International
IOR Rectifier

IRKDL450..S20 SERIES

FAST DIODES

SUPER MAGN-A-pak™ Power Modules

460 A

Features

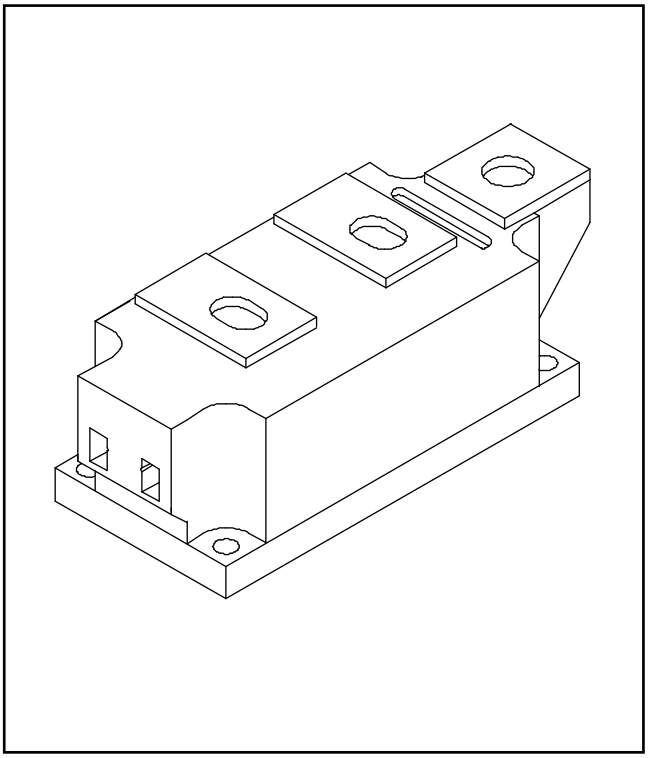
- High power FAST recovery diode series
- High current capability
- 3000 V_{RMS} isolating voltage with non-toxic substrate
- High surge capability
- High voltage ratings up to 2500V
- Industrial standard package
- UL recognition pending

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^2s
	@ 60Hz	790	KA^2s
$I^2\sqrt{t}$		8450	$KA^2\sqrt{s}$
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

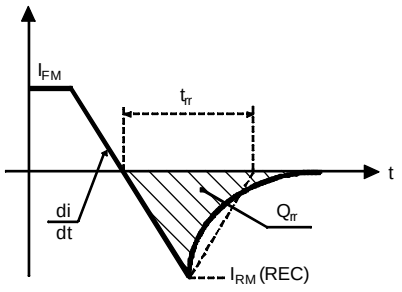
Type number	Voltage Code	V_{RRM} , maximum repetitive peak reverse voltage V	V_{RSM} , maximum non-repetitive peak rev. voltage V	I_{RRM} max. @ T_J max. mA
IRKDL450..S20	16	1600	1700	50
	20	2000	2100	
	25	2500	2600	

Forward Conduction

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

Recovery Characteristics

Code	T_J = 25°C typical t_{rr} @ 25% I_{RRM} (µs)	Test conditions I_{pk} Square Pulse (A)	di/dt (A/µs)	V_r (V)	Max. values @ T_J = 150°C t_{rr} @ 25% I_{RRM} (µs)	Q_{rr} (µC)	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 ± 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	12 - 15		
wt	Approximate weight	1500	g	
	Case style	SUPER MAGN-A-pak		See outline table

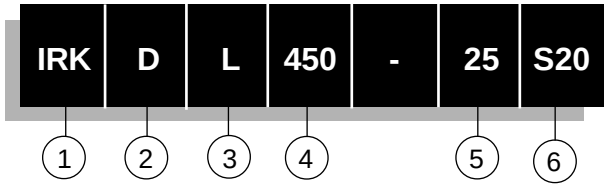
ΔR_{thJC} Conduction

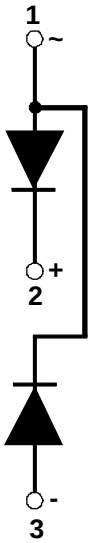
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.009	0.006	K/W	$T_J = T_J$ 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





