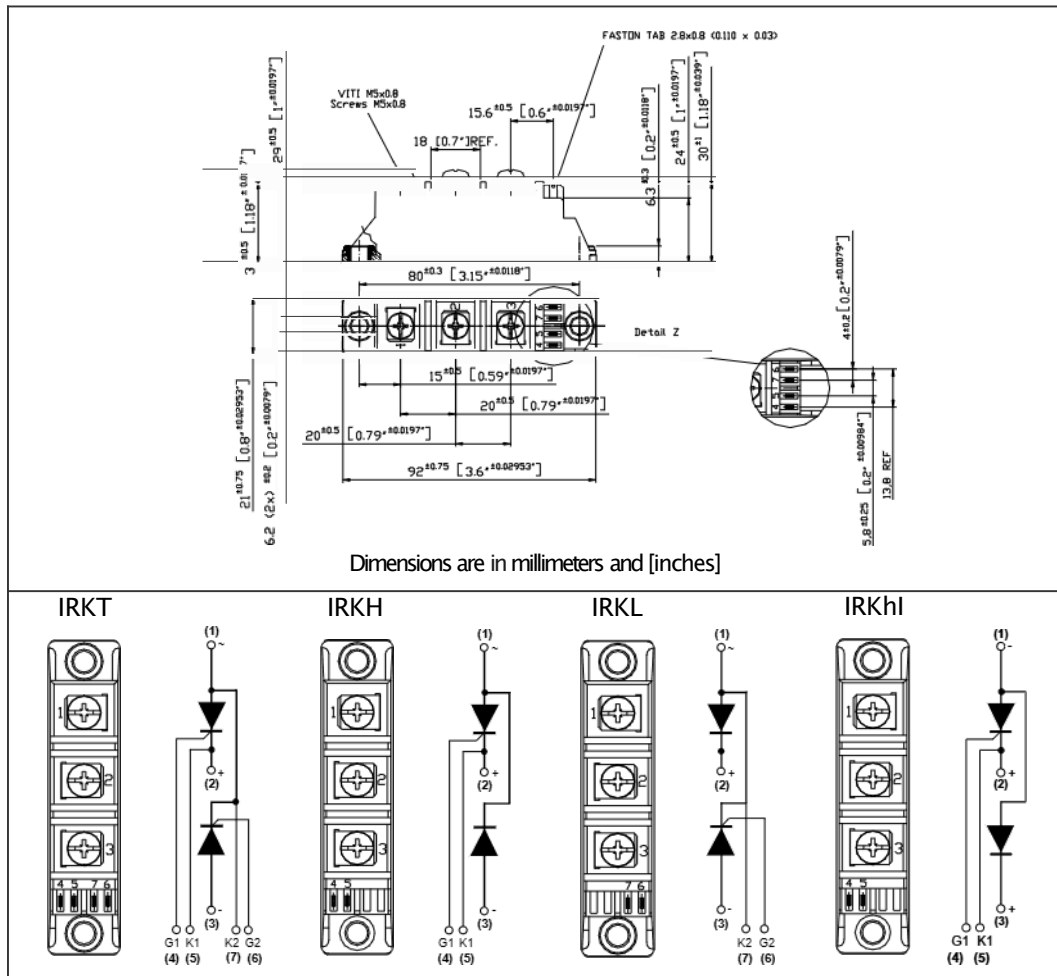
Ordering Information Table

Device Code					
IRK	T	56	/	16	A S90
①	②	③		④	⑤ ⑥
1	Module type				
2	Circuit configuration (See Circuit Configuration table below)				
3	Current code " "				
4	Voltage code (See Voltage Ratings table)				
5	A : Gen V				
6	dv/dt code: 590 = dv/dt 1000 V/is No letter = dv/dt 500 Vis				

