

**FAST DIODES**
**SUPER MAGN-A-pak™ Power Modules**
**Features**

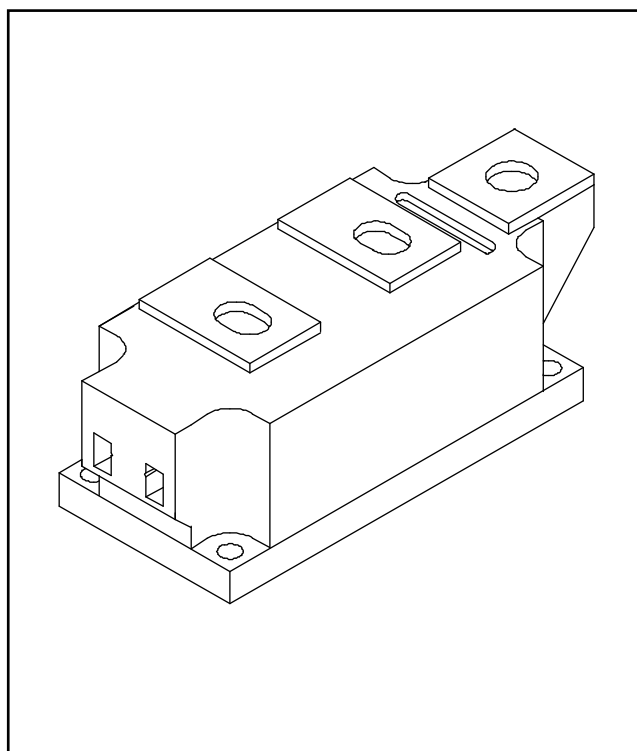
- High power FAST recovery diode series
- High current capability
- 3000 V<sub>RMS</sub> isolating voltage with non-toxic substrate
- High surge capability
- High voltage ratings up to 2500V
- Industrial standard package
- UL recognition pending

**460 A**
**Typical Applications**

- Snubber for large GTO
- Snubber for large IGBT

**Major Ratings and Characteristics**

Parameters	IRKDL450..S20	Units	
$I_{F(AV)}$	460	A	
@ $T_C$	82	°C	
$I_{F(RMS)}$	720	A	
@ $T_C$	82	°C	
$I_{FSM}$	@ 50Hz	13.0	KA
	@ 60Hz	13.8	KA
$I^2t$	@ 50Hz	845	KA <sup>2</sup> s
	@ 60Hz	790	KA <sup>2</sup> s
$I^2\sqrt{t}$		8450	KA <sup>2</sup> √s
$V_{RRM}$	range	1600 to 2500	V
$t_{rr}$		4.0	μs
$T_{STG}$	range	-40 to 150	°C
$T_J$	range	-40 to 150	°C



**ELECTRICAL SPECIFICATIONS**

**Voltage Ratings**

Type number	Voltage Code	$V_{RRM}$ , maximum repetitive peak reverse voltage V	$V_{RSM}$ , maximum non-repetitive peak rev. voltage V	$I_{RRM}$ max. @ $T_J$ max. mA
IRKDL450..S20	16	1600	1700	50
	20	2000	2100	
	25	2500	2600	

**Forward Conduction**

Parameter	IRKDL450..	Units	Conditions
$I_{F(AV)}$ Maximum average forward current @ Case temperature	460	A	180° conduction, half sine wave
	82	°C	
$I_{F(RMS)}$ Maximum RMS forward current	720	A	180° conduction, half sine wave @ $T_C = 82^\circ\text{C}$
$I_{FSM}$ Maximum peak, one-cycle forward, non-repetitive surge current	13.0	KA	t = 10ms No voltage reappplied
	13.8		t = 8.3ms reappplied
	11.1		t = 10ms 100% $V_{RRM}$ reappplied
	11.8		t = 8.3ms reappplied
$I^2t$ Maximum $I^2t$ for fusing	845	KA <sup>2</sup> s	t = 10ms No voltage reappplied
	790		t = 8.3ms reappplied
	616		t = 10ms 100% $V_{RRM}$ reappplied
	578		t = 8.3ms reappplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	8450	KA <sup>2</sup> $\sqrt{s}$	t = 0.1 to 10ms, no voltage reappplied
$V_{F(TO)1}$ Low level value of threshold voltage	1.16	V	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J$ max.
$V_{F(TO)2}$ High level value of threshold voltage	1.62	V	$(I > \pi \times I_{F(AV)})$ , $T_J = T_J$ max.
$r_{f1}$ Low level value of forward slope resistance	0.68	m $\Omega$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J$ max.
$r_{f2}$ High level value of forward slope resistance	0.41	m $\Omega$	$(I > \pi \times I_{F(AV)})$ , $T_J = T_J$ max.
$V_{FM}$ Maximum forward voltage drop	2.20	V	$I_{pk} = 1800\text{A}$ , $T_J = 25^\circ\text{C}$ , $t_p = 10\text{ms}$ sine pulse

