LS Industrial Systems

SEPT. 2009

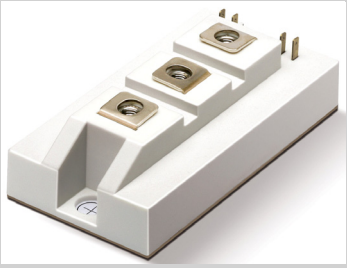
SUSPM™

LVH150G1201_Preliminary
LVH150G1201Z*_Preliminary

1200V 150A 2-Pack IGBT Module

Features

- Soft punch through IGBT(SPT+ IGBT)
  - Low saturation voltage
  - Positive temperature coefficient
  - Fast switching
  - High ruggedness
- Free wheeling diodes with fast and soft reverse recovery
- Industrial standard package with copper base plate
- 10us short circuit rated
- Included gate surge protection function



SUSPM2

94 X 48 X 30 mm

Application

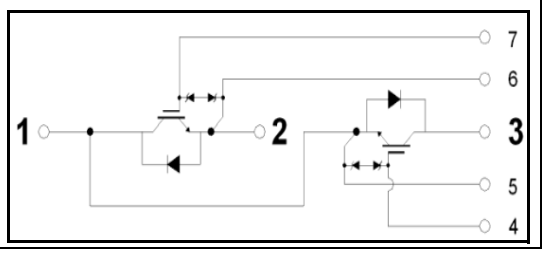
- Welder
- Power supply
- Industrial motor drive
- Induction heating

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Item	Symbol	Condition	Value	Units
IGBT	V_{CES}	@T_C = 25 °C	1200	V
	V_{GES}	@T_C = 25 °C	±20	V
	I_C	@T_C = 25 °C	240	A
		@T_C = 80 °C	150	A
	I_{CM}	t_p=1ms	300	A
	T_{sc}	@T_j = 125 °C, V_{CC} = 600V, V_{GE}= 15V	10	μA
	$T_{j(max)}$	Maximum chip junction temperature	-40 to + 150	° C
	P_D	@T_C = 25 °C	780	W
		@T_C = 80 °C	440	W
Inverse Diode	V_{RRM}	@T_C = 25 °C	1200	V
	I_F	@T_C = 25 °C	-	A
		@T_C = 80 °C	-	A
	I_{FRM}	@T_C = 25 °C, t_p=1ms	-	A
	$T_{j(max)}$	Maximum chip junction temperature	-40 to + 150	° C
	P_D	@T_C = 25 °C	-	W
		@T_C = 80 °C	-	W
Module	T_{stg}	Storage junction temperature	-40 to +125	° C
	$T_{j(op)}$	Operating junction temperature	-40 to +125	° C
	V_{iso}	@AC 1minute	2500	V
	Bolt length	Recommended Main Terminal bolt length(M6)	8 ~ 12	mm
	M_t	Main terminal mounting torque(M6)	2.5 ~ 5.0	Nm
	M_s	Heat sink mounting torque(M6)	3.0 ~ 5.0	Nm
	W	Weight	240	g

Internal Circuit & Pin Description

Pin Number	Pin Name	Pin Description
1	C2E1	Output
2	E2	Negative dc link ouput
3	C1	Positive dc link ouput
4	G1	Gate input for high-side
5	E1	Emitter input for high-side
6	G2	Gate input for low-side
7	E2	Emitter input for low-side