IRK 57 types
With no auxiliary cathode

** Available with no auxiliary cathode.
Tospeci\change 41 to 42
56 to 57
e.g. : IRKT57/16A etc.

Outline Table



NOTE: To order the Optiona/ Hardware see Bulletin I2T900

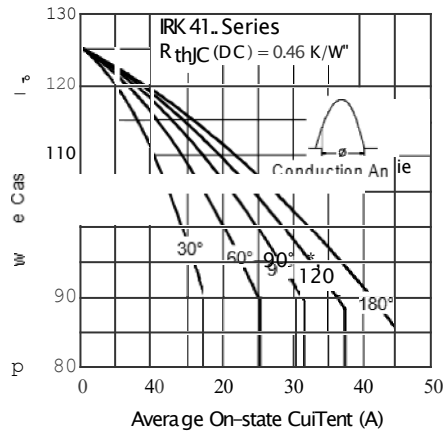


Fig. 1 -Current Ratings Characteristics

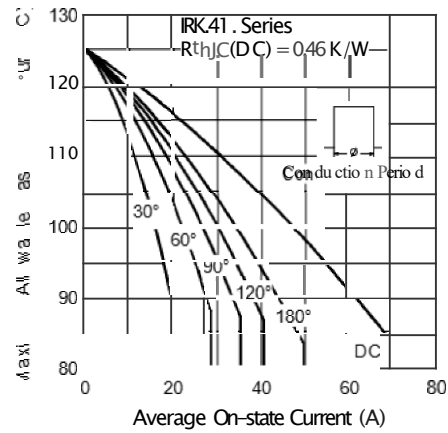


Fig. 2- Current Ratings Characteristics