**Recovery Characteristics**

Code	$T_J = 25^\circ\text{C}$ typical $t_{rr}$ @ 25% $I_{RRM}$ ( $\mu\text{s}$ )	Test conditions			Max. values @ $T_J = 150^\circ\text{C}$			
		$I_{pk}$ Square Pulse (A)	$di/dt$ (A/ $\mu\text{s}$ )	$V_r$ (V)	$t_{rr}$ @ 25% $I_{RRM}$ ( $\mu\text{s}$ )	$Q_{rr}$ ( $\mu\text{C}$ )	$I_{rr}$ (A)	
S20	2.0	1000	100	-50	4.0	400	180	

**Blocking**

Parameter	IRKDL450..	Units	Conditions
$V_{INS}$ RMS isolation voltage	3000	V	t = 1 s
$I_{RRM}$ Maximum peak reverse and off-state leakage current	50	mA	$T_J = T_J$ max., rated $V_{RRM}$ applied

Thermal and Mechanical Specifications

Parameter	IRKDL450..	Units	Conditions
$T_J$ Max. junction operating temperature range	- 40 to 150	°C	
$T_{stg}$ Max. storage temperature range	- 40 to 150		
$R_{thJC}$ Max. thermal resistance, junction to case	0.065	K/W	Per junction, DC operation
$R_{thC-hs}$ Max. thermal resistance, case to heatsink	0.02	K/W	
T Mounting torque $\pm 10\%$ SMAP to heatsink	6 - 8	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
	busbar to SMAP		
wt Approximate weight	1500	g	
Case style	SUPER MAGN-A-pak		See outline table

$\Delta R_{thJC}$  Conduction

(The following table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.009	0.006	K/W	$T_J = T_J \text{ max.}$
120°	0.011	0.011		
90°	0.014	0.015		
60°	0.021	0.022		
30°	0.037	0.038		

Ordering Information Table

**Device Code**

IRK	D	L	450	-	25	S20
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(1)
(2)
(3)
(4)
(5)
(6)

- 1** - Module type
- 2** - Circuit configuration D = 2 diodes in series
- 3** - Fast recovery
- 4** - Current rating
- 5** - Voltage code: Code x 100 =  $V_{RRM}$  (See Voltage Ratings Table)
- 6** -  $t_{rr}$  code (see Recovery Characteristics table)