1 - Module type

2 - Circuit configuration D = 2 diodes in series

3 - Fast recovery

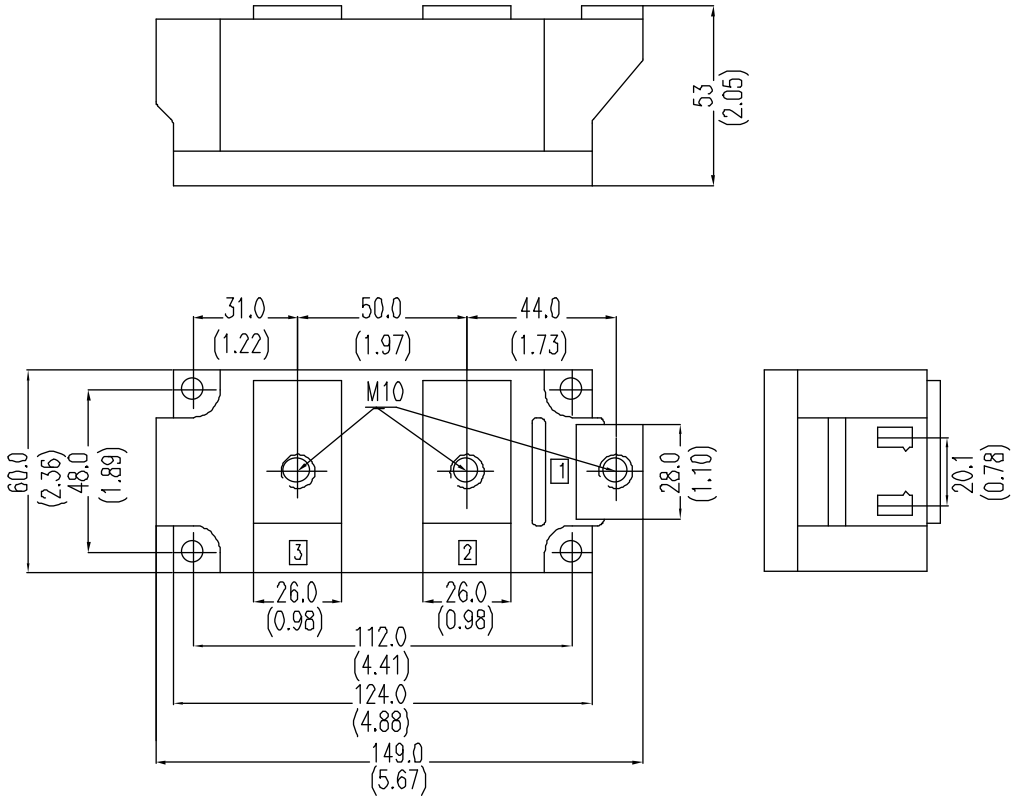
4 - Current rating

5 - Voltage code: Code x 100 = V_{RRM} (See Voltage Ratings Table)

6 - t_{rr} code (see Recovery Characteristics table)

Outline Table

All dimensions in millimeters (inches)



