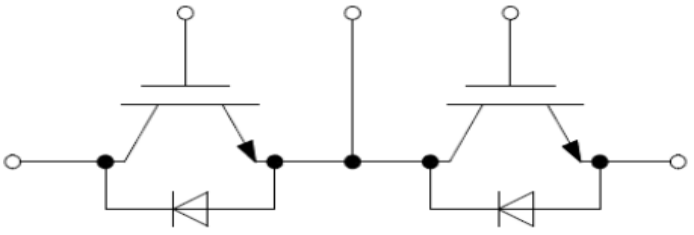
IGBT - Field Stop, Trench, Soft Fast Recovery Diode

1700V/200A

Features

- Electrical features
  - V_{CES}=1700V
  - $I_{C\ nom}$=200A / I_{CRM}=400A
  - Low switching losses
  - Low inductance
  - Fast switching and short tail current
  - High power and thermal cycling capability
- Mechanical features
  - High power and thermal cycling capability
  - Al2O3 substrate with low thermal resistance
  - Copper base plate
- Potential Applications
  - Switching mode power supply
  - Drive inverters with brake system
  - Uninterruptible power supply
  - AC and DC servo drive amplifier



Half Bridge

Device	Package	Shipping
SPM200V170Y62HS	Y62	Tray

IGBT, Inverter

Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	Unit
Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	1700	V
Continuous DC collector current	T_C = 100°C, $T_{vj, max}$ = 150°C	$I_{C nom}$	200	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	300	A
Total power dissipation	T_C = 25°C, $T_{vj, max}$ = 175°C	P_{tot}	1250	W
Gate-emitter peak voltage		V_{GES}	+/-20	V

Characteristic Value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
		T_{vj} =			1.65		V
Collector-emitter saturation voltage	I_C = 200 A, V_{GE} = 15 V	25°C T_{vj}	$V_{CE,sat}$		1.96		
		= 125°C			2.01		V
		T_{vj} =					
		150°C					V
Gate threshold voltage	I_C = 1mA, V_{CE} = V_{GE}, T_{vj} = 25°C		$V_{GE,th}$	5.0	5.66	6.2	V
Gate charge	V_{GE} = -15 V ... +15 V		Q_G		2.3		µC
Internal gate resistor	T_{vj} = 25°C		R_{Gint}		3.6		Ω
Input capacitance	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{ies}		18		nF
Reverse transfer capacitance	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{res}		0.58		nF
Collector-emitter cut-off current	V_{CE} = 1700 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			1	mA

	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
ate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25°C		I_{GES}			300	nA
Turn-on delay time, inductive load	I_C = 200A, V_{CE} = 900V V_{GE} = +15/-15V $R_{G,on}$ = 2.2Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$T_{d,on}$		0.185 0.202 0.214		us us us
Rise time, inductive load	I_C = 200A, V_{CE} = 900V V_{GE} = +15/-15V $R_{G,on}$ = 2.2Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	T_r		0.036 0.046 0.050		us us us
Turn-off delay time, inductive load	I_C = 200A, V_{CE} = 900V V_{GE} = +15/-15V $R_{G,off}$ = 2.2Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$T_{d,off}$		0.41 0.461 0.469		us us us
Fall time, inductive load	I_C = 200A, V_{CE} = 900V V_{GE} = +15/-15V $R_{G,off}$ = 2.2Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	T_f		0.19 0.231 0.491		us us us
Turn-on energy loss per pulse	I_C = 200A, V_{CE} = 900V, L_s=60nH V_{GE} = +15/-15V, di/dt =3300A/μs $R_{G,on}$ = 2.2Ω (T_{vj} = 150°C)	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		19.90 34.83 40.36		mJ mJ mJ

Turn-off energy loss per pulse	I_C = 200A, V_{CE} = 900V, L_s=60nH V_{GE} = +15/-15V, dv/dt =4200V/μs $R_{G,off}$ = 2.2Ω (T_{vj} = 150°C)	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		35.53 49.25 53.49		m J m J m J
SC data	V_{GE} ≤15V, V_{CC} =900 V, t_P ≤ 8 μs, T_{vj} = 150°C , C_{GE} = 0.0uF , V_{CEmax} =V_{CES} -L_{sCE} ·di/dt		I_{SC}		1032		A
Thermal resistance, junction to case	Per IGBT		Rth,JC		0.120		K/W

Diode, Inverter

Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	nit
Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1700	V
Continuous DC forward current		I_F	200	A
Repetitive peak forward current	t_P = 1 ms	I_{FRM}	400	A