Outline Table

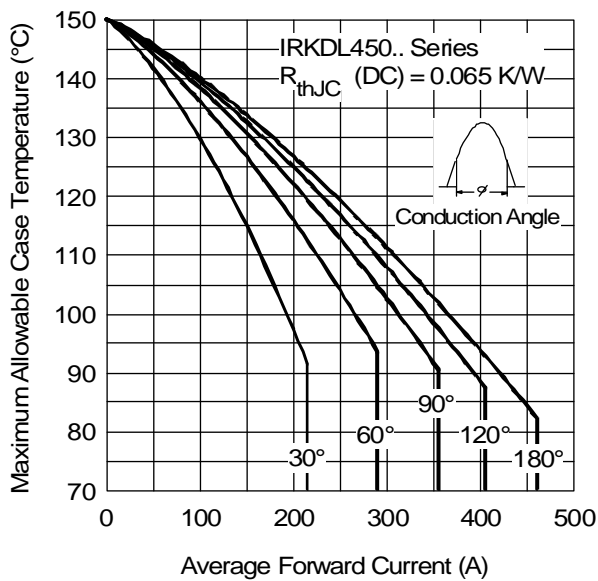
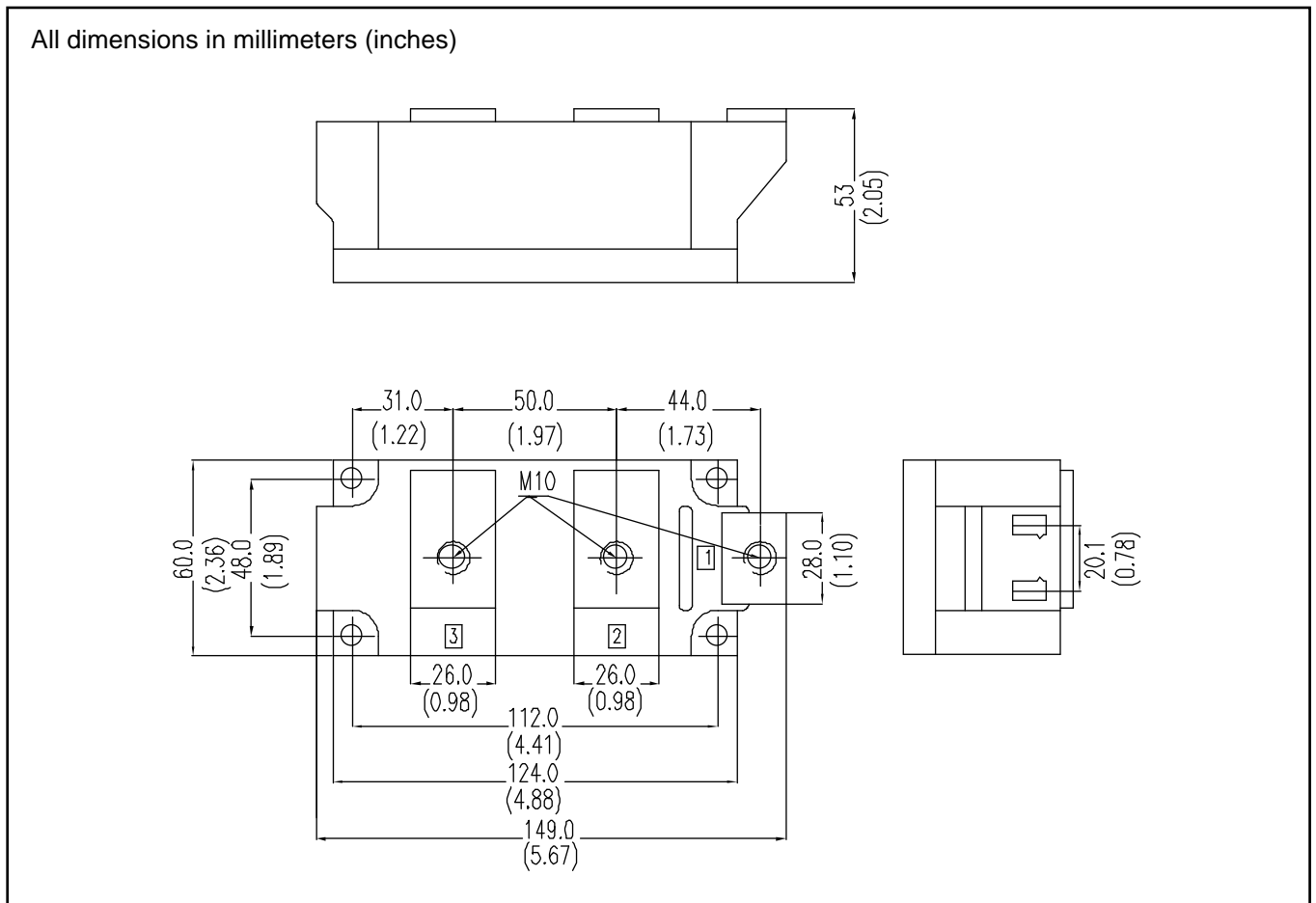