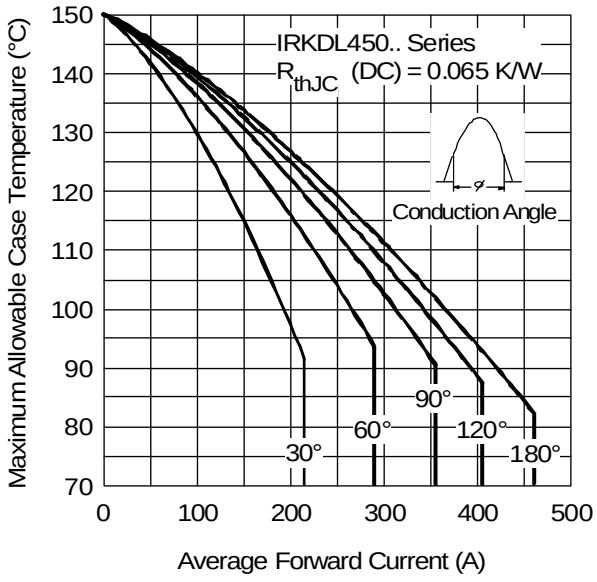


Fig. 1 - Current Ratings Characteristics

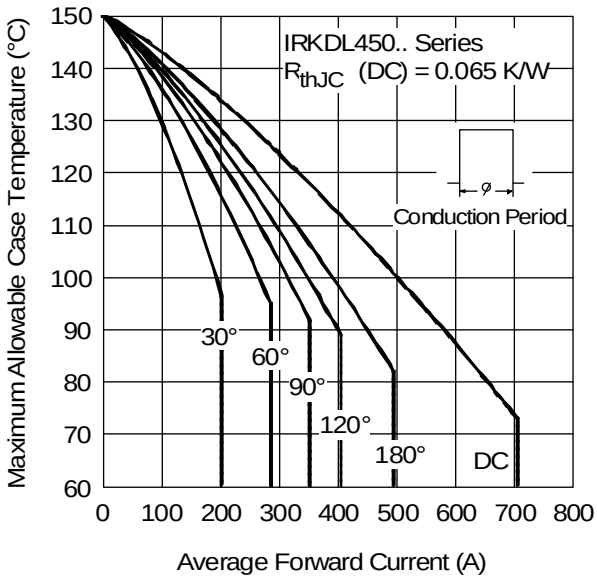


Fig. 2 - Current Ratings Characteristics

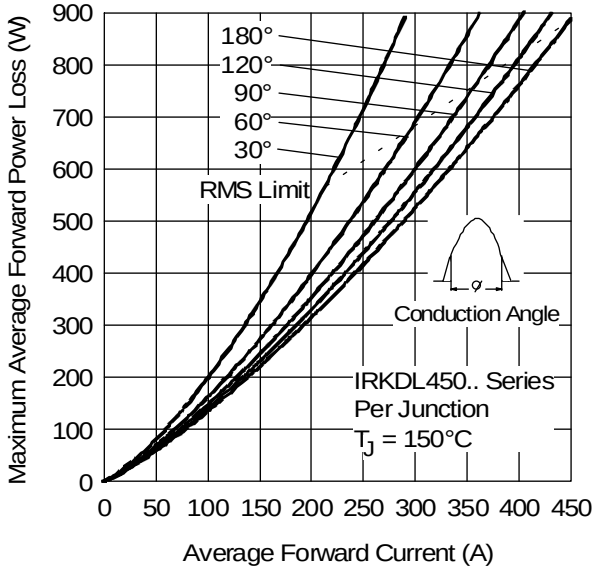


Fig. 3 - Forward Power Loss Characteristics

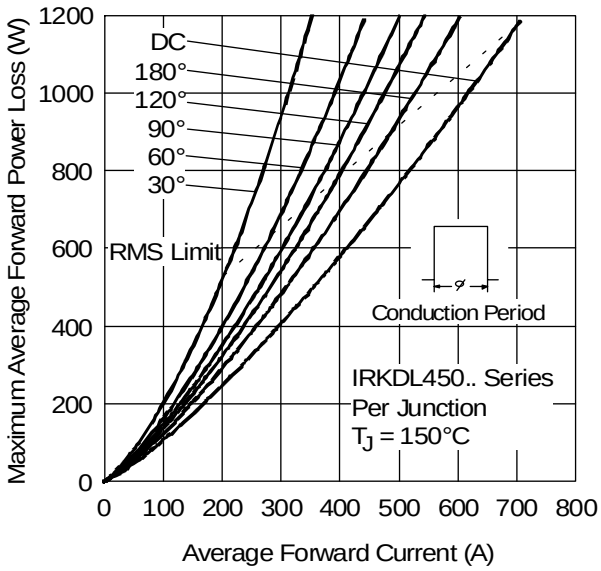


