合肥中恒微半导体有限公司
HeFei Cpower Technology,Ltd.
TLC450M07S1P

➢ 产品外观 / Appearance

V_{CES} = 650V

$I_{C\ nom}$ = 450A / I_{CRM} = 900A

➢ 特性 / Features

a) Neutral Point Clamped Three−Level Inverter Module

b) Low Inductive Layout

c) Thermistor

➢ 用途 / Applications

a) Solar Inverters

b) Uninterruptable Power Supplies Systems

c) 3-Level-Applications

➢ 相关信息 / Related Information

条形码 / Barcode Code

二维码 / DMX – Code

公司地址：合肥市高新区创新大道与明珠大道交叉口 106 号 5 号楼 2 层 C 区、D 区。
Address：Area C and D, 2nd floor, Building 5, No. 106, Intersection of Innovation Avenue and Mingzhu Avenue, High-tech Zone, Hefei City.

TLC450M07S1P

IGBT 逆变器 / IGBT Inverter
(Q1−1, Q1−2, Q4−1, Q4−2)

最大额定值/Maximum Rated Values

集电极-发射极电压 Collector−Emitter voltage	T_J=25℃	V_{CES}	650	V
连续集电极直流电流 Continuous DC collector current	T_C = 100℃, T_j max = 175℃	$I_{c\ nom}$	225	A
集电极重复峰值电流 Repetitive peak collector current	T_P=1ms	I_{CRM}	450	A
栅极-发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-20	V

电特性/Electrical Characteristics (T_J = 25℃ unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Outer IGBT (Q1−1, Q1−2, Q4−1, Q4−2)							
集电极-发射极饱和电压 Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 225 A	T_J = 25℃ T_J = 125℃	$V_{CE(sat)}$		1.40 1.55		V
栅极-发射极阈值电压 Gate−Emitter Threshold Voltage	V_{GE} = V_{CE} , I_C = 2.25 mA		$V_{GE(th)}$		4.95		V
输入电容 Input Capacitance	V_{CE} = 20 V V_{GE} = 0 V f = 10 kHz		C_{ies}		15.5		nF
反向传输电容 Reverse Transfer Capacitance			C_{res}		0.12		
集电极-发射极截止电流 Collector−Emitter Cut-off Current	V_{GE} = 0 V, V_{CE} = 650 V		I_{CES}			300	μA
栅极峰值电流 Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V		I_{GES}			600	nA
开通延迟时间 Turn−on Delay Time	V_{CE} = 400 V, I_C = 100 A, V_{GE} = -5/+15 V, R_g = 15Ω	T_J = 25℃ T_J = 125℃	$t_{d(on)}$		180 240		ns
上升时间 Rise Time		T_J = 25℃ T_J = 125℃	t_r		95 110		
关断延迟时间 Turn−off Delay Time		T_J = 25℃ T_J = 125℃	$t_{d(off)}$		940 980		
下降时间 Fall Time		T_J = 25℃ T_J = 125℃	t_f		165 195		
开通损耗能量 Turn−on Switching Loss per Pulse		T_J = 25℃ T_J = 125℃	E_{on}		5.20 5.60		mJ
关断损耗能量 Turn off Switching Loss per Pulse		T_J = 25℃ T_J = 125℃	E_{off}		4.30 5.20		

总栅极电荷 Total Gate Charge	V_{CE} = 480 V, I_C = 225 A, V_{GE} = ±15 V	Q_g		1550		nC
芯片 – 外壳热阻 Thermal Resistance – chip−to−case	Thermal grease, Thickness = 2 Mil ±2%, λ= 2.8 W/mK	R_{thJC}		0.085		℃/W
开关状态下温度 Temperature under switching		$T_{j\,op}$	-40		150	℃

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二极管/Diode（D5,D6）

最大额定值/Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	T_j = 25℃	V_{RRM}	650	V
连续正向直流电流 Continuous DC forward current		I_F	375	A
正向重复峰值电流 Repetitive peak forward current	t_p= 1 ms	I_{FRM}	750	A

