

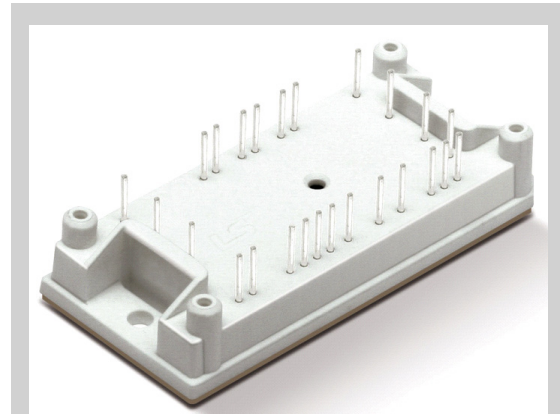
LEL15G604_Preliminary

SISPM1

600V 15A PIM(CI) IGBT Module

Features

- Trench Field Stop Technology adopted IGBT
 - Low saturation voltage
 - Positive temperature coefficient
 - Fast switching
- Free wheeling diodes with fast and soft reverse recovery
- Industrial standard package with insulated substrate
- Temperature sensor included



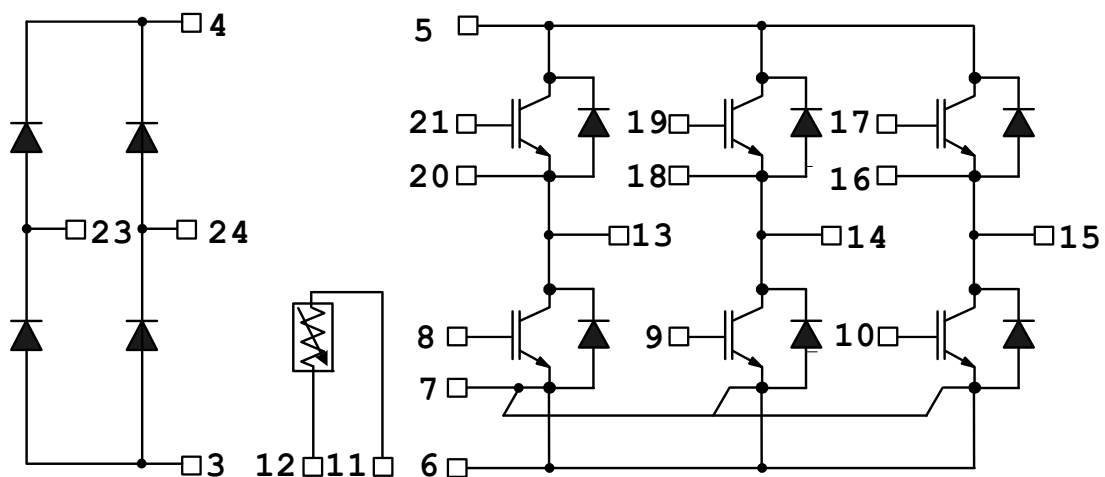
SISPM1

82 X 37.4 X 17.1 mm

Application

- Input from single or three phase grid
- Three phase synchronous or asynchronous motor
- Dynamic braking operation