Fig. 4 - Forward Power Loss Characteristics

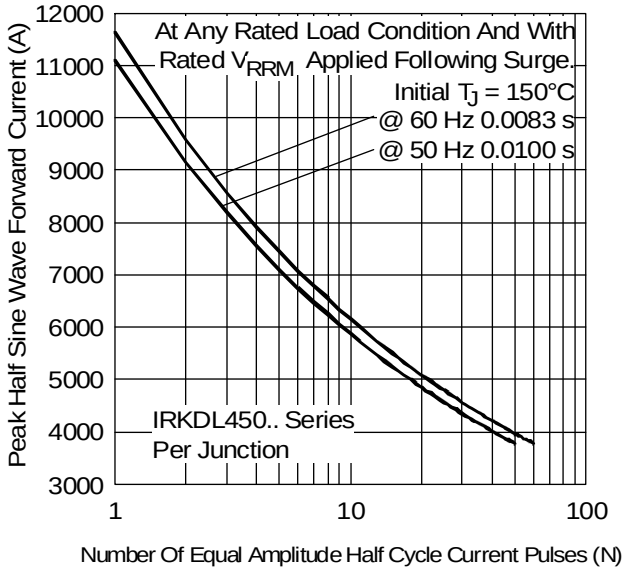


Fig. 5 - Maximum Non-Repetitive Surge Current

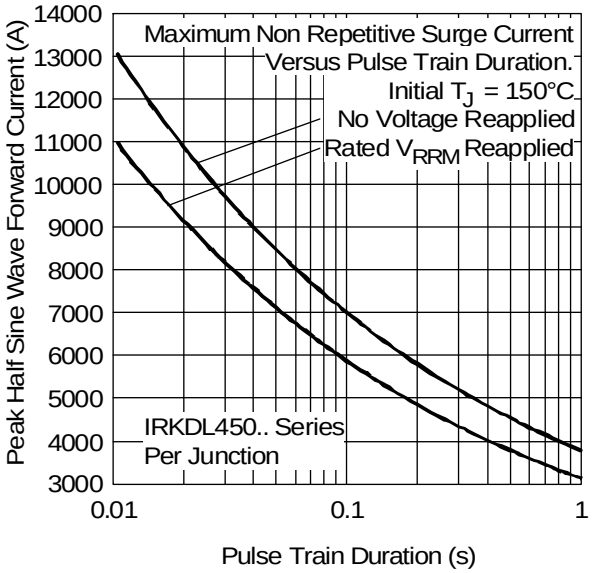


Fig. 6 - Maximum Non-Repetitive Surge Current

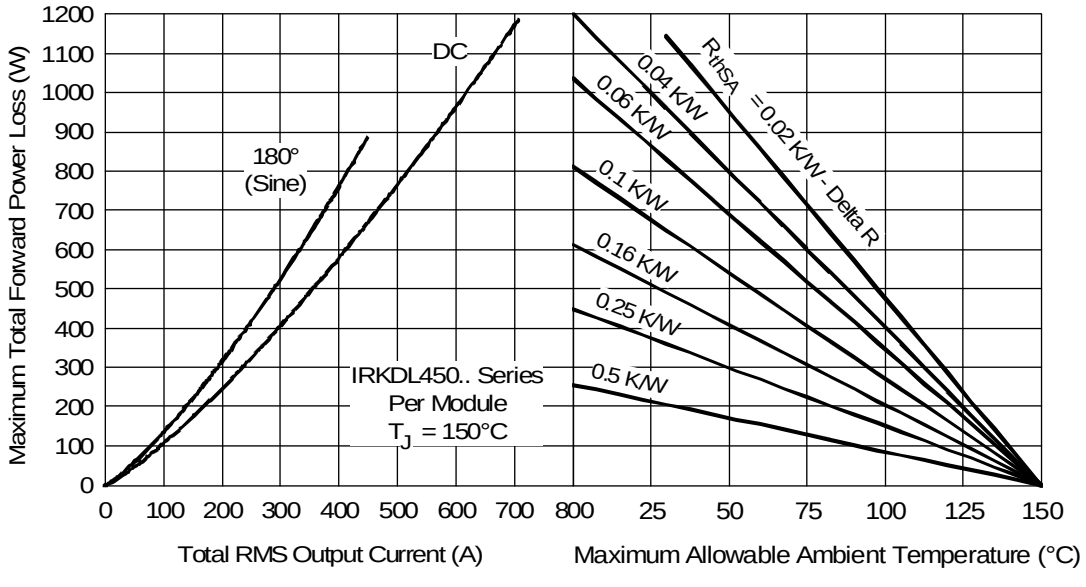