*** Option : Zener Diode between Gate and Emitter**

Electrical Characteristics of IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	C-E breakdown voltage	V_{GE} = 0V, I_C = 250uA	1200	-	-	V
I_{CES}	Collector cut-Off current	V_{CE} = V_{CES}, V_{GE} = 0V	-	-	1.0	mA
I_{GES}	G-E leakage current	V_{GE} = V_{GES}, V_{CE} = 0V	-	-	200	nA
On Characteristics						
$V_{GE(th)}$	G-E threshold voltage	V_{GE} = V_{CE}, I_C=150mA	6.42	6.92	7.42	V
$V_{CE(sat)}$	C-E Saturation voltage	I_C =150A, V_{GE} = 15V, T_c=25°C	-	2.0	2.5	V
		I_C =150A, V_{GE} = 15V, T_c=125°C	-	2.15	-	V
Dynamic Characteristics						
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz, Tc=25°C	-	5.52	-	nF
C_{oes}	Output capacitance		-	0.40	-	nF
C_{res}	Reverse transfer capacitance		-	0.26	-	nF
Switching Characteristics						
$t_{d(on)}$	Turn-On delay time	Tc=25°C,R_G=8.2 Ohm L=100 uH, V_{CC}=600V V_{GE}= ± 15V Ic=150A	-	150	-	ns
t_r	Rise time		-	70	-	ns
$t_{d(off)}$	Turn-off delay time		-	520	-	ns
t_f	Fall time		-	75	-	ns
E_{on}	Turn-on switching loss		-	10.7	-	mJ
E_{off}	Turn-off switching loss		-	9.0	-	mJ
E_{ts}	Total switching loss		-	19.7	-	mJ
$t_{d(on)}$	Turn-on delay time	Tc=125°C,R_G=8.2 Ohm L=100 uH, V_{CC}=600V V_{GE}= ± 15V Ic=150A	-	160	-	ns
t_r	Rise time		-	70	-	ns
$t_{d(off)}$	Turn-off delay time		-	600	-	ns
t_f	Fall time		-	235	-	ns
E_{on}	Turn-on switching loss		-	12.7	-	mJ
E_{off}	Turn-off switching loss		-	14.6	-	mJ
E_{ts}	Total switching loss		-	27.3	-	mJ
Q_g	Total gate charge	V_{GE}=0V ~ +15V	-	-	-	nC
Q_{ge}	Gate-emitter charge		-	-	-	nC
Q_{gc}	Gate-collector charge		-	-	-	nC

Electrical Characteristics of Inverse Diode T_c = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode forward voltage	I_F=150A, V_{GE}=0V	T_C = 25°C	-	1.66	2.16	V
			T_C = 125°C	-	1.70	-	
t_{rr}	Diode reverse recovery time	R_G=8.2 Ohm L=100 uH, V_{CC}=600V V_{GE}= ± 15V, I_F=150A	T_C = 25°C	-	340	-	ns
			T_C = 125°C	-	500	-	
I_{RRM}	Diode peak reverse recovery current		T_C = 25°C	-	175	-	A
			T_C = 125°C	-	220	-	
Q_{rr}	Diode reverse recovery charge		T_C = 25°C	-	21.0	-	uC
			T_C = 125°C	-	38.3	-	
E_{rr}	Diode reverse recovery energy		T_C = 25°C	-	-	-	mJ
			T_C = 125°C	-	-	-	

*** Option : Zener Diode between Gate and Emitter**

Thermal Characteristics

Symbol	Parameter	Min	Typ.	Max.	Units
$R_{th(J-C)}$	Junction-to-case (IGBT part)	-	-	0.16	℃/W
$R_{th(J-C)D}$	Junction-to-case (Diode part)	-	-	-	℃/W