Internal Equivalent Circuit



Absolute Maximum Rating T_c = 25 °C unless otherwise noted

Item	Symbol	Description	Condition	Rating	Unit
Input Rectifier	V _{R_{RRM}}	Repetitive peak reverse voltage	I _R =250uA	1600	V
	I _{FAV}	Forward current per diode	T _c =80 °C	28	A
	I _{FSM}	Surge forward current	t _p =10ms, half sine wave	370	A
	i ² t	i ² t-value	T _J =150 °C, t _p =10ms half sine wave	360	A ² s
	P _D	Maximum power dissipation	T _c =80 °C	TBD	W
	T _J	Operation junction temperature	-	-40 to + 125	°C
	R _{th(j-c)}	j-c Thermal Resistance	-	TBD	K/W
Transistor Inverter	V _{CE}	Collector-emitter breakdown voltage	T _c =25 °C, I _c =250uA	600	V
	I _C	DC collector current	T _c =25 °C	TBD	A
			T _c =100 °C	TBD	A
	I _{cpuls}	Repetitive peak collector current	t _p =1ms, T _c =80 °C	TBD	A
	P _D	Maximum power dissipation	T _c =25 °C	TBD	W
	V _{GE}	Gate-emitter peak voltage	Continuous	±20	V
	t _{sc}	SC withstand time	V _{CC} = 400V, R _g = 22Ω V _{GE} = +15V to 0V	5	us
	T _J	Operation junction temperature	-	-40 to + 125	°C
R _{th(j-c)}	j-c Thermal Resistance	-	TBD	K/W	
Diode Inverter	V _{R_{RRM}}	Repetitive peak reverse voltage	T _c =25 °C, I _R =250uA	600	V
	I _F	DC forward current	T _c =25 °C	TBD	A
			T _c =100 °C	TBD	A
	I _{FRM}	Repetitive peak forward current	T _c =80 °C	TBD	A
	P _D	Maximum power dissipation	-	TBD	W
	T _J	Operation junction temperature	-	-40 to + 125	°C
R _{th(j-c)}	j-c Thermal Resistance	-	TBD	K/W	
Module	T _{stg}	storage temperature	-	-40 to +125	°C
	V _{iso}	Isolation voltage	@AC 1minute	2500	V
	W	Weight	-	40	g

Electrical Characteristics T_C = 25°C unless otherwise noted

Input Rectifier

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
V _F	Diode forward voltage	T _C =25°C, I _F =35A	-	1.25	1.8	V
		T _C =125°C, I _F =35A	-	1.21	1.8	V
V _{to}	Threshold voltage	T _C =25°C, I _F =35A	-	PBD	-	V
		T _C =125°C, I _F =35A	-	PBD	-	V
I _R	Reverse current	V _R =1600V	-	-	0.05	mA
t _{rr}	Diode reverse recovery current	T _C =25°C, ± 1A	-	20	-	us

Transistor Inverter, inductive load

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate-emitter threshold voltage	V _{CE} =V _{GE} , I _C =350uA	4.0	5.0	6.5	V
V _{CE(SAT)}	Collector-emitter saturation voltage	T _C =25°C, I _C =15A, V _{GE} =15V	-	1.85	2.35	V
		T _C =125°C, I _C =15A, V _{GE} =15V	-	2.20	2.70	V
I _{CES}	Collector-emitter cut-off current	V _{GE} =0V, V _{CE} =600V	-	2	125	uA
I _{GES}	Gate-emitter leakage current	V _{GE} = ± 20V, V _{CE} =0V	-	-	± 100	nA
t _{d(on)}	Turn-on delay time	T _C =25°C R _{G(on)} =40 Ohm R _{G(off)} =20 Ohm V _{GE} =15V to 0V I _C =15A V _{CC} =300V V _{CC} = 400V, R _g = 22Ω V _{GE} = +15V to 0V	-	90	-	ns
t _r	Rise time		-	45	-	ns
t _{d(off)}	Turn-off delay time		-	152	-	ns
t _f	Fall time		-	55	-	ns
E _{on}	Turn-on energy loss per pulse		-	0.205	-	mJ
E _{off}	Turn-off energy loss per pulse		-	0.261	-	mJ
t _{SC}	SC withstand time		-	-	5	us
C _{ies}	Input capacitance		V _{GE} =0V, V _{CC} =30V	-	765	-
C _{oss}	Output capacitance	f=1MHz, T _C =25°C	-	52	-	pF
C _{rss}	Reverse transfer capacitance		-	23	-	pF
C _{ies}	Input capacitance	V _{GE} =0V, V _{CC} =30V	-	TBD	-	pF
C _{oss}	Output capacitance	f=1MHz, T _C =125°C	-	TBD	-	pF
C _{rss}	Reverse transfer capacitance		-	TBD	-	pF
Q _{ge}	Gate-to-Emitter Charge (turn-on)	I _C =12A, V _{GE} =15V, V _{CC} =400V	-	7	11	nC
Q _{gc}	Gate-to-Collector Charge (turn-on)		-	11	16	nC
Q _g	Gate charge		-	25	38	nC