Fig. 7 - Forward Power Loss Characteristics

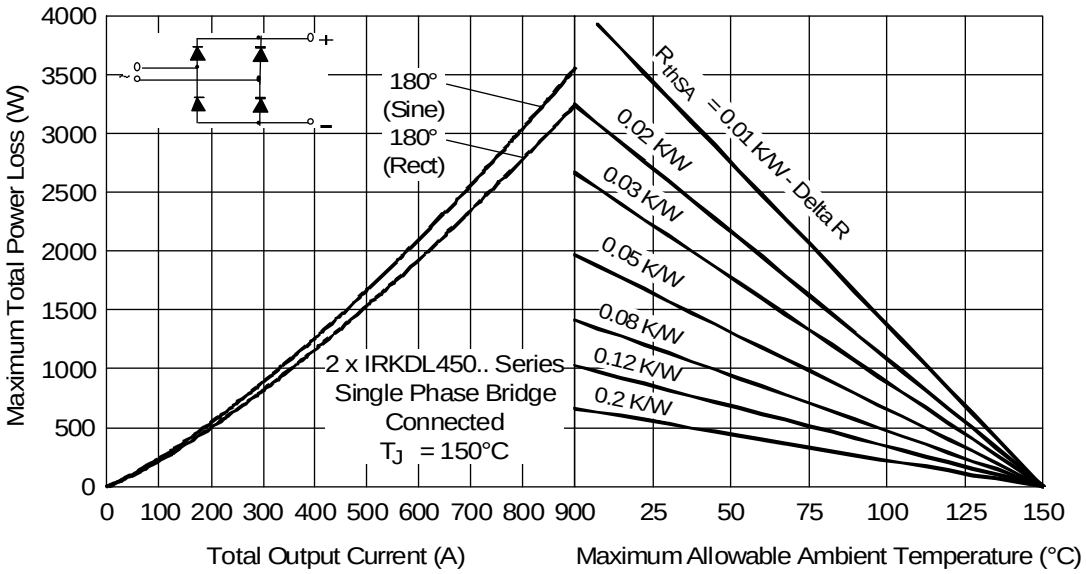


Fig. 8 - Forward Power Loss Characteristics

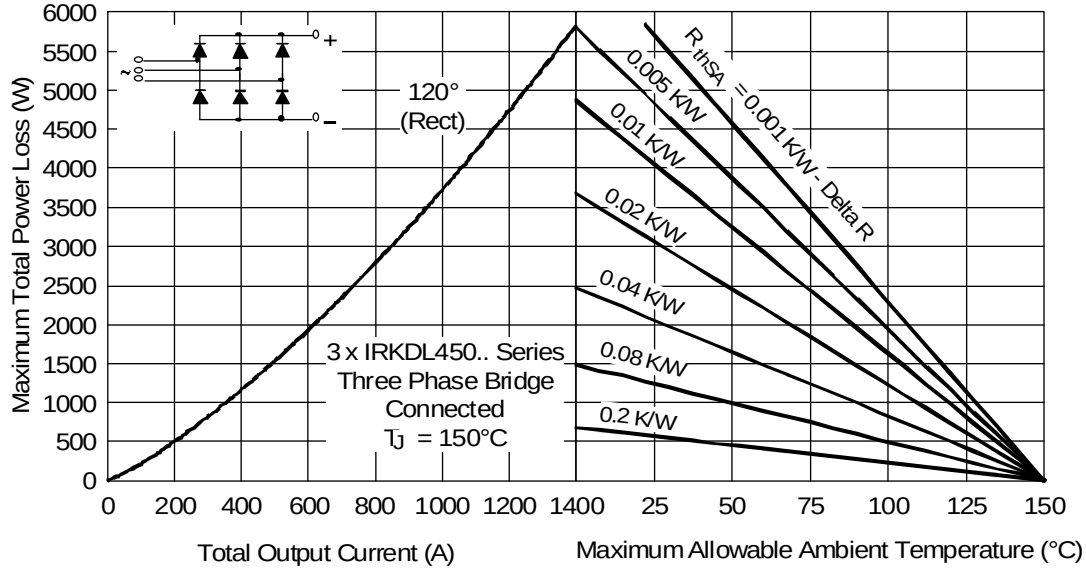


Fig. 9 - Forward Power Loss Characteristics

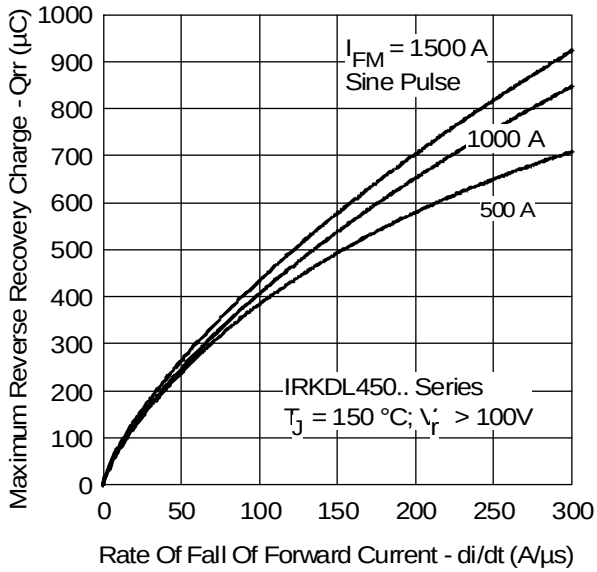


Fig. 10 - Forward Voltage Drop Characteristics

