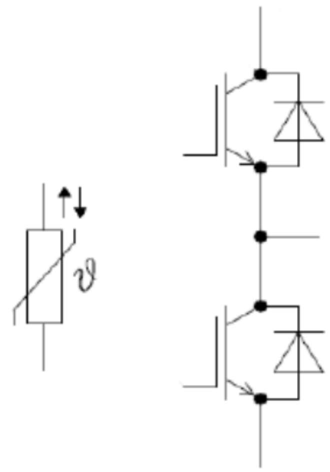
TECHNICON

TE450GB17C5R7-CA

C5 series package: 1700V 450A IGBT module

Datasheet



Equivalent
Circuit Schematic

Features:

- V_{CES} = 1700V
- $I_{C\ nom}$ = 450A
- Trenchgate Gen.7 IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High RBSOA capability
- Low static losses: $V_{CE(sat)}$ = 1,55V@25C

Options:

- pre-applied TIM (option +M01)
- adoption for parallel connection (Vf selection)

Typical Applications:

- Motor Drives
- Solar Applications
- UPS Systems
- Energy Storage

IGBT, Inverter / IGBT
Maximum Rated Values

Collector-emitter Voltage	T_{vj} = 25℃	V_{CES}	1700	V
Implemented collector current		I_{Cnom}	450	A
Continuous DC Collector Current	T_C = 90℃, $T_{vj\ max}$ = 175℃	I_C	450	A
Repetitive Peak Collector Current	t_p $T_{vj\ op}$	I_{CRM}	900	A
Gate-emitter Peak Voltage		V_{GES}	±20	V

Characteristic Values

				min.	typ.	max.	
Collector-emitter Saturation Voltage[1)]	I_C = 450A, V_{GE} = 15V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	V_{CEsat}	-	1.55 1.75 1.80 1.87	-	V
Gate Threshold Voltage	V_{CE} = V_{GE}, I_C = 9mA, T_{vj} = 25℃		V_{GEth}	-	6.10	-	V
Gate Charge	V_{GE} = -15V/15V, V_{CE} = 600V		Q_G	-	4.2	-	μC
Internal Gate Resistor	T_{vj} = 25℃		R_{Gint}	-	0.43	-	Ω
Input Capacitance	f = 100kHz, T_{vj} = 25℃, V_{CE} = 25V, V_{GE} = 0V		C_{ies}	-	45.9	-	nF
Reverse Transfer Capacitance	f = 100kHz, T_{vj} = 25℃, V_{CE} = 25V, V_{GE} = 0V		C_{res}	-	0.16	-	nF
Collector-emitter Cutoff Current	V_{CE} = 1700V, V_{GE} = 0V, T_{vj} = 25℃		I_{CES}	-	-	1	mA
Gate-emitter Leakage Current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25℃		I_{GES}	-	-	100	nA
Turn-on Delay Time, Inductive Load	I_C = 450A, V_{CE} = 900V V_{GE} = -8V/15V R_{GON} = 1.5Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	t_{don}	-	142 148 149 150	-	ns
Rise Time, Inductive Load	I_C = 450A, V_{CE} = 900V V_{GE} = -8V/15V R_{GON} = 1.5Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	t_r	-	52 64 65 67	-	ns
Turn-off Delay Time, Inductive Load	I_C = 450A, V_{CE} = 900V V_{GE} = -8V/15V R_{Goff} = 1.5Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	tdoff	-	499 540 549 560	-	ns
Fall Time, Inductive Load	I_C = 450A, V_{CE} = 900V V_{GE} = -8V/15V R_{Goff} = 1.5Ω	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	t_f	-	449 733 783 870	-	ns
Turn-on Energy Loss per Pulse	I_C = 450A, V_{CE} = 900V, L_σ = 30nH V_{GE} = -8V/15V, R_{GON} = 1.5Ω di/dt = 5448 (T_{vj} = 175℃)	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	E_{on}	-	107 145 156 165	-	mJ
Turn-off energy Loss per Pulse	I_C = 450A, V_{CE} = 900V, L_σ = 30nH V_{GE} = 1-8V/15V, R_{Goff} = 1/5Ω du/dt = 4762 (T_{vj} = 175℃)	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	E_{off}	-	112 155 167 175	-	mJ
SC Data	V_{GE} = -8V/15V V_{CC} = 1000V	t_p ≤ 8μs, T_{vj} = 150℃ t_p ≤ 6μs, T_{vj} = 175℃	I_{SC}	-	1900 1800	-	A

Thermal Resistance, Junction to Case	Per IGBT	R_{thJC}	–	0.060	–	K/W
Thermal Resistance, Case to Heatsink	Per IGBT λ grease = 1W/(m·K)	R_{thCH}	–	0.037	–	K/W
Temperature under Switching Conditions		$T_{vj\ op}$	-40		175	℃