Diode Inverter

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
V _F	Diode forward voltage	T _C =25°C, I _F =20A	-	1.27	1.8	V
		T _C =125°C, I _F =20A	-	1.25	1.8	V
I _{RM}	Peak reverse recovery current	diF/dt = 436 A/us	-	TBD	TBD	A
t _{rr}	Reverse recovery current	± 9.5A, 300V, 150A/us	-	TBD	TBD	ns
Q _{rr}	Reverse recovery charge	± 9.5A, 300V, 150A/us	-	TBD	TBD	uC
E _{rec}	Reverse recovered energy	diF/dt = 436 A/us	-	TBD	TBD	mJ

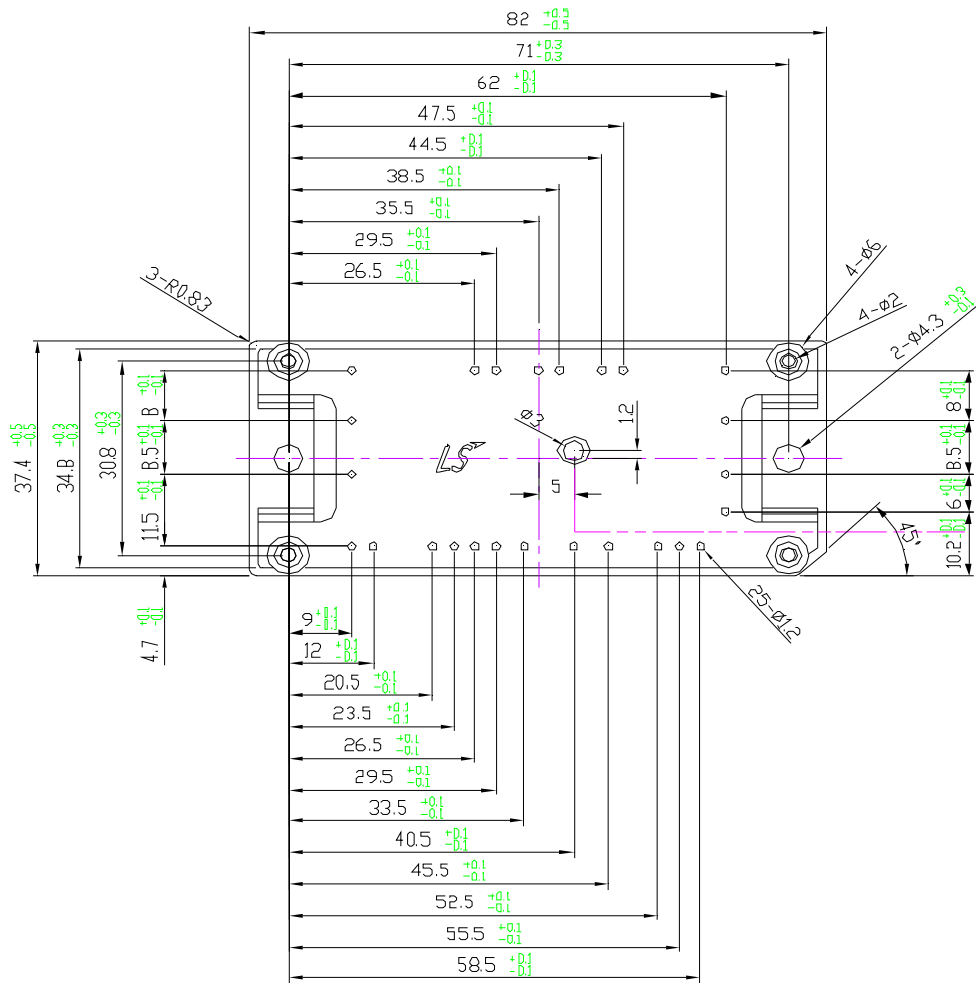
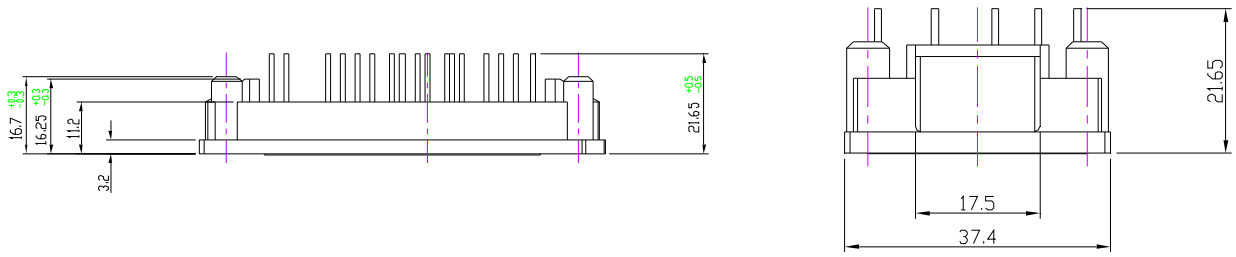
NTC-Thermistor