*** Option : Zener Diode between Gate and Emitter**

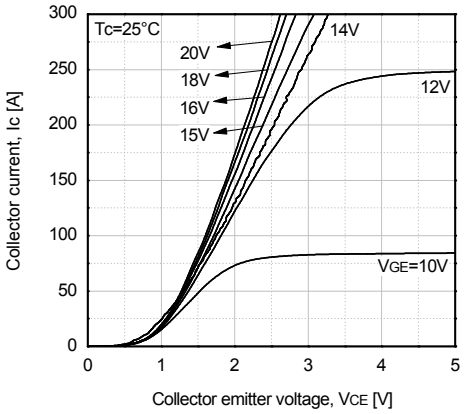


Fig 1. Typical output characteristics

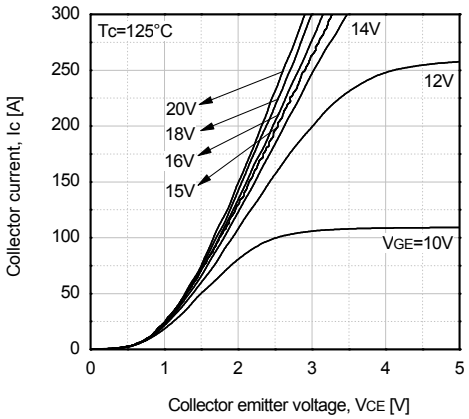


Fig 2. Typical output characteristics

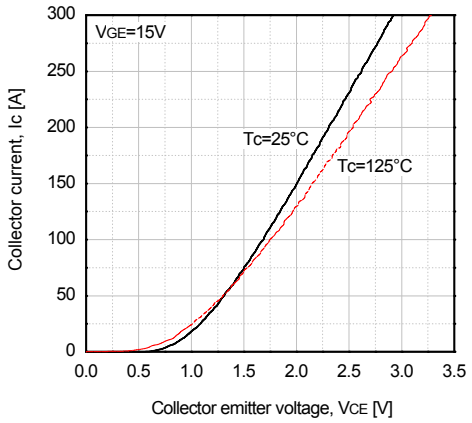


Fig 3. Typical transfer characteristics

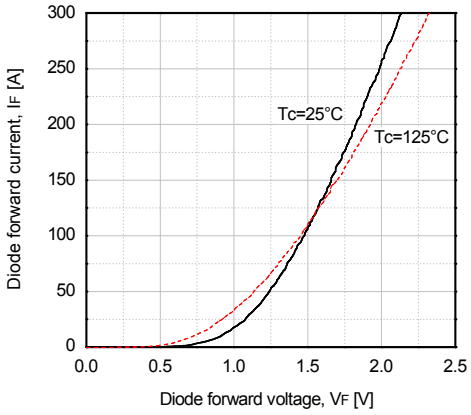


Fig 4. Typical diode forward characteristics

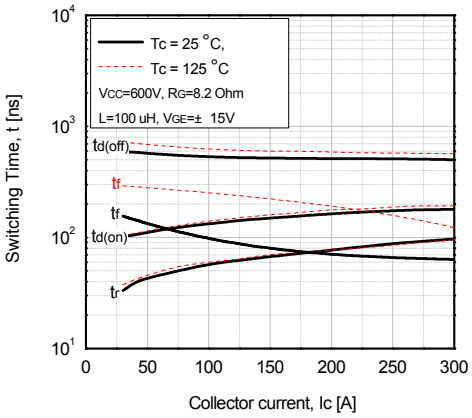


Fig 5. Typical switching time vs collector current