Fig. 1 - Current Ratings Characteristics

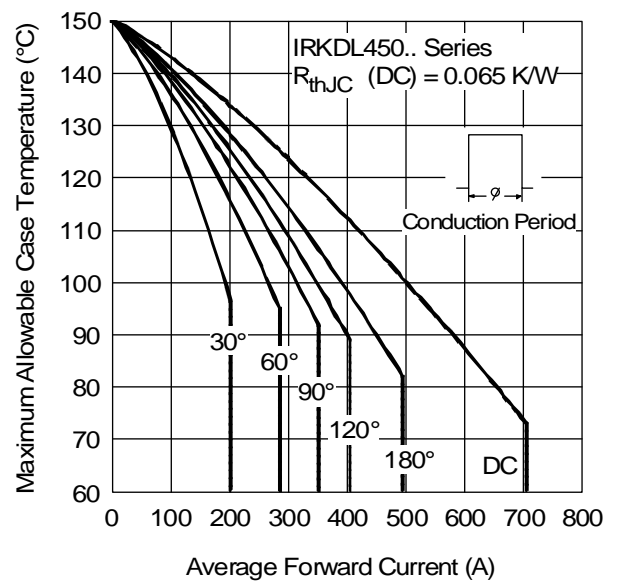


Fig. 2 - Current Ratings Characteristics

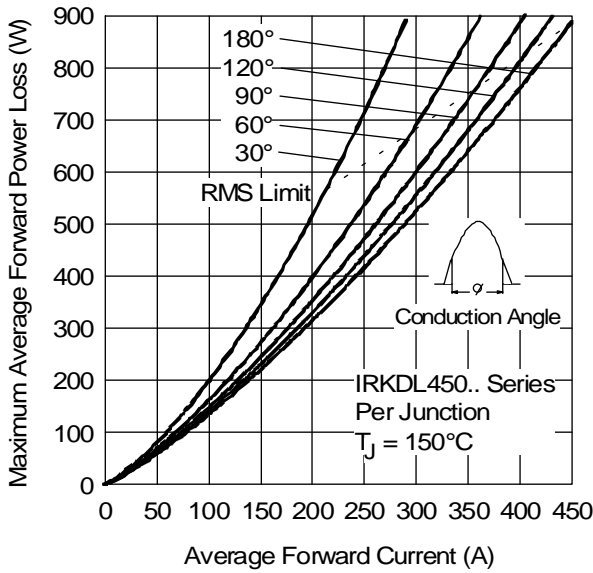


Fig. 3 - Forward Power Loss Characteristics

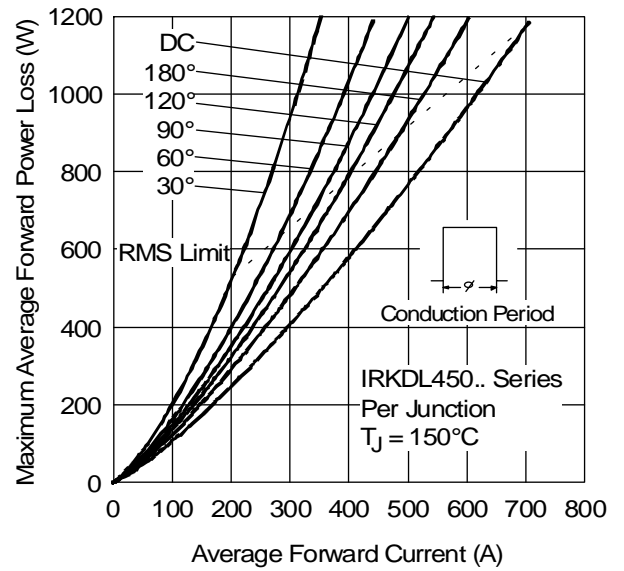


Fig. 4 - Forward Power Loss Characteristics