电特性 / Electrical Characteristics (T_J = 25℃, unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
NEUTRAL POINT DIODE (D5, D6)							
二极管正向电压 Diode Forward Voltage	I_F = 375 A	T_J = 25℃ T_J = 125℃	V_F		1.55 1.70		V
反向恢复电流 Reverse Recovery Time	V_{CE} = 400 V, I_C = 100 A, V_{GE} = -5/+15 V, R_g = 15Ω	T_J = 25℃ T_J = 125℃	t_{rr}		145 210		ns
反向恢复电荷 Reverse Recovery Charge		T_J = 25℃ T_J = 125℃	Q_{rr}		5.75 11.0		µC
反向恢复峰值电流 Peak Reverse Recovery Current		T_J = 25℃ T_J = 125℃	I_{RRM}		70 90		A
反向恢复能量 Reverse Recovery Energy		T_J = 25℃ T_J = 125℃	E_{rr}		1.15 2.80		mJ
芯片 – 外壳热阻 Thermal Resistance – chip–to–case	Thermal grease, Thickness = 2 Mil ±2%, λ= 2.8 W/mK		R_{thJC}		0.146		℃/W
在开关状态下温度 Temperature under switching			$T_{j\,op}$	-40		150	℃

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IGBT 逆变器 / IGBT Inverter (Q2, Q3)

最大额定值/Maximum Rated Values

集电极-发射极电压 Collector−Emitter voltage	T_J=25℃	V_{CES}	650	V
连续集电极直流电流 Continuous DC collector current	T_C = 100℃, T_j max = 175℃	$I_{c\ nom}$	375	A
集电极重复峰值电流 Repetitive peak collector current	T_P=1ms	I_{CRM}	750	A
栅极-发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-20	V

电气特性 / Electrical Characteristics (T_J = 25℃ unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Inner IGBT (Q2, Q3)							
集电极-发射极饱和电压 Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 375 A	T_J = 25℃ T_J= 125℃	$V_{CE(sat)}$		1.40 1.55		V
栅极-发射极阈值电压 Gate−Emitter Threshold Voltage	V_{GE} = V_{CE} , I_C = 3.75 mA		$V_{GE(th)}$		4.95		V
输入电容 Input Capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 10 kHz		C_{ies}		15.5		nF
反向传输电容 Reverse Transfer Capacitance			C_{res}		0.12		
集电极-发射极截止电流 Collector−Emitter Cut-off Current	V_{GE} = 0 V, V_{CE} = 650 V		I_{CES}			300	μA
栅极峰值电流 Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V		I_{GES}			600	nA
开通延迟时间 Turn−on Delay Time	V_{CE} = 400 V, I_C = 100 A , V_{GE} = -5/+15 V, R_g = 15 Ω	T_J = 25℃ T_J =125℃	$t_{d(on)}$		180 240		ns
上升时间 Rise Time		T_J = 25℃ T_J =125℃	t_r		95 110		
关断延迟时间 Turn−off Delay Time		T_J = 25℃ T_J =125℃	$t_{d(off)}$		940 980		
下降时间 Fall Time		T_J = 25℃ T_J =125℃	t_f		165 195		
开通损耗能量 Turn−on Switching Loss per Pulse		T_J = 25℃ T_J =125℃	E_{on}		5.20 5.60		mJ
关断损耗能量 Turn off Switching Loss per Pulse		T_J = 25℃ T_J =125℃	E_{off}		4.30 5.20		

IGBT 逆变器 / IGBT Inverter (Q2, Q3)

总栅极电荷 Total Gate Charge	V_{CE} = 480 V, I_C = 375 A, V_{GE} = ±15 V	Q_g		1550		nC
芯片- 外壳热阻 Thermal Resistance – chip–to–case	Thermal grease, Thickness = 2 Mil ±2%, λ= 2.8 W/mK	R_{thJC}		0.102		℃/W
开关状态下温度 Temperature under switching		$T_{j\,op}$	-40		150	℃

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反向二极管/Inverse Diodes (D1,D2,D3,D4)