Characteristic Value

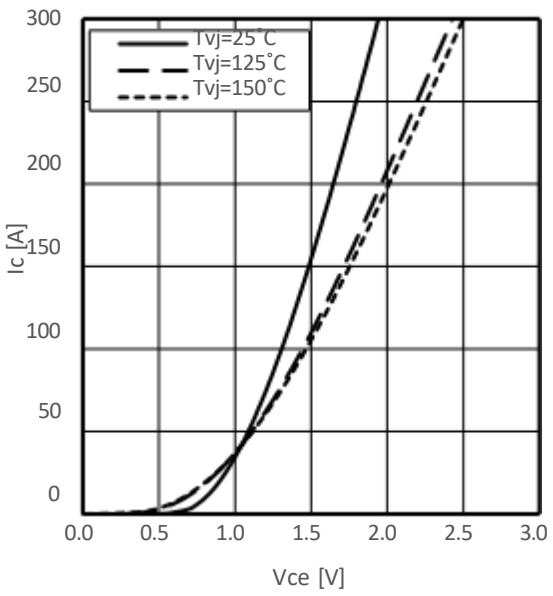
Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F = 200 A, V_{GE} = 0 V	T_{vj} = 25°C	V_F		2.11		V
		T_{vj} = 125°C			2.32		V
		T_{vj} = 150°C			2.35		V
Peak reverse recovery current	I_F = 200A, V_R = 900V V_{GE} = -15V, - di_F/dt = 1400 A/µs (T_{vj}=150°C)	T_{vj} = 25°C	I_{RM}		388		A
		T_{vj} = 125°C			315		A
		T_{vj} = 150°C			305		A
Recovered charge	I_F = 200A, V_R = 900V V_{GE} = -15V, - di_F/dt = 1400 A/µs (T_{vj}=150°C)	T_{vj} = 25°C	Q_r		46		µC
		T_{vj} = 125°C			59		µC
		T_{vj} = 150°C			67		µC
Reverse recovery energy	I_F = 200A, V_R = 900V V_{GE} = -15V, - di_F/dt = 1400 A/µs (T_{vj}=150°C)	T_{vj} = 25°C	E_{rec}		20		mJ
		T_{vj} = 125°C			30		mJ
		T_{vj} = 150°C			35		mJ
Thermal resistance, junction to case	Per diode		th,JC		0.230		K/W

Module

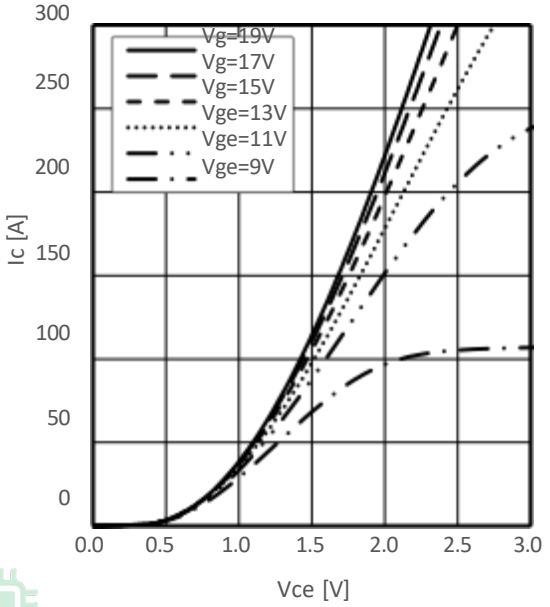
Characteristic Value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation Voltage	RMS, f=50HZ,1min	V_{ISOL}			4000	V
Stray inductance module		L_{sCE}		20		nH
Operation Junction Temperature		T_{jop}	-40		150	C
Storage Temperature Range		T_{stg}	-40		125	C
Mounting Torque	Screw M5	M	2.5		6	N.m
Weight of Module		G		340		g