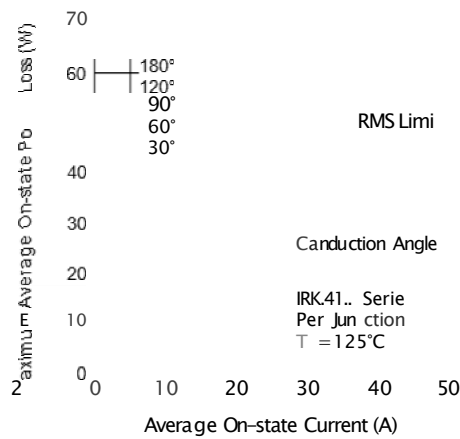


Fig. 3-On-state Power Loss Characteristics

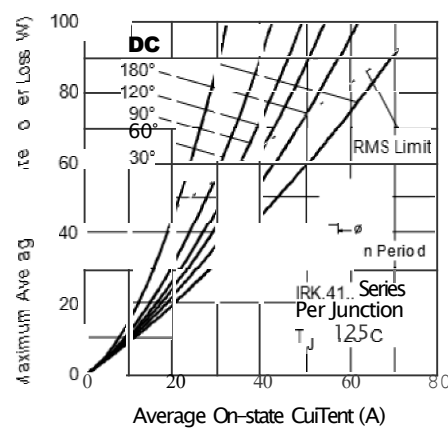


Fig. 4-On-state Power Loss Characteristics

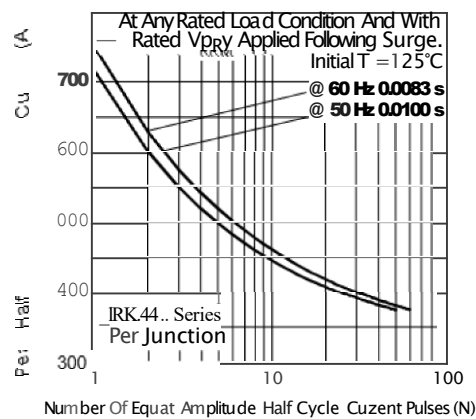


Fig. 5- Maximum Non-Repetitive Surge Current

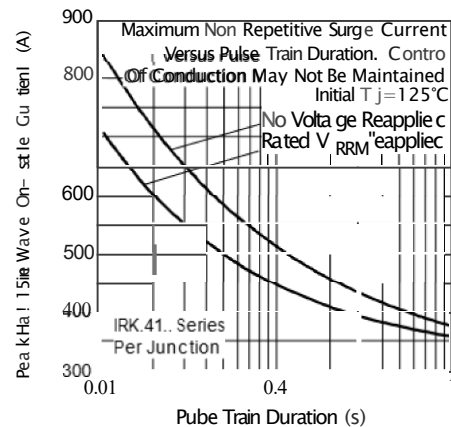


Fig. 6-Maximum Non-Repetitive Surge Current

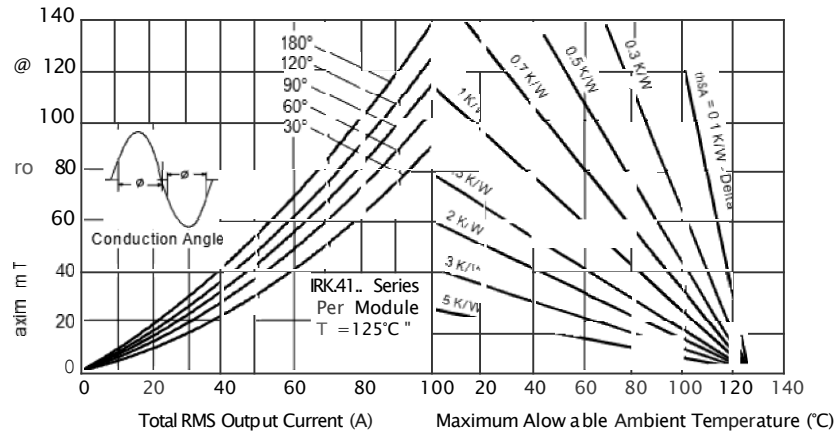


Fig 7- On-state Power Loss Characteristics