最大额定值/Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	T_j = 25℃	V_{RRM}	650	V
连续正向直流电流 Continuous DC forward current		I_F	150	A
正向重复峰值电流 Repetitive peak forward current	t_p= 1 ms	I_{FRM}	300	A

电特性 / Electrical Characteristics (T_J = 25℃, unless otherwise noted)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
Inverse Diodes (D1, D2, D3, D4)							
二极管正向电压 Diode Forward Voltage	I_F = 375 A	T_J = 25℃ T_J = 125℃	V_F		1.65 1.90		V
反向恢复电流 Reverse Recovery Time	V_{CE} = 400 V, I_C = 100 A, V_{GE} = -5/+15 V, R_g = 15Ω	T_J = 25℃ T_J = 125℃	t_{rr}		145 210		ns
反向恢复电荷 Reverse Recovery Charge		T_J = 25℃ T_J = 125℃	Q_{rr}		5.75 11.0		μC
反向恢复峰值电流 Peak Reverse Recovery Current		T_J = 25℃ T_J = 125℃	I_{RRM}		70 90		A
反向恢复能量 Reverse Recovery Energy		T_J = 25℃ T_J = 125℃	E_{rr}		1.15 2.80		mJ
芯片 – 外壳热阻 Thermal Resistance – chip–to–case	Thermal grease, Thickness = 2 Mil ±2%, λ= 2.8 W/mK		R_{thJC}		0.366		℃/W
在开关状态下温度 Temperature under switching			$T_{j\,op}$	-40		150	℃

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负温度系数热敏电阻/NTC-Thermistor

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

			Min.	Typ.	Max.	
额定阻值 Rated resistance	TC = 25℃	R25		22		kΩ
阻值误差 Deviation of R100	TC = 100℃, R100 = 1468 Ω	ΔR/R	-5		5	%
功率损耗 Power dissipation	TC = 25℃	P25			200	mW
B 值/B – value	R2=R25 exp [B25/50(1/T2 – 1/(298.15K))]	B25/50		3950		K
B 值/B – value	R2=R25 exp [B25/100(1/T2 – 1/(298.15K))]	B25/100		3433		K

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模块 / Module

绝缘配置 / Insulation Coordination

隔离试验电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V_{ISOL}	4.0	kV
模块基板材料 Material of module baseplate			Cu	
内部绝缘/Internal Isolation	基本绝缘 (class 1, IEC61140) Basic insulation (class 1, IEC61140)		Al_2O_3	
爬电距离/Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal	dCreep	10.0	mm
间隙/Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal	dClear	7.5	mm
相对漏电起痕指数 Comparative tracking index		CTI	> 200	

特征值 / Characteristic Values

			Min.	Typ.		
杂散电感，模块 Stray inductance module		L_{sCE}		20		nH
模块引线电阻 Module lead resistance	TC = 25℃, 每个开关 / per switch	$R_{CC'+EE}$		1.6		mΩ
储存温度/Storage temperature		T_{stg}	-40		125	℃
模块安装的安装扭距 Mounting torque for module mounting	螺丝 M5 / Screw M5	M	3.00		5.00	Nm
重量/Weight		G		188		g