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated resistance	$T_c=25\text{ }^\circ\text{C}$	4.2	4.7	5.3	KOhm
$D_{R/R}$	Deviation of R100	$T_c=100\text{ }^\circ\text{C}$	-	2.56	-	%/K
P	Power dissipation given Epcos-Typ	$T_c=25\text{ }^\circ\text{C}$	-	210	-	mW
$B_{(25/100)}$	B-value	$T_c=25\text{ }^\circ\text{C}$	-	3530	-	K

Pin Description

Pin Number	Pin Name	Pin Description
1	-	Not used pin
2	-	Not used pin
3	DCN	Negative DC Link Input
4	DCP	Positive DC Link Input
5	P	Positive DC Link Output
6	N	Negative DC Link Output
7	COM	Common Supply Ground
8	GUN	Gate Input for Low-side U Phase
9	GVN	Gate Input for Low-side V Phase
10	GWN	Gate Input for Low-side W Phase
11	TH1	NTC-, Thermistor1
12	TH2	NTC+, Thermistor2
13	U	Output for U Phase
14	V	Output for V Phase
15	W	Output for W Phase
16	EWP	Emitter Input for High-side W Phase
17	GWP	Gate Input for High-side W Phase
18	EVP	Emitter Input for High-side V Phase
19	GVP	Gate Input for High-side V Phase
20	EUP	Emitter Input for High-side U Phase
21	GUP	Gate Input for High-side U Phase
22	-	Not used pin
23	R	Input for S Phase
24	S	Input for T Phase
25	-	Not used pin

Package Dimensions [Unit : mm]