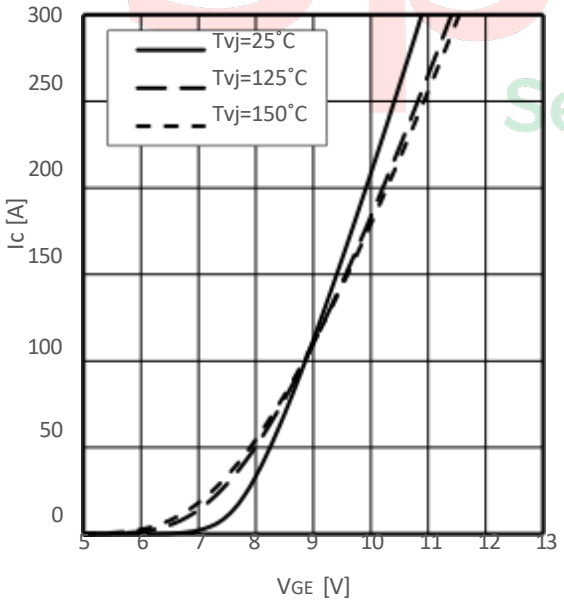
Characteristics Diagrams



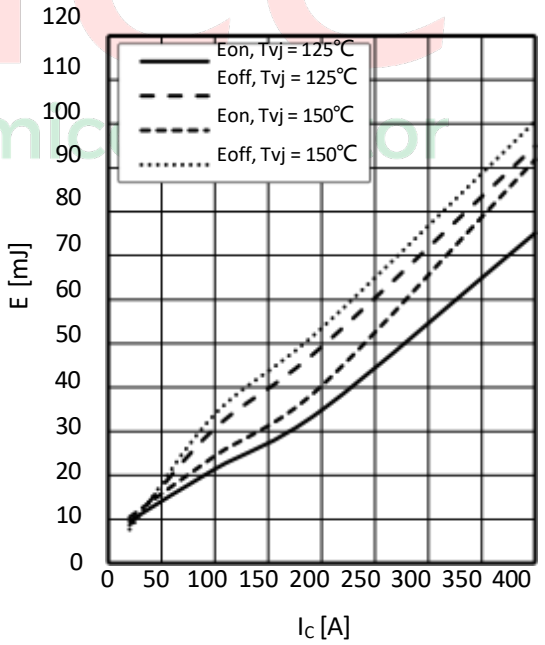
Output characteristic IGBT, Inverter (typical)
$I_C = f(V_{CE})$ $V_{GE} = 15V$



Output characteristic IGBT, Inverter (typical)
$I_C = f(V_{CE})$ $T_{vj} = 150°C$

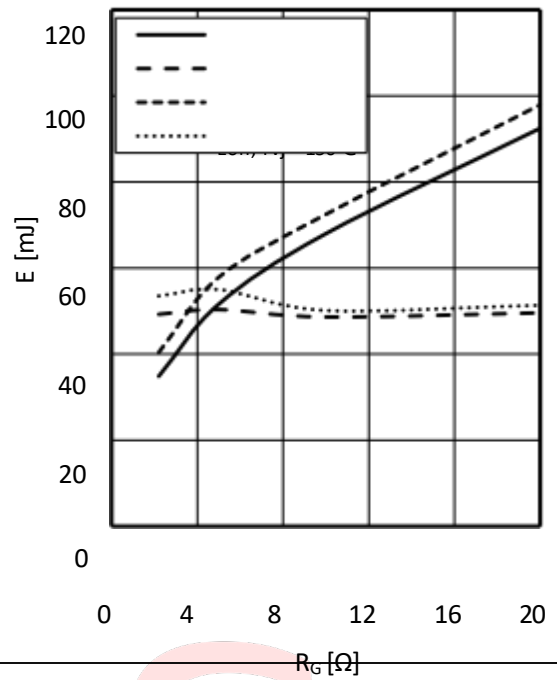


Transfer characteristic IGBT, Inverter (typical)
$I_C = f(V_{GE})$ $V_{CE} = 20V$



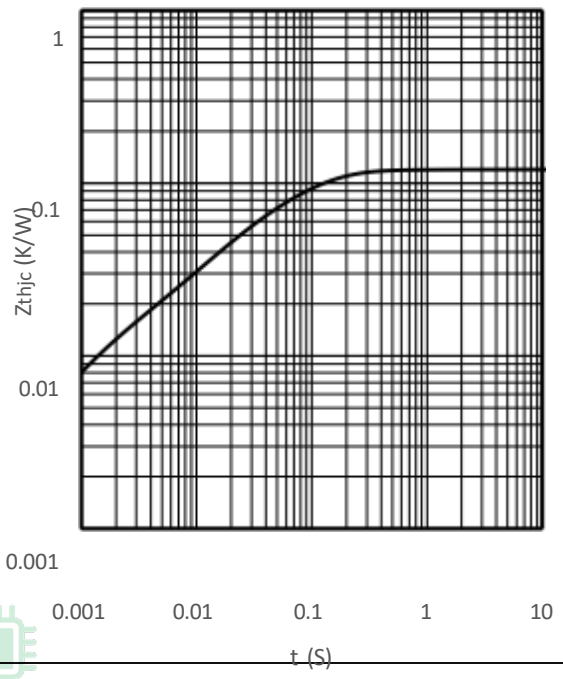
Switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$ $V_{GE} = \pm 15V$, $R_{Gon} = 2.2\ \Omega$ $R_{Goff} = 2.2\ \Omega$, $V_{CE} = 900V$