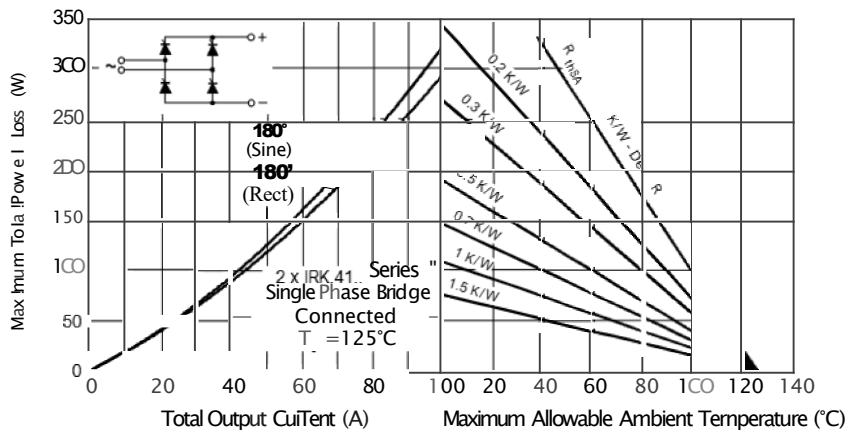


Fig 8- On-state Power Loss Characteristics

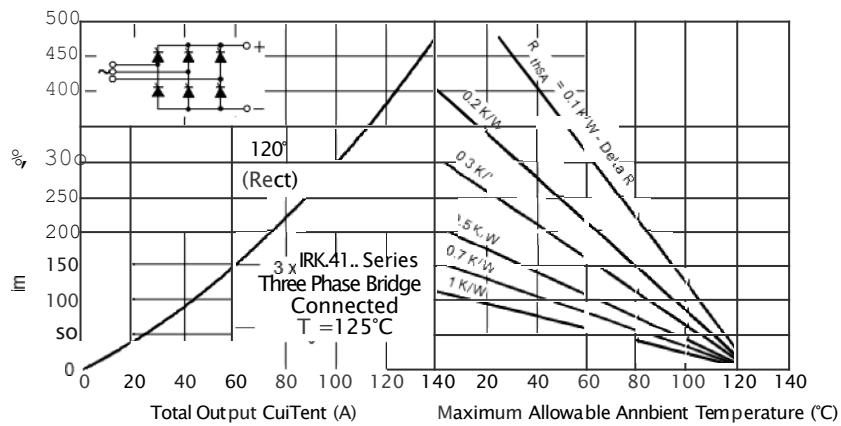


Fig 9- On-state Power Loss Characteristics

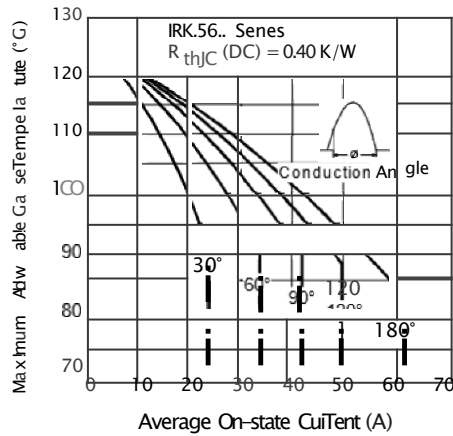


Fig. 10 - Current Ratings Characteristics

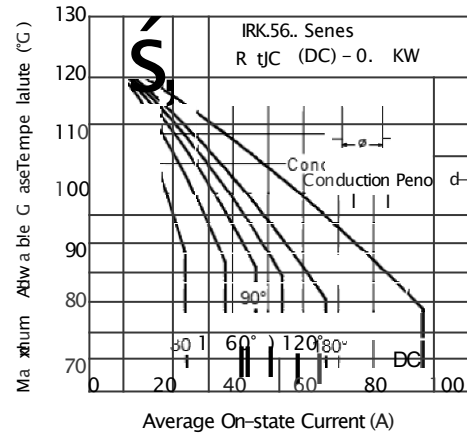


Fig. 11 - Current Ratings Characteristics

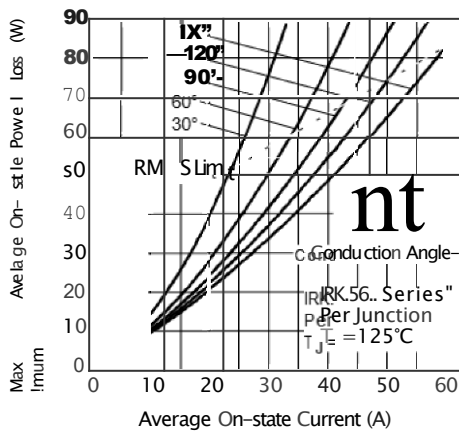