1. Output Inverter IGBT/DIODE

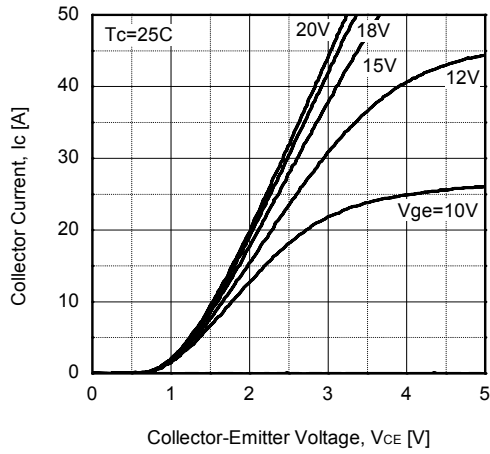


Fig.1 Typical Output Characteristics

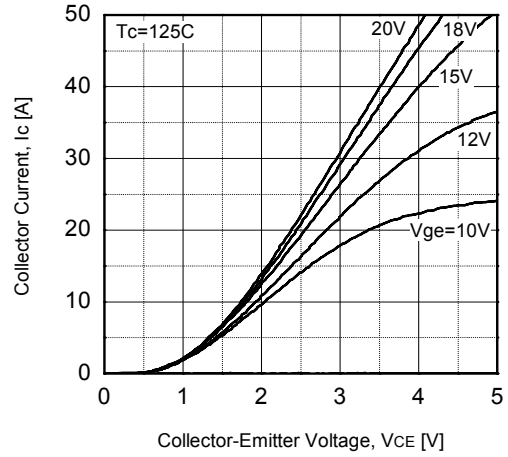


Fig.2 Typical Output Characteristics

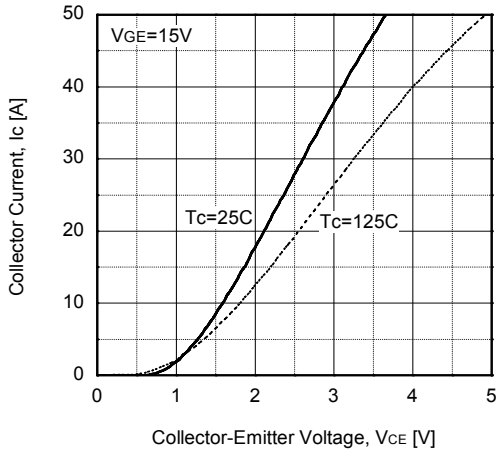


Fig.3. Typical Transfer Characteristics

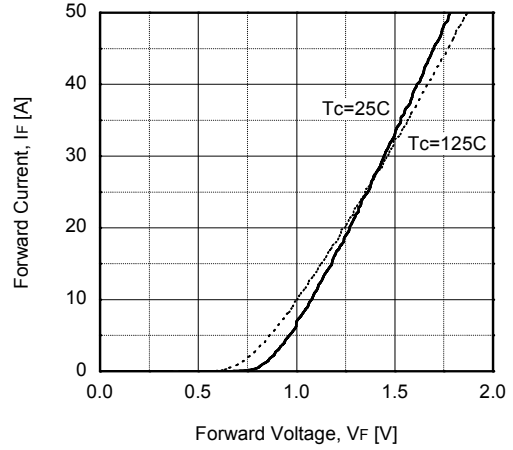


Fig.4. Typical Forward Current

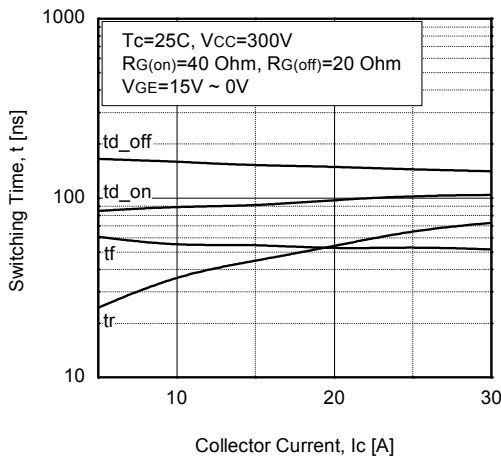


Fig5. Typical Switching Time vs I_c