Diode, Inverter
Maximum Rated Values

Repetitive Peak Reverse Voltage	T_{vj} = 25℃	V_{RRM}	1700	V
Continuous DC Forward Current		I_{Fnom}	450	A
Repetitive Peak Forward Current	t_p = 1ms	I_{FRM}	900	A

Characteristic Values

				min.	typ.	max.	
Forward Voltage[1)]	I_F = 450A, V_{GE} = 0V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	V_F	–	1.65 1.92 2.00 2.05	–	V
Peak Reverse Recovery Current	I_F = 450A, V_R = 900V $-di_F/dt$ = 5556A/us (T_{vj} = 175℃) V_{GE} = −8V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	I_{RM}	–	662 678 686 678	–	A
Recovery Charge	I_F = 450A, V_R = 900V $-di_F/dt$ = 5556A/us (T_{vj} = 175℃) V_{GE} = −8V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	Q_R	–	79 114 125 135	–	μC
Reverse Recovery Energy	I_F = 450A, V_R = 900V $-di_F/dt$ = 5556A/us (T_{vj} = 175℃) V_{GE} = −8V	T_{vj} = 25℃ T_{vj} = 125℃ T_{vj} = 150℃ T_{vj} = 175℃	E_{rec}	–	36 59 66 71	–	mJ
Thermal Resistance, Junction to Case	Per FRD		R_{thJC}	–	0.078	–	K/W
Thermal Resistance, Case to Heatsink	Per IGBT λ grease = 1W/(m·K)		R_{thCH}	–	0.048	–	K/W
Temperature under Switching Conditions			$T_{vj\ op}$	-40	–	175	℃

NTC-Thermistor / NTC
Maximum Rated Values

			min.	typ.	max.	
Rated Resistance	T_{NTC} = 25℃	R_{25}	–	5	–	KΩ
Deviation of R100 R100	T_{NTC} = 100℃, R_{100} = 465Ω	△R/R	-5	–	5	%
Power Dissipation	T_{NTC} = 25℃	P_{25}	–	–	20	mW
B-Value B	$R_2 = R_{25}\ exp[B_{25/50}(1/T_2-1/(298.15K))]$	$B_{25/50}$	–	3375	–	K
	$R_2 = R_{25}\ exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$	–	3414	–	K
	$R_2 = R_{25}\ exp[B_{25/100}(1/T_2-1/(298.15K))]$	$B_{25/100}$	–	3436	–	K

1) Terminal impedance is not included.

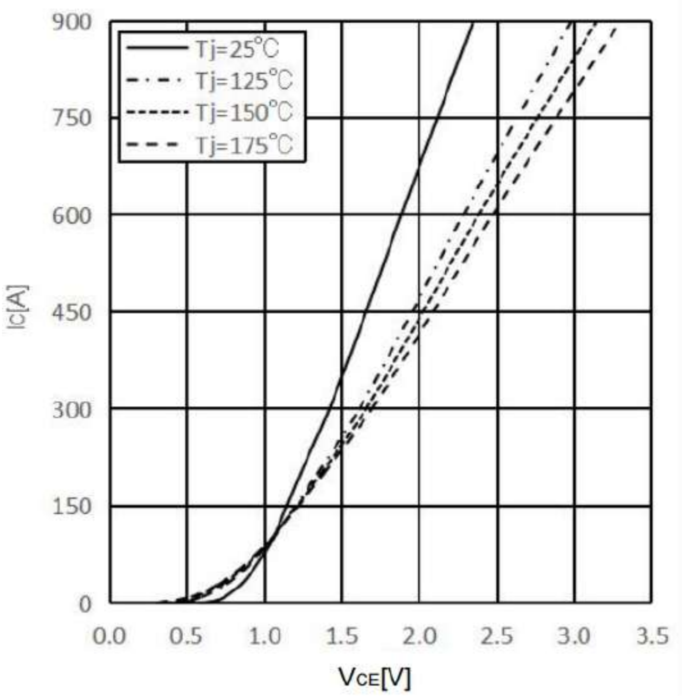
Module

Isolation Test Voltage	RMS, f=50Hz, t=1min	V_{ISOL}	3.4	kV
Isolation Test Voltage of NTC	RMS, f=50Hz, t=1min	$V_{ISOL(NTC)}$	3.4	kV
Material of Module Baseplate			Cu	
Internal Isolation			ZTA	
Creepage Distance	Terminal to heatsink, min Terminal to terminal, min		15 12.1	mm
Clearance	Terminal to heatsink, min Terminal to terminal, min		12.5 10	mm
Comparative Tracking Index		CTI	>200	