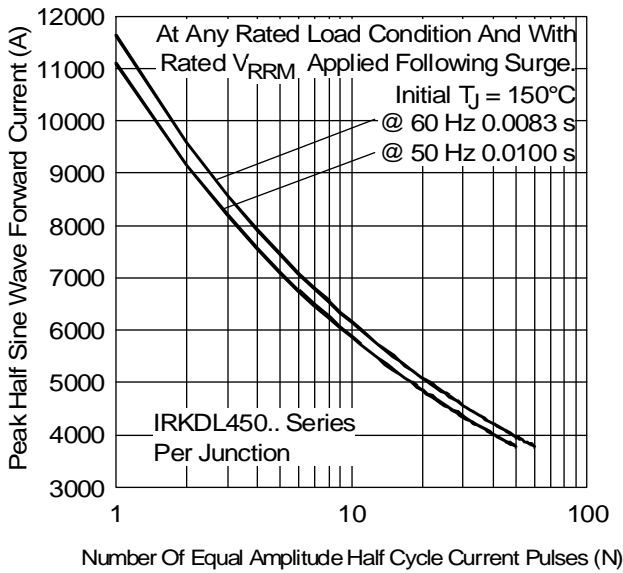


Fig. 5 - Maximum Non-Repetitive Surge Current

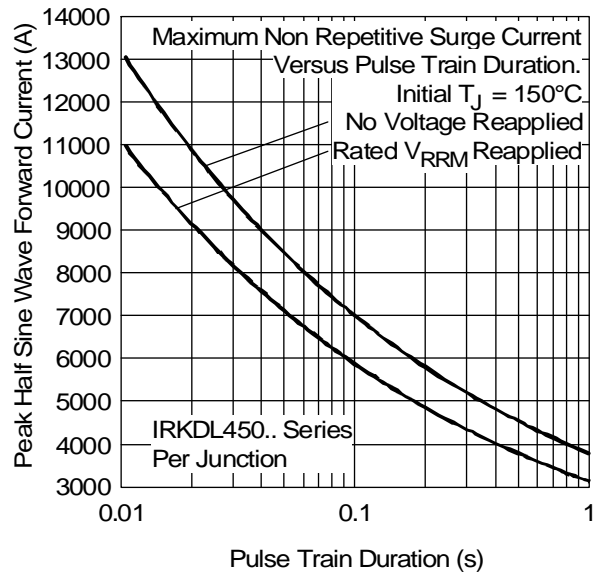


Fig. 6 - Maximum Non-Repetitive Surge Current

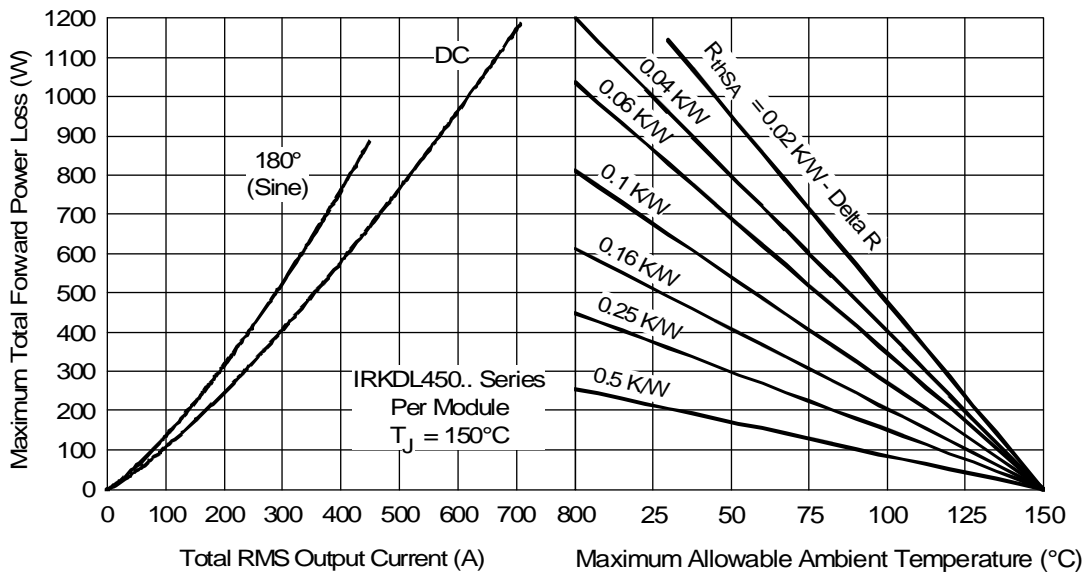


Fig. 7 - Forward Power Loss Characteristics