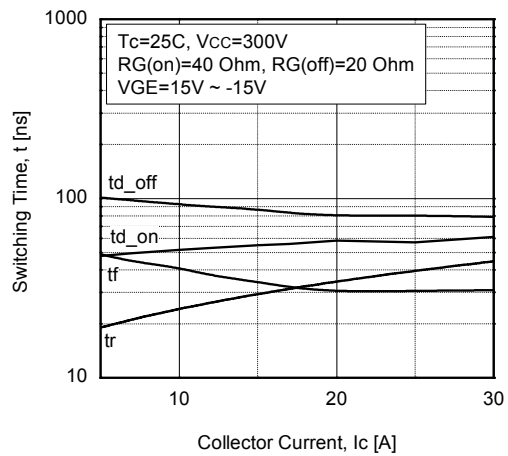


Fig6. Typical Switching Time vs I_c

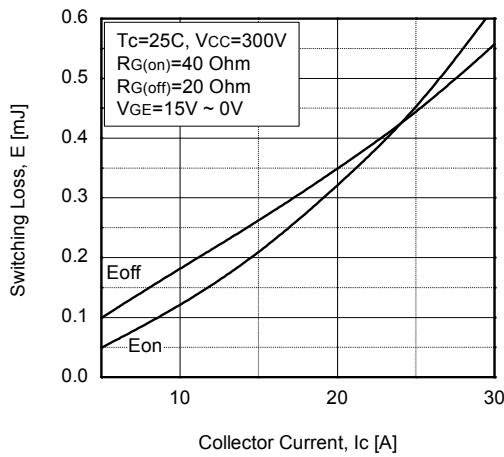


Fig7. Typical Switching Loss vs I_C

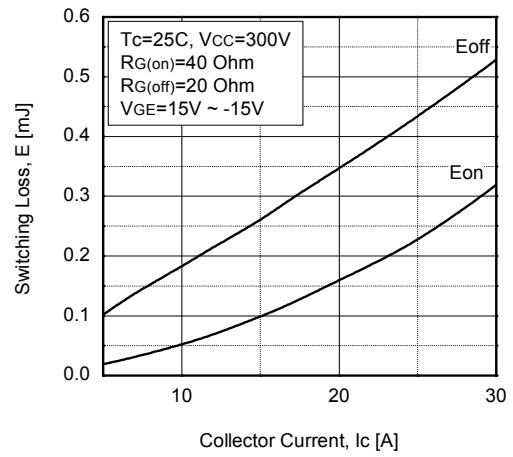


Fig8. Typical Switching Loss vs I_C

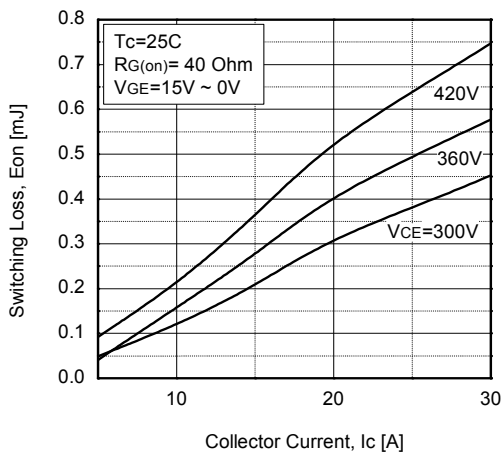


Fig9. Typical Switching Loss(E_{on}) vs I_C

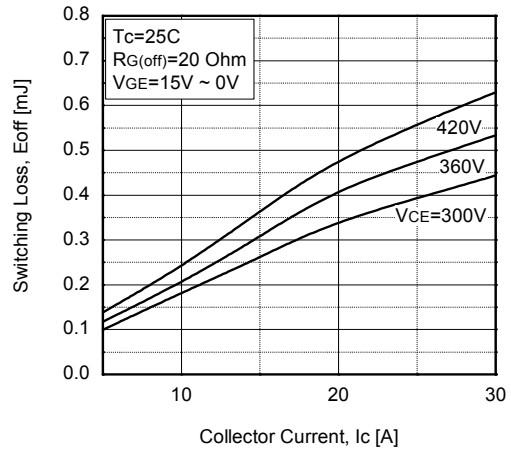


Fig10. Typical Switching Loss(E_{off}) vs I_C