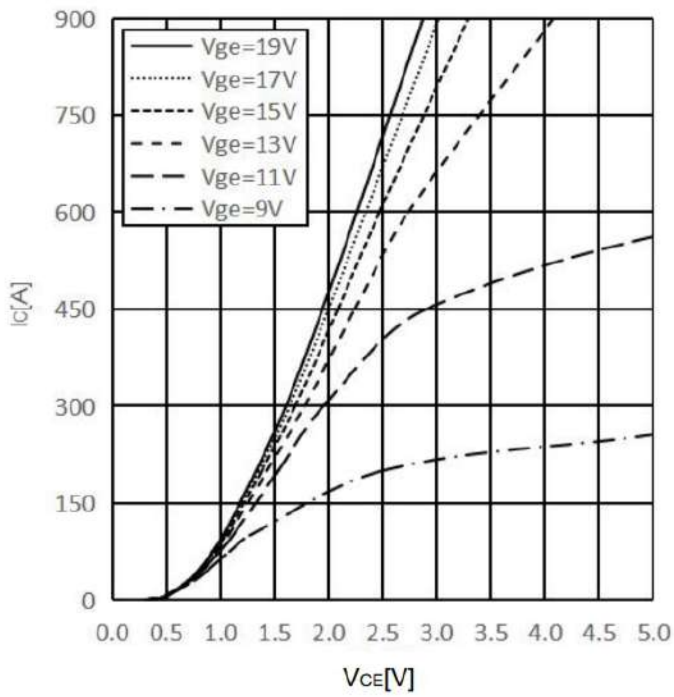
			min.	typ.	max.	
Stray Inductance Module		L_{sCE}	–	20	–	nH
Module Lead Resistance, Terminals-Chip	T_C = 25℃, Per Switch	$R_{CC'+EE'}$	–	0.8	–	mΩ
Storage Temperature		T_{stg}	-40	–	125	℃
Mounting Torque for Module Mounting	Screw M5 / M5	M	3.0	–	6.0	Nm
Mounting Torque for Terminal Mounting	Screw M6 / M6	M	3.0	–	6.0	Nm
Weight		G	–	345	–	g

Circuit Diagram

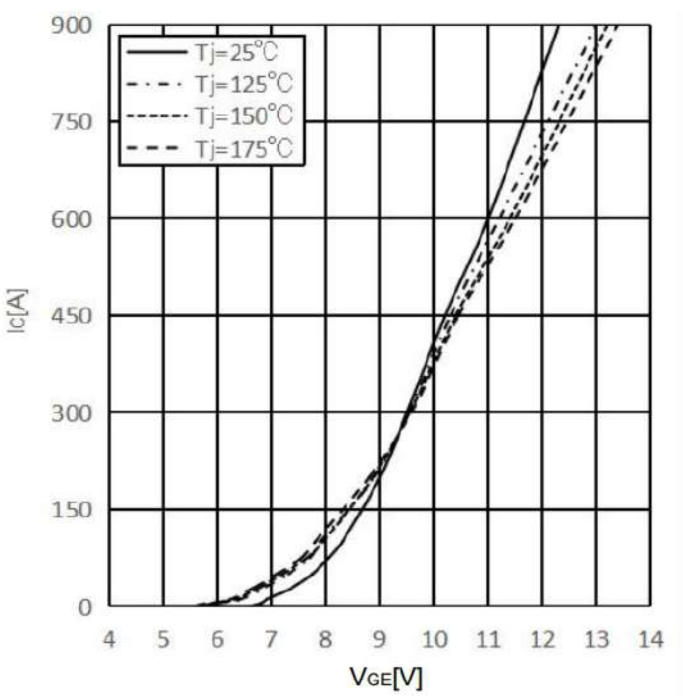
Output characteristic IGBT, Inverter (typical),
Inclusive RCC'+EE' $I_C = f(V_{CE})$, $V_{GE} = 15V$



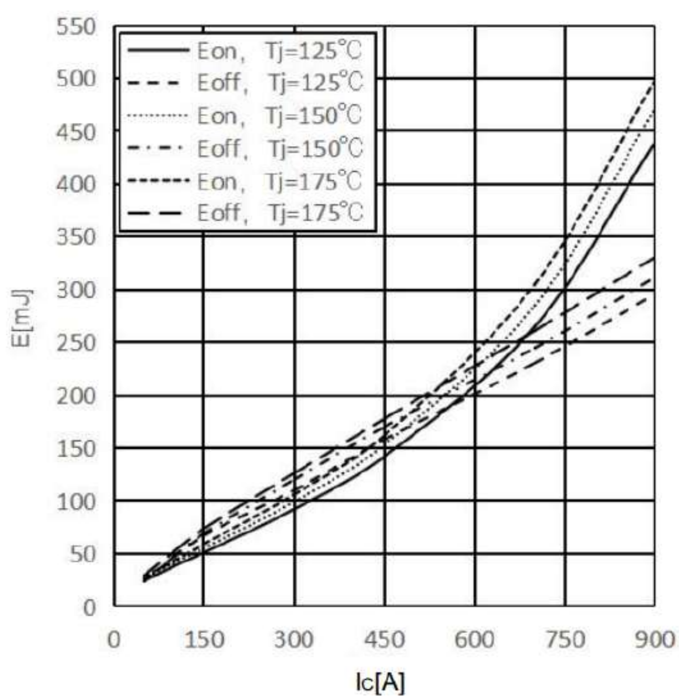
Output characteristic IGBT, Inverter (typical),
Inclusive RCC'+EE' $I_C = f(V_{CE})$, $T_{vj} = 175°C$