# IRKDL450..S20 Series

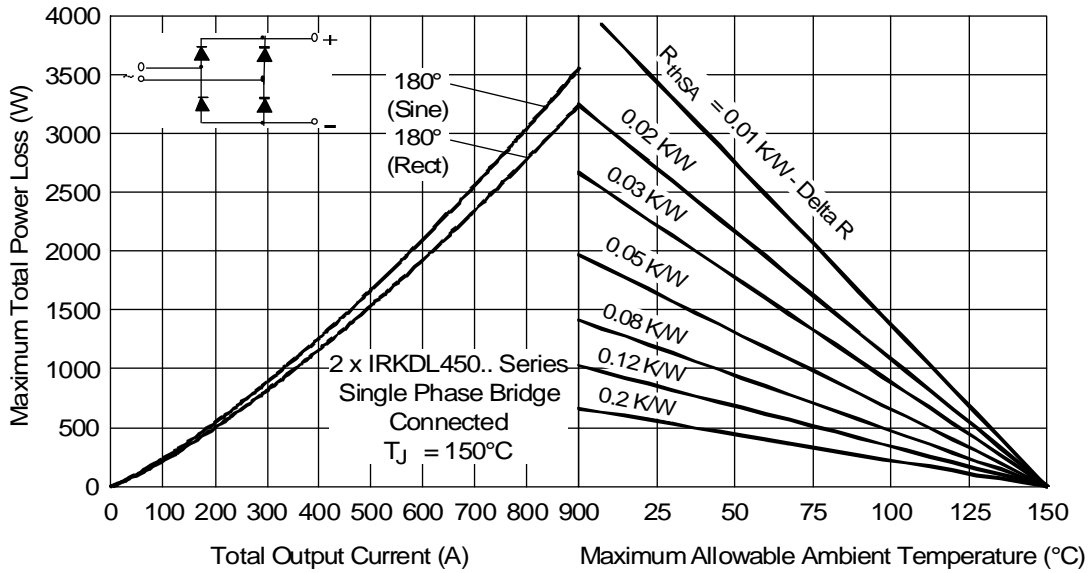


Fig. 8 - Forward Power Loss Characteristics

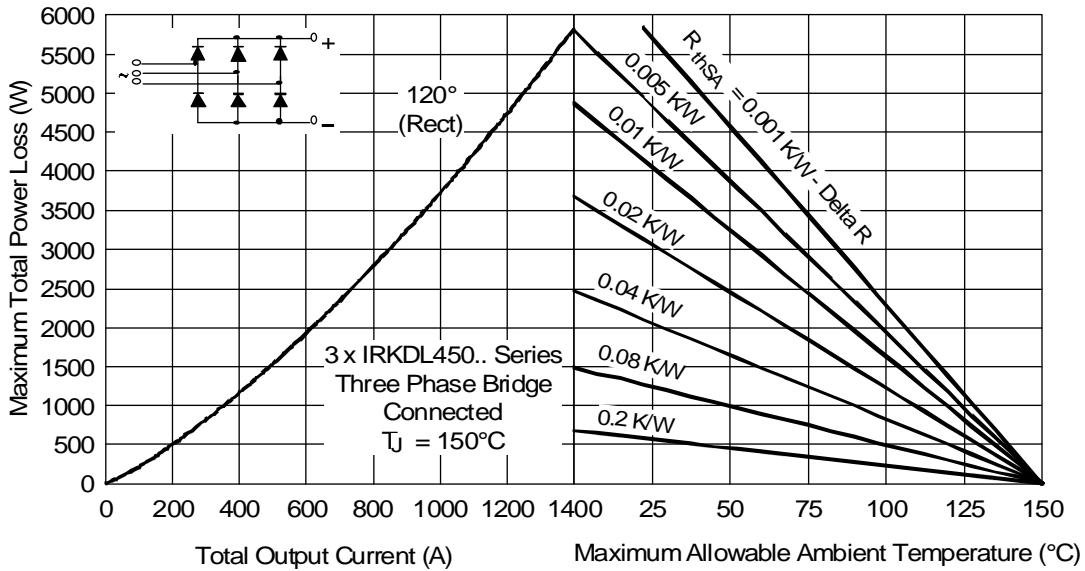


Fig. 9 - Forward Power Loss Characteristics

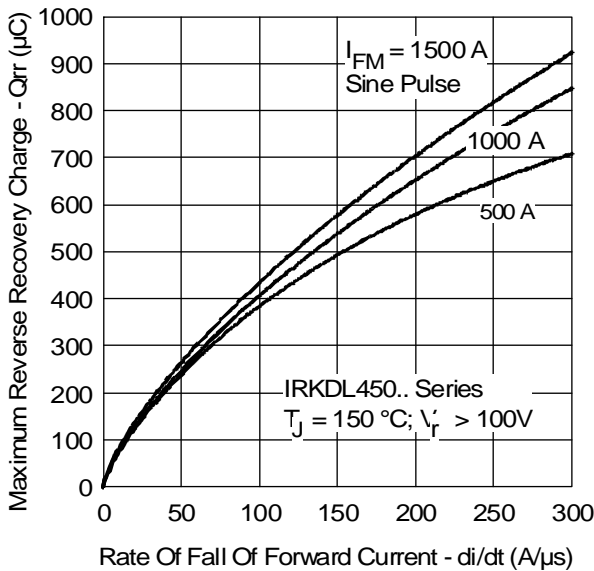


Fig. 10 - Forward Voltage Drop Characteristics

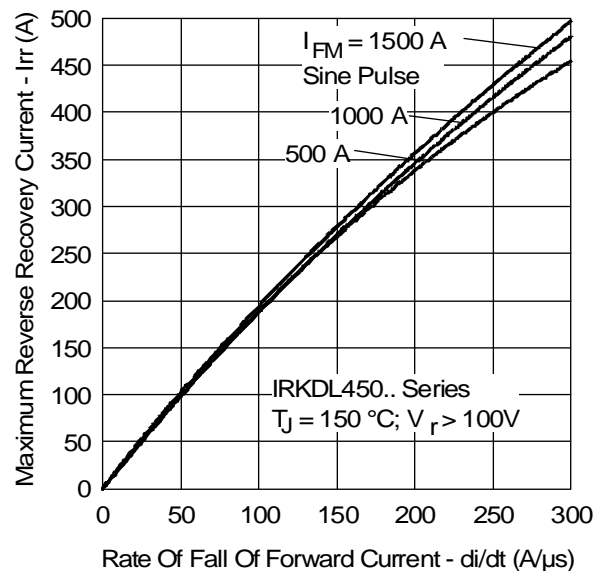