Fig. 12 - On-state Power Loss Characteristics

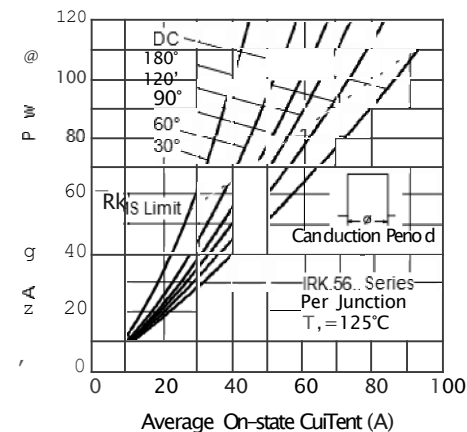


Fig. 13 - On-state Power Loss Characteristics

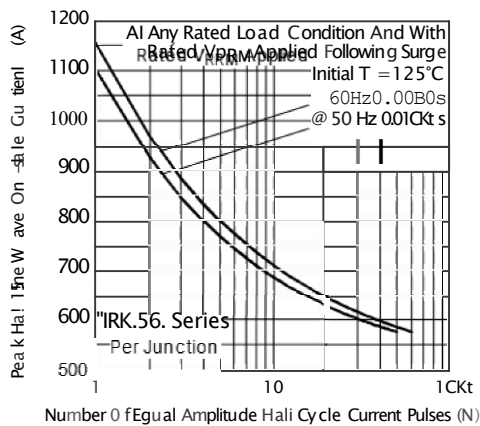


Fig. 14 - Maximum Non-Repetitive Surge Current

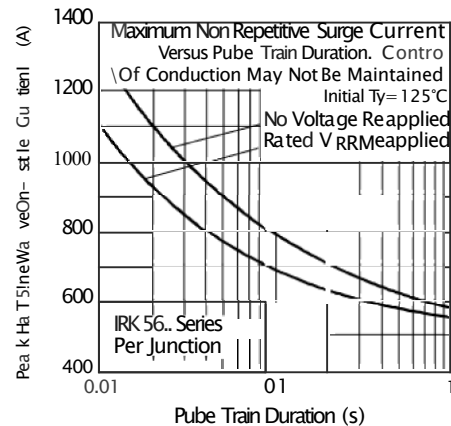
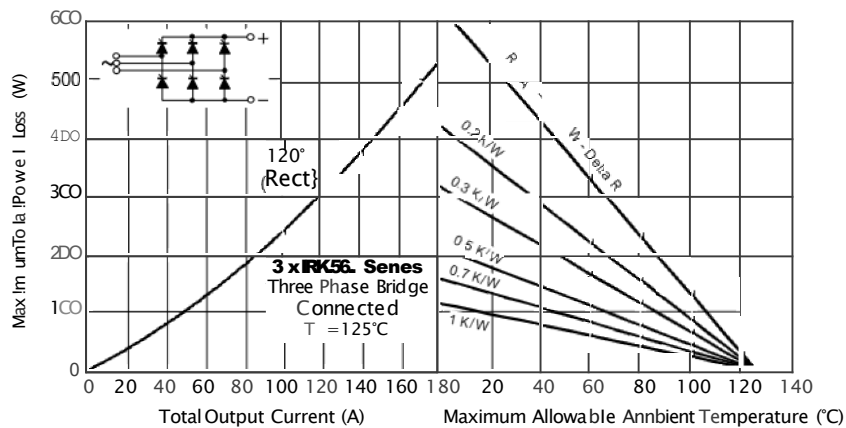
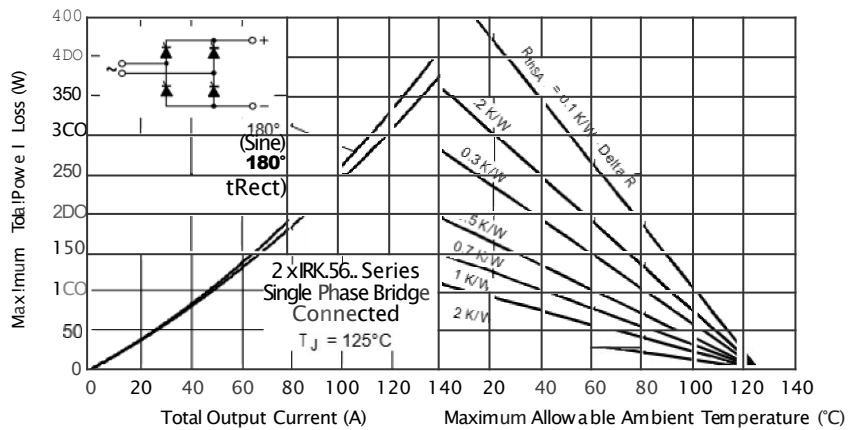
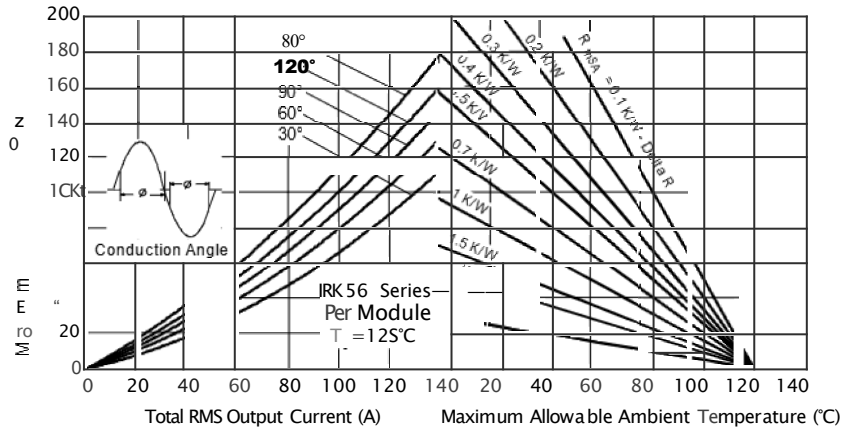