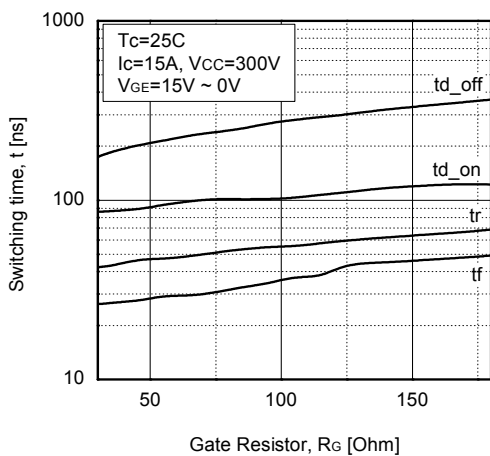


Fig11. Typical Switching Time vs R_G

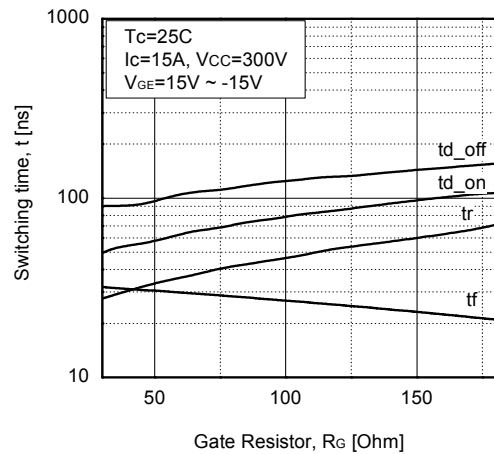


Fig12. Typical Switching Time vs R_G

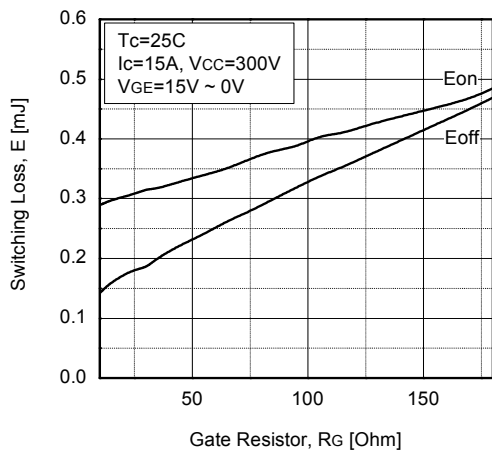


Fig13. Typical Switching Loss vs RG

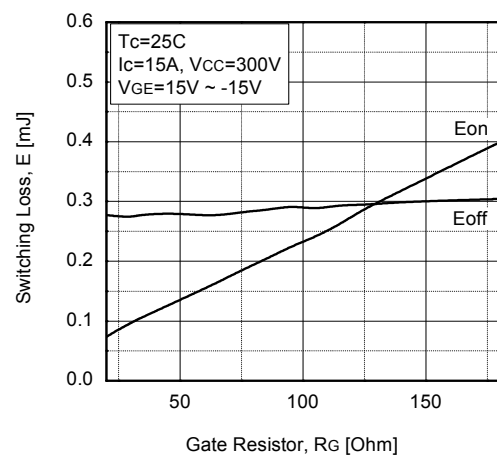


Fig14. Typical Switching Loss vs RG

2. Rectifier DIODE

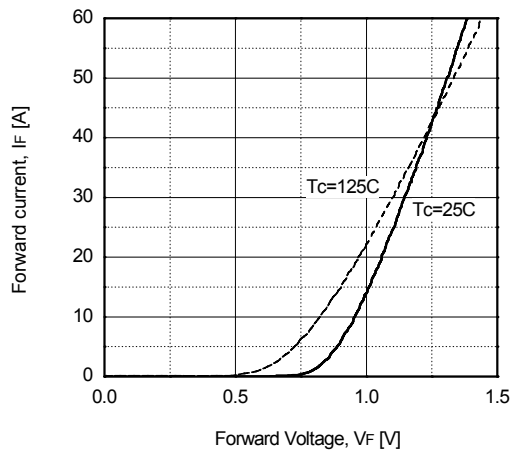


Fig 15. Typical Transfer Characteristics