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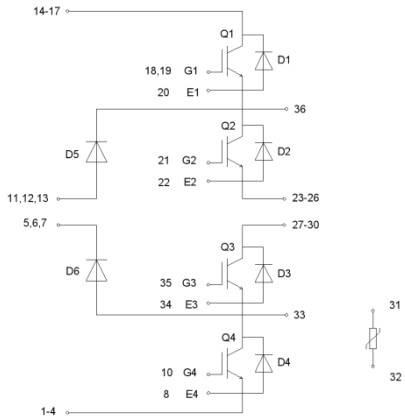
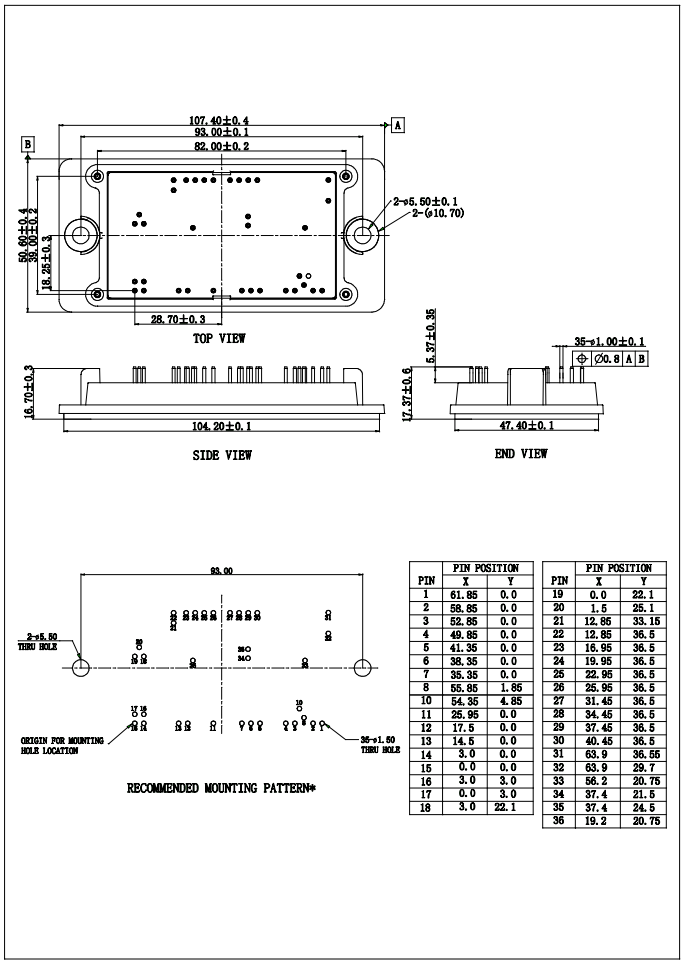
封装/Package

电路拓扑/Circuit Topology



封装尺寸 / Package outlines

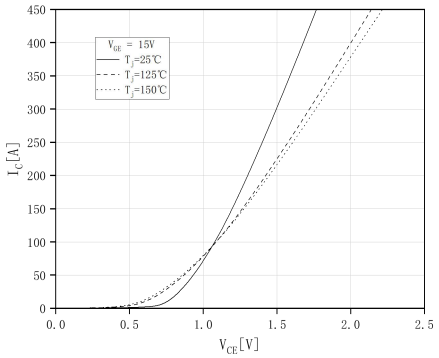


PIN	PIN POSITION	
	X	Y
1	61.85	0.0
2	58.85	0.0
3	52.85	0.0
4	49.85	0.0
5	41.35	0.0
6	38.35	0.0
7	35.35	0.0
8	55.85	1.85
10	54.35	4.85
11	25.95	0.0
12	17.5	0.0
13	14.5	0.0
14	3.0	0.0
15	0.0	0.0
16	3.0	3.0
17	0.0	3.0
18	3.0	22.1

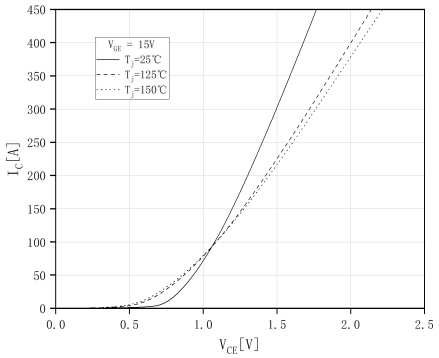
PIN	PIN POSITION	
	X	Y
19	0.0	22.1
20	1.5	25.1
21	12.85	33.15
22	12.85	36.5
23	16.95	36.5
24	19.95	36.5
25	22.95	36.5
26	25.95	36.5
27	31.45	36.5
28	34.45	36.5
29	37.45	36.5
30	40.45	36.5
31	63.9	36.55
32	63.9	29.7
33	56.2	20.75
34	37.4	21.5
35	37.4	24.5
36	19.2	20.75