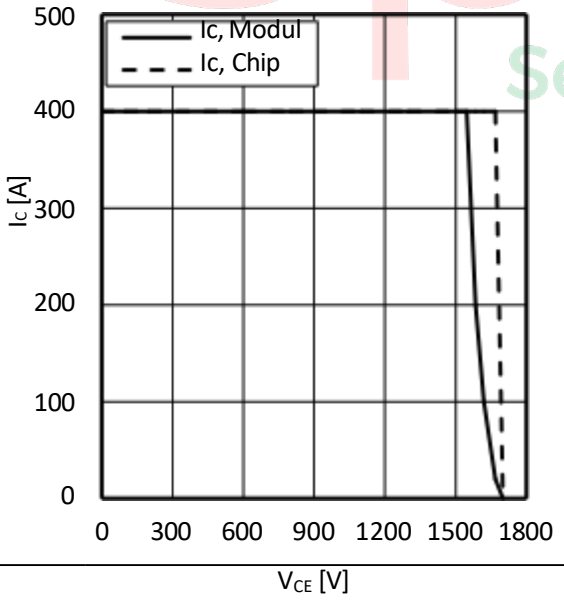
Switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$ $V_{GE} = \pm 15V$, $I_C = 200A$, $V_{CE} = 900V$



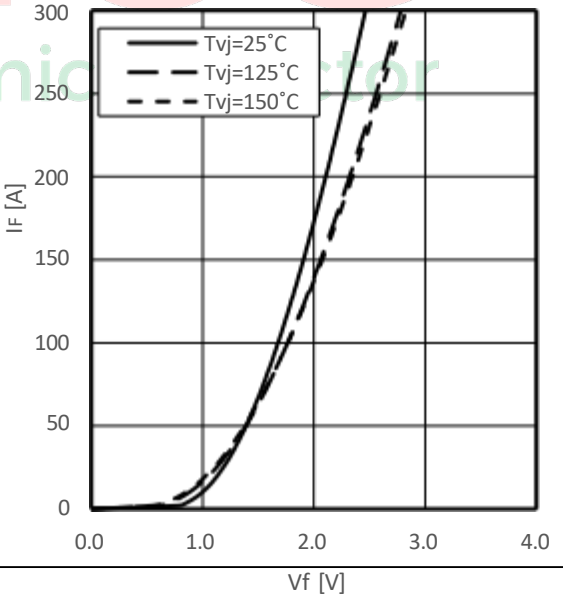
Transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$

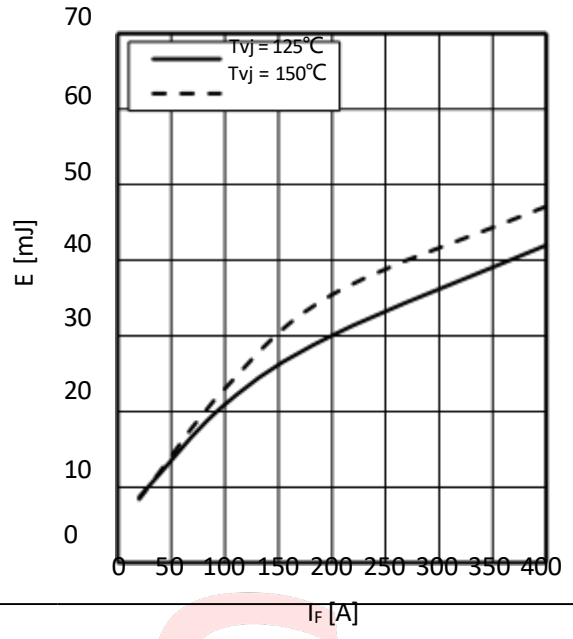


Reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$ $V_{GE} = \pm 15V$ $R_{Goff} = 15\Omega$, $T_{vj} = 150°C$