Fig. 11 - Thermal Impedance  $Z_{thJC}$  Characteristic

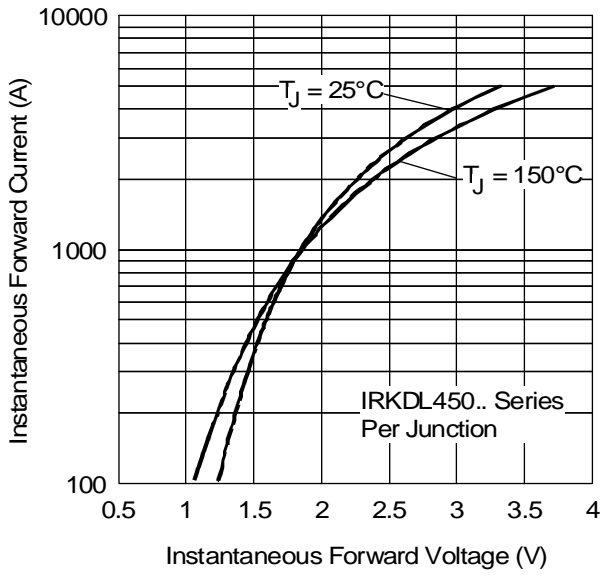


Fig. 12 - Forward Voltage Drop Characteristics

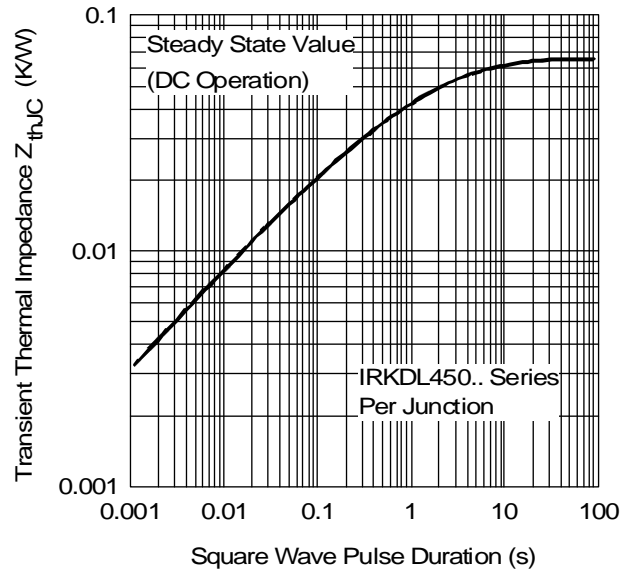


Fig. 13 - Thermal Impedance  $Z_{thJC}$  Characteristic



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