

IGBT, 制动-斩波器 / IGBT, Brake-Chopper
最大额定值 / Maximum Rated Values

初步数据
Preliminary Data

集电极 - 发射极电压 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -25^{\circ}\text{C}$	V_{CES}	3300 3300	V
连续集电极直流电流 Continuous DC collector current	$T_C = 80^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	400 660	A A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	800	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$	P_{tot}	4,80	kW
栅极 - 发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-20	V

特征值 / Characteristic Values

			min.	typ.	max.		
集电极 - 发射极饱和电压 Collector-emitter saturation voltage	$I_C = 400\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 400\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	3,40 4,30	4,25 5,00	V V	
栅极阈值电压 Gate threshold voltage	$I_C = 40,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	4,2	5,1	6,0	V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}, V_{CE} = 1800\text{ V}$		Q_G	8,00			μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	1,3			Ω
输入电容 Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	50,0			nF
反向传输电容 Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	2,70			nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 3300\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{CES}		5,0		mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{GES}		400		nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 2,7\ \Omega, C_{GE} = 68,0\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{on}}$	0,28 0,28			μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 2,7\ \Omega, C_{GE} = 68,0\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,18 0,20			μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 3,6\ \Omega, C_{GE} = 68,0\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{off}}$	1,55 1,70			μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 3,6\ \Omega, C_{GE} = 68,0\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,20 0,20			μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}, L_S = 60\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 2,7\ \Omega, C_{GE} = 68,0\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	470 730			mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}, L_S = 60\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 3,6\ \Omega, C_{GE} = 68,0\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	430 510			mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 2500\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$		I_{SC}	2000			A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		26,0		K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$		R_{thCH}	12,0			K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	125		$^{\circ}\text{C}$

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初步数据
Preliminary Data

二极管，制动-斩波器 / Diode, Brake-Chopper
最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -25^{\circ}\text{C}$	V_{RRM}	3300 3300	V
连续正向直流电流 Continuous DC forward current		I_F	400	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	800	A
I^2t -值 I^2t - value	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$, $T_{vj} = 125^{\circ}\text{C}$	I^2t	55,5	kA^2s
最大损耗功率 Maximum power dissipation	$T_{vj} = 125^{\circ}\text{C}$	P_{RQM}	800	kW
最小开通时间 Minimum turn-on time		$t_{on \text{ min}}$	10,0	μs

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 400 \text{ A}$, $V_{GE} = 0 \text{ V}$ $I_F = 400 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	2,80 2,80	3,50 3,50	V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 400 \text{ A}$, $-di_F/dt = 2200 \text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	550 650		A A
恢复电荷 Recovered charge	$I_F = 400 \text{ A}$, $-di_F/dt = 2200 \text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	235 440		μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 400 \text{ A}$, $-di_F/dt = 2200 \text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	245 515		mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}		51,0	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$		R_{thCH}	24,0		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj \text{ op}}$	-40	125	$^{\circ}\text{C}$

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