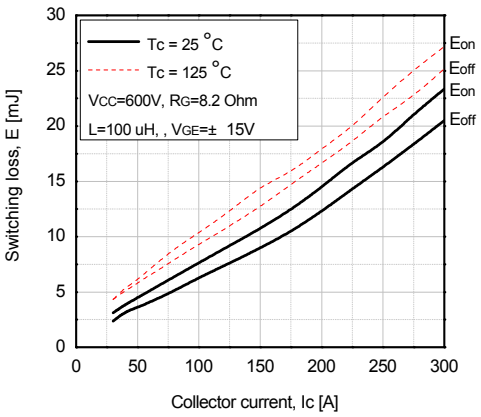


Fig 6. Typical switching loss vs collector current

*** Option : Zener Diode between Gate and Emitter**

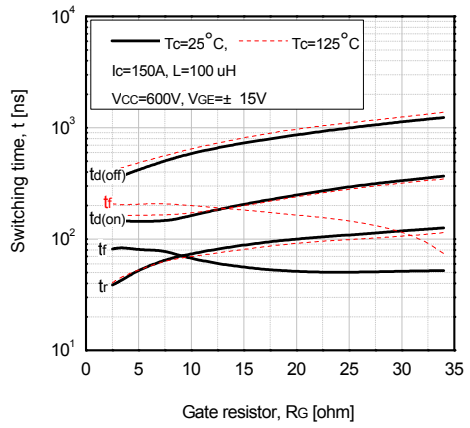


Fig 7. Typical switching time vs gate resistor

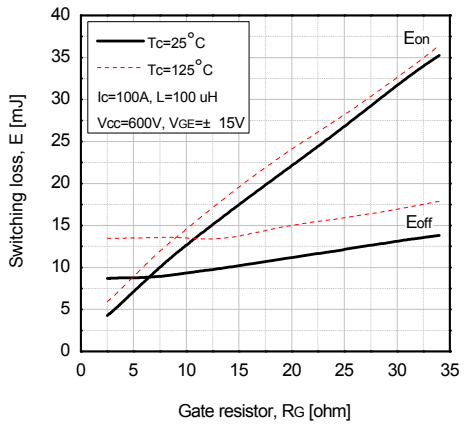


Fig 8. Typical switching loss vs gate resistor

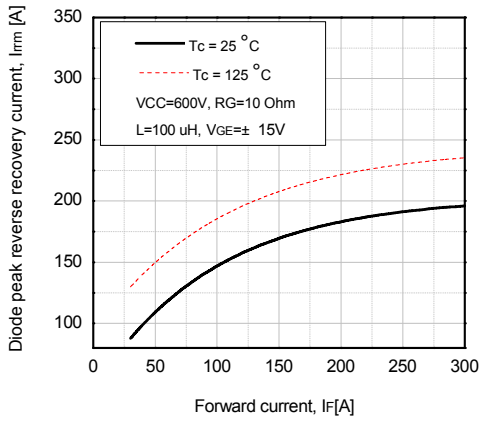


Fig 9. Diode peak reverse recovery current vs collector current