性能/Performance

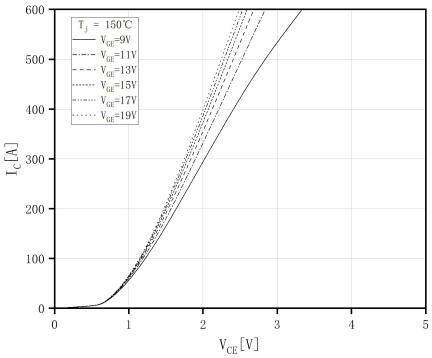
输出特性 IGBT(Q1, Q4), 逆变器（典型）
Output characteristic IGBT(Q1, Q4), Inverter (typical)



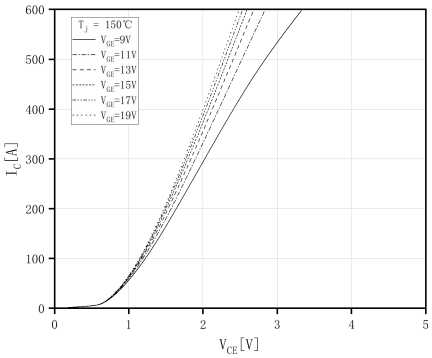
输出特性 IGBT(Q2, Q3), 逆变器（典型）
Output characteristic IGBT(Q2, Q3), Inverter (typical)



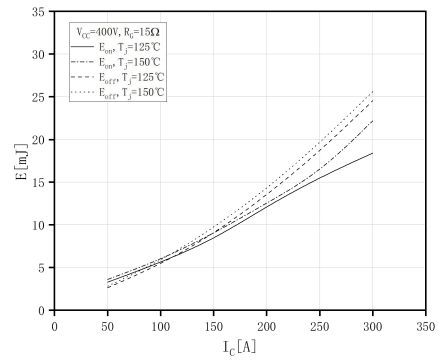
输出特性 IGBT(Q1, Q4), 逆变器（典型）
Output characteristic IGBT(Q1, Q4), Inverter (typical)



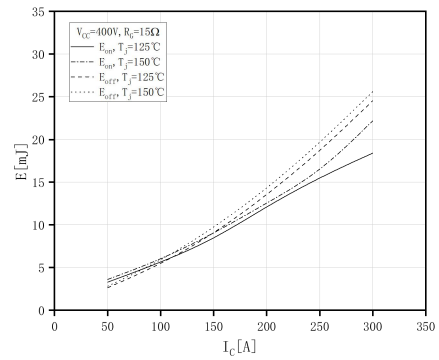
输出特性 IGBT(Q2, Q3), 逆变器（典型）
Output characteristic IGBT(Q2, Q3), Inverter (typical)



开关损耗 IGBT(Q1, Q4), 逆变器（典型）
Switching losses IGBT(Q1, Q4), Inverter (typical)



开关损耗 IGBT(Q2, Q3), 逆变器（典型）
Switching losses IGBT(Q2, Q3), Inverter (typical)



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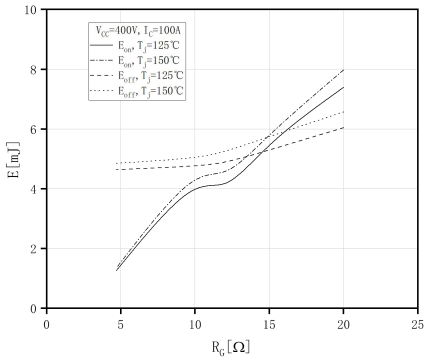
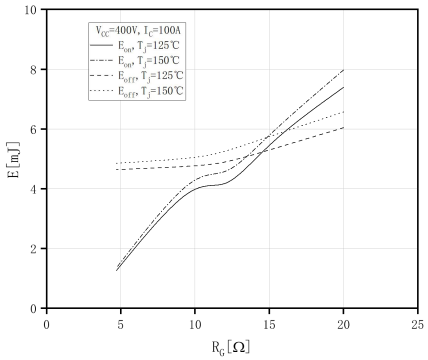
性能/Performance