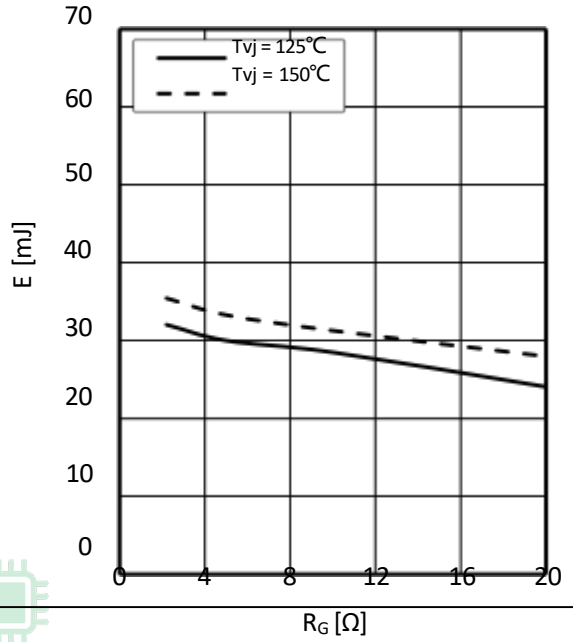


Forward characteristic of Diode, Inverter (typical)



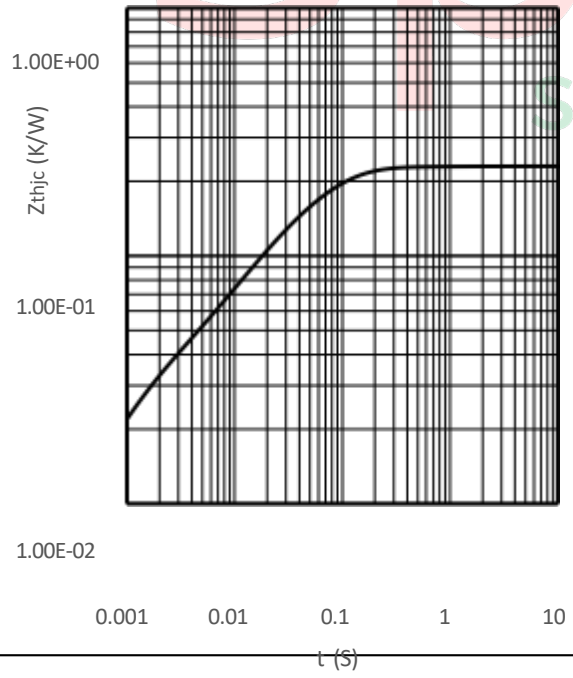
Switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$ $R_{Gon} = 2.2\ \Omega$, $V_{CC} = 900V$



Switching losses Diode, Inverter (typical)

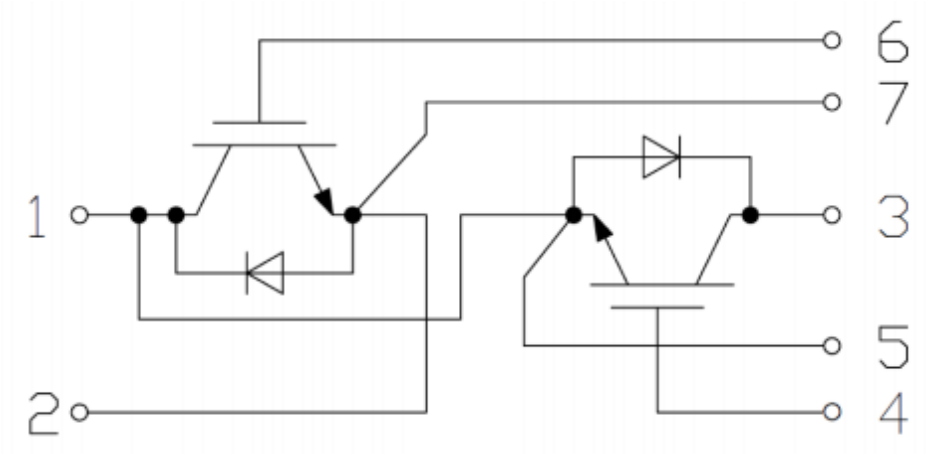
$E_{rec} = f(R_G)$ $I_F = 200\ A$, $V_{CC} = 900V$



Transient thermal impedance Diode Inverter

$Z_{thJC} = f(t)$

Circuit Diagram



Package Outlines