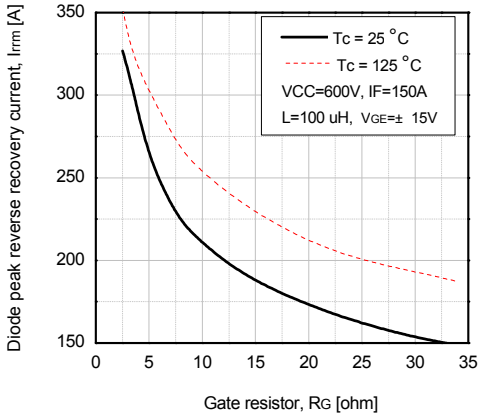


Fig 10. Diode peak reverse recovery current vs gate resistor

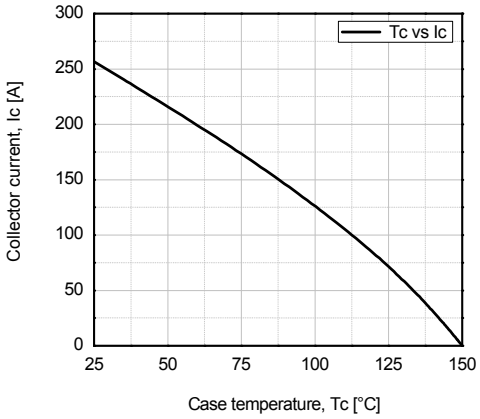


Fig 11. Case temperature vs collector current

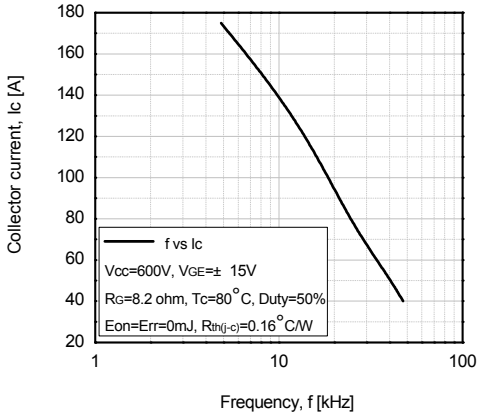
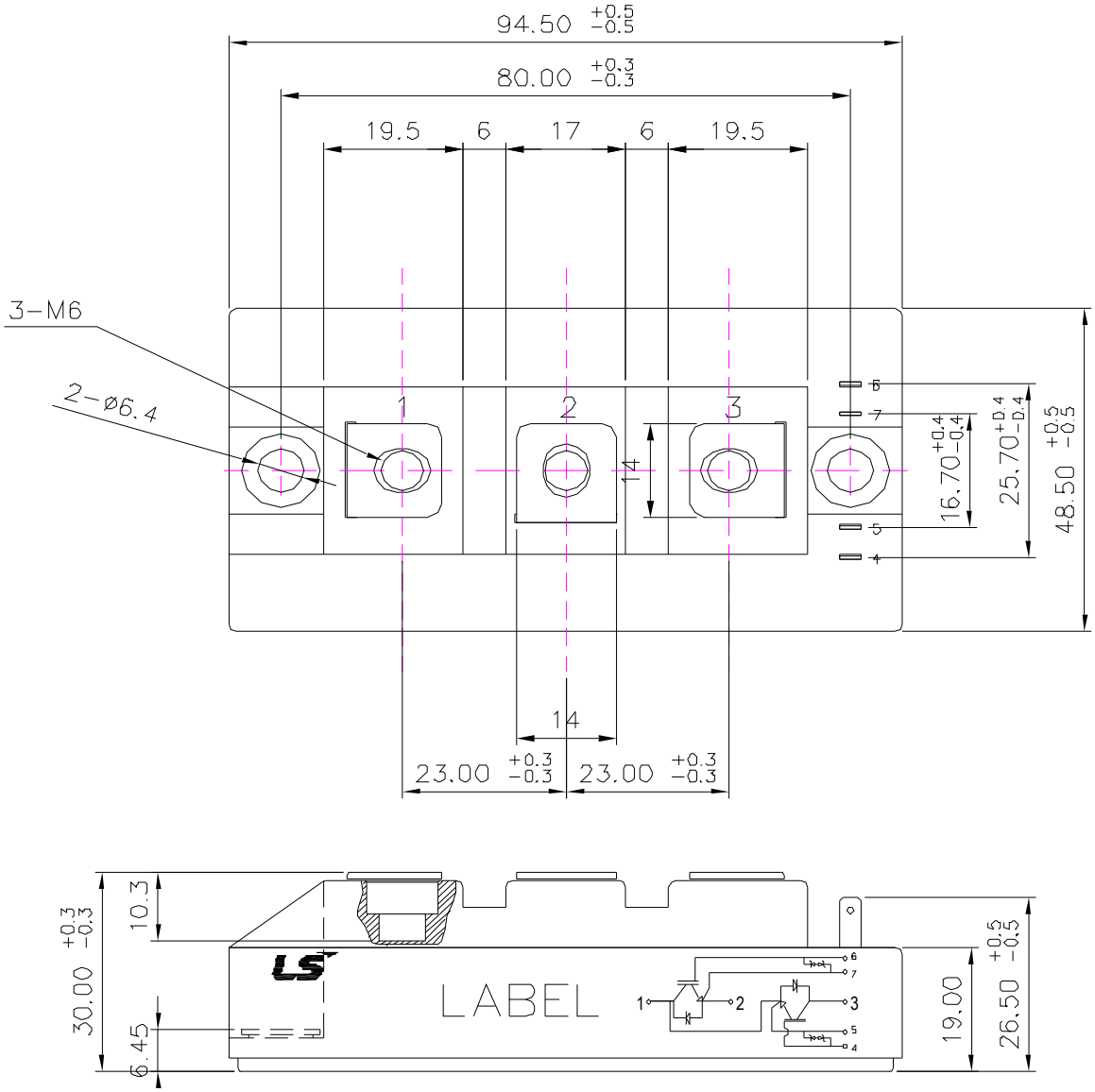


Fig 12. Frequency vs collector current

*** Option : Zener Diode between Gate and Emitter**

Package Dimension (dimensions in mm)



*** Option : Zener Diode between Gate and Emitter**