Fig. 15 - Maximum Non-Repetitive Surge Current



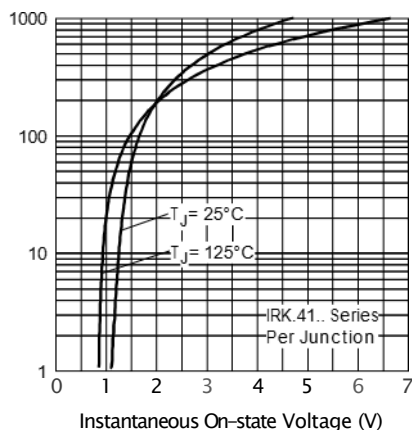


Fig. 19 - On-state Voltage Drop Characteristics

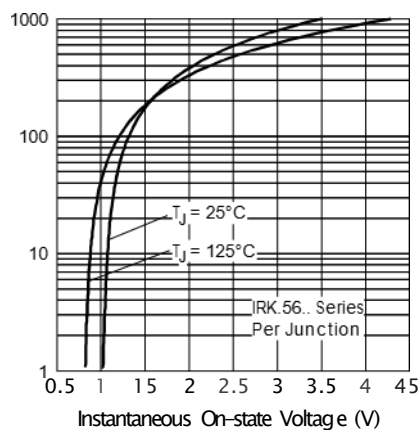


Fig. 20 - On-state Voltage Drop Characteristics

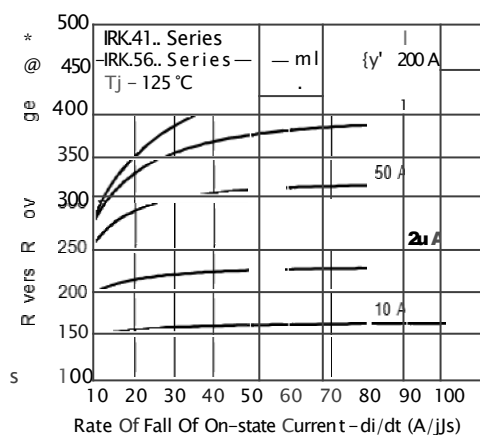


Fig. 21 - Recovery Charge Characteristics

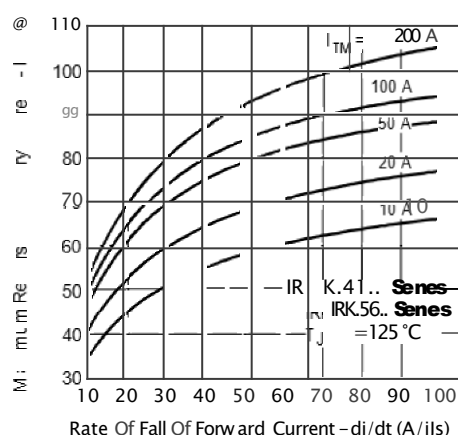


Fig. 22 - Recovery Current Characteristics

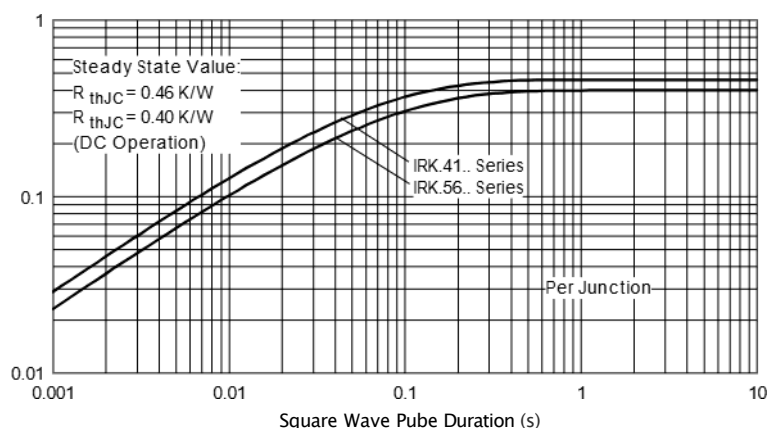


Fig. 23 - Thermal Impedance Characteristics

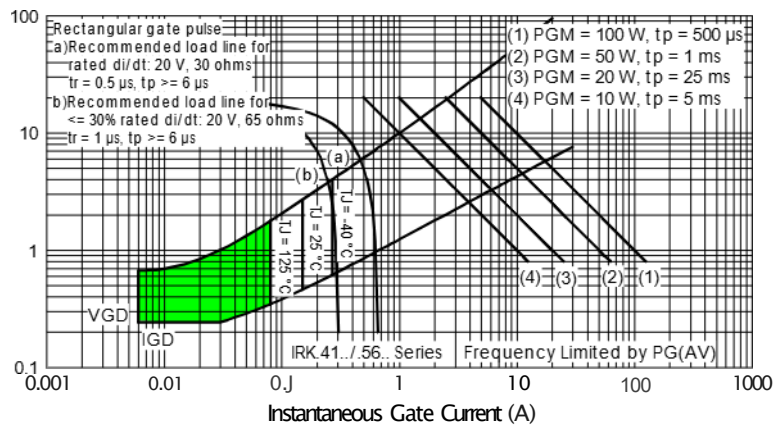


Fig. 24 - Gate Characteristics