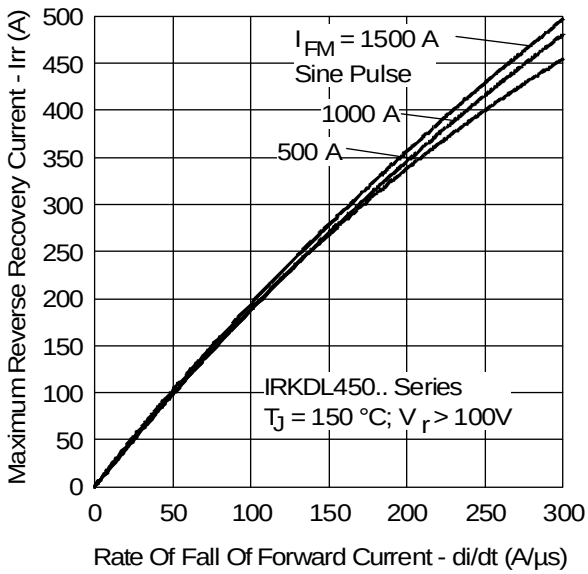


Fig. 11 - Thermal Impedance Z_{thJC} Characteristic

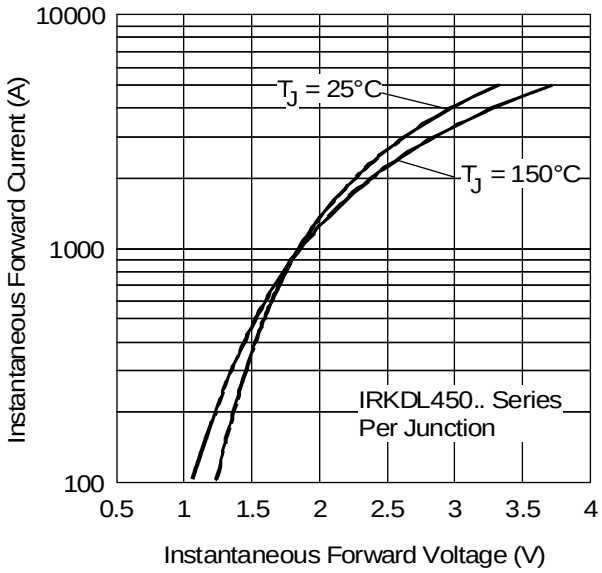


Fig. 12 - Forward Voltage Drop Characteristics

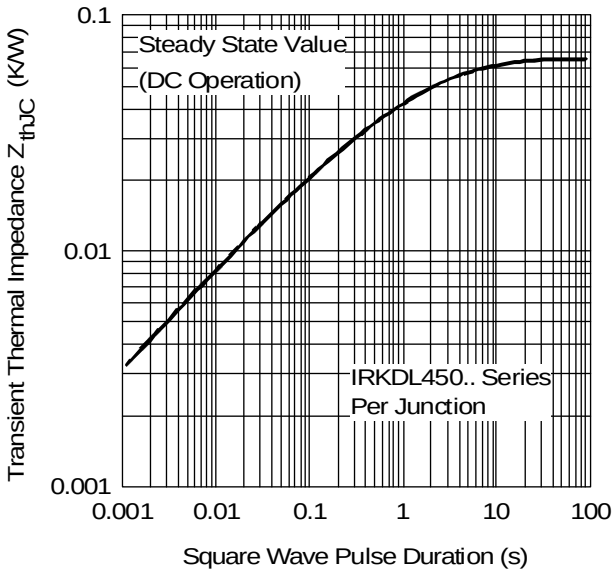


Fig. 13 - Thermal Impedance Z_{thJC} Characteristic