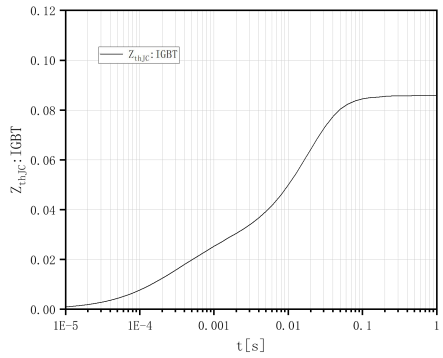
开关损耗 IGBT(Q1, Q4), 逆变器（典型）
Switching losses IGBT(Q1, Q4), Inverter (typical)



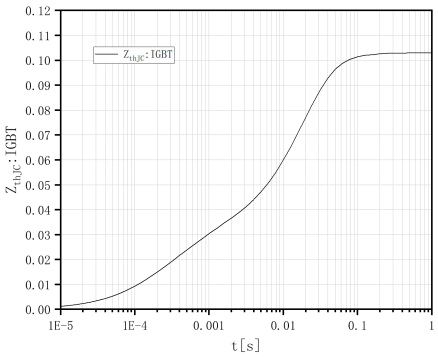
开关损耗 IGBT(Q2, Q3), 逆变器（典型）
Switching losses IGBT(Q2, Q3), Inverter (typical)



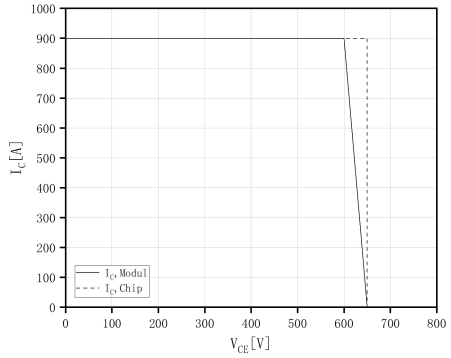
瞬态热阻抗 IGBT(Q1, Q4), 逆变器
Transient thermal impedance IGBT(Q1, Q4), Inverter



瞬态热阻抗 IGBT(Q2, Q3), 逆变器
Transient thermal impedance IGBT(Q2, Q3), Inverter



反偏安全工作区 IGBT, 逆变器（RBSOA）
Reverse bias safe operating area IGBT, Inverter(RBSOA)



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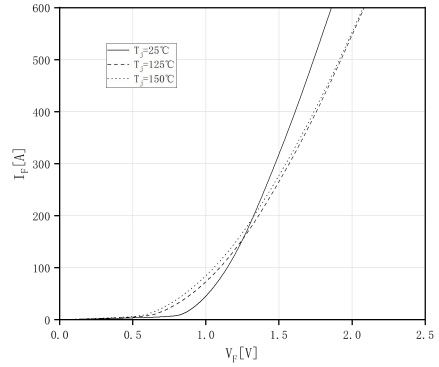
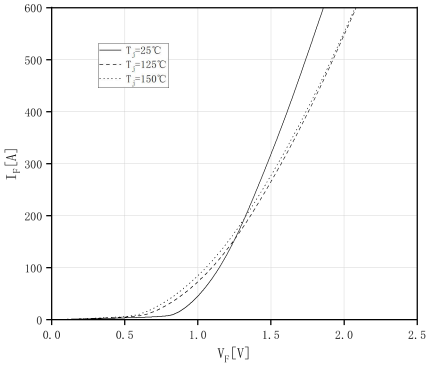
性能/Performance

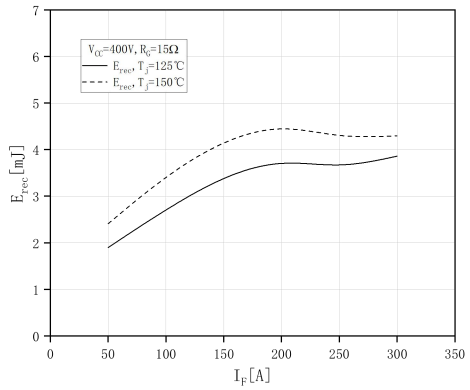
正向偏压特性二极管(D1, D2, D3, D4),逆变器（典型）
Forward characteristic of Diode(D1, D2, D3, D4), Inverter(typical)