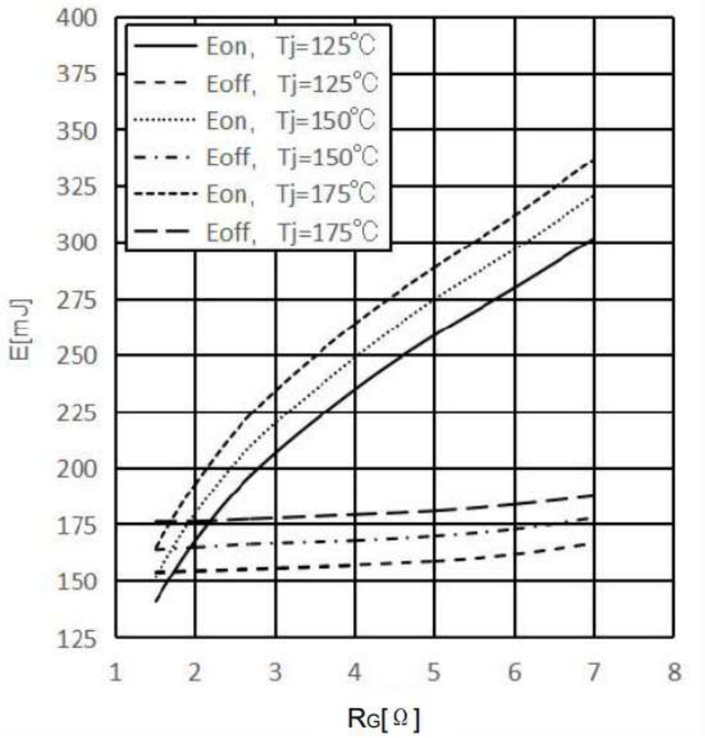
Transfer characteristic IGBT, Inverter(typical),
Inclusive RCC'+EE' $I_C = f(V_{GE})$, $V_{CE} = 20V$



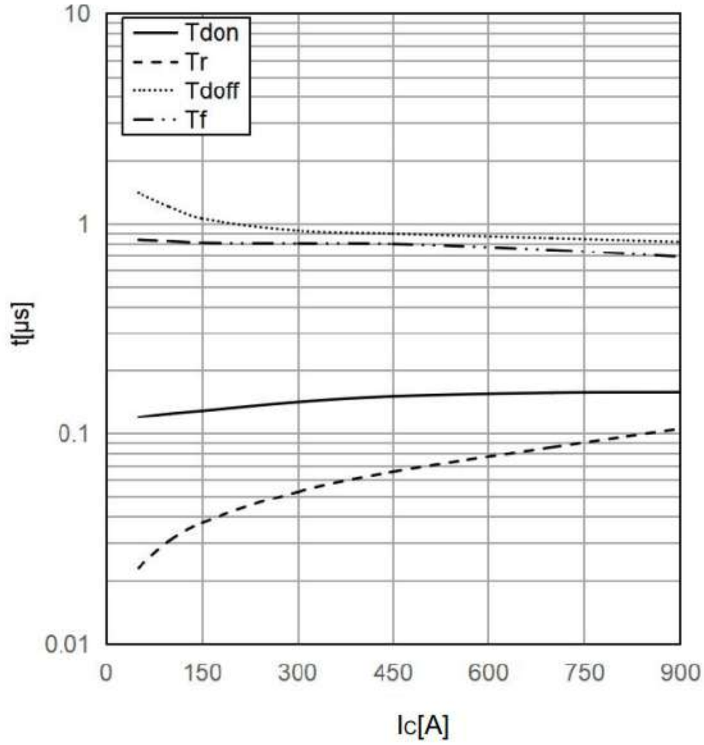
Switching losses IGBT, Inverter (Typical),
Inclusive RCC'+EE' $E = f(I_C)$
$V_{GE} = +15V/-8V$, $R_{Gon} = 1.5\Omega$, $R_{Goff} = 1.5\Omega$, $V_{CC} = 600V$