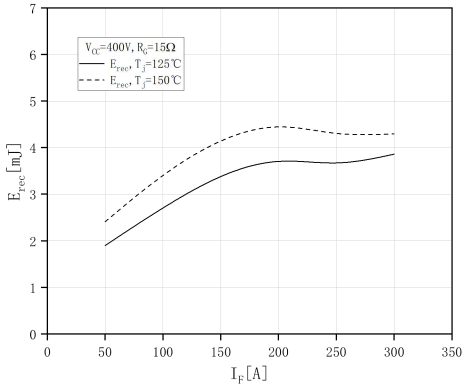
正向偏压特性 二极管(D5, D6),逆变器（典型）
Forward characteristic of Diode(D5, D6), Inverter(typical)



开关损耗二极管(D1, D2, D3, D4), 逆变器（典型）
Switching losses Diode(D1, D2, D3, D4), Inverter(typical)



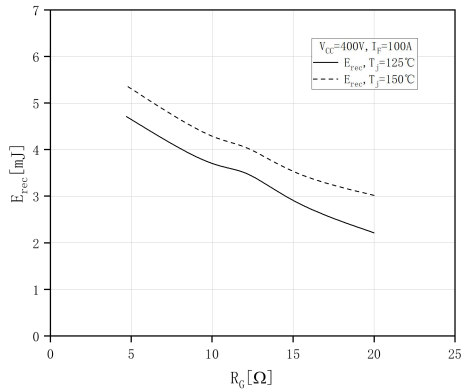
开关损耗二极管(D5, D6), 逆变器（典型）
Switching losses Diode(D5, D6), Inverter(typical)



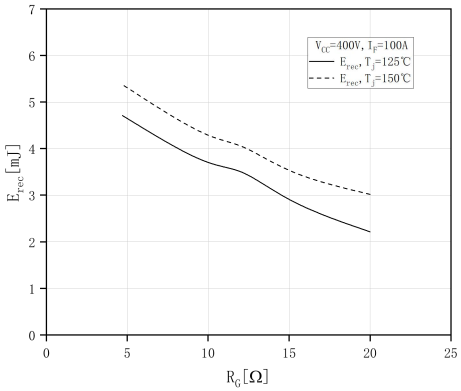
TLC450M07S1P

性能/Performance

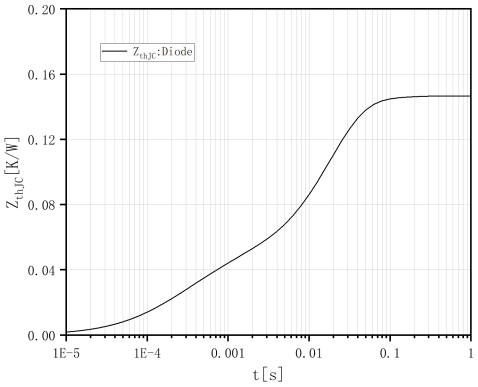
开关损耗 二极管(D1, D2, D3, D4), 逆变器（典型）
Switching losses Diode(D1, D2, D3, D4), Inverter(typical)



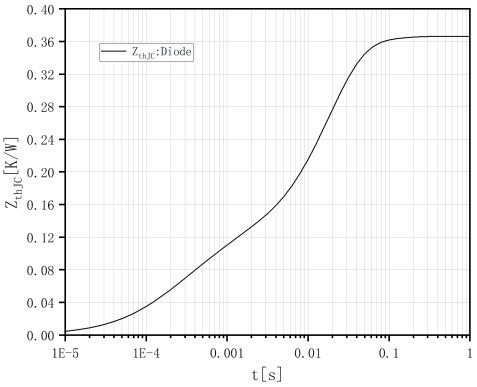
开关损耗 二极管(D5, D6), 逆变器（典型）
Switching losses Diode(D5, D6), Inverter(typical)



瞬态热阻抗 二极管, D5,D6
Transient thermal impedance Diode



瞬态热阻抗 二极管, D1,D2,D3,D4
Transient thermal impedance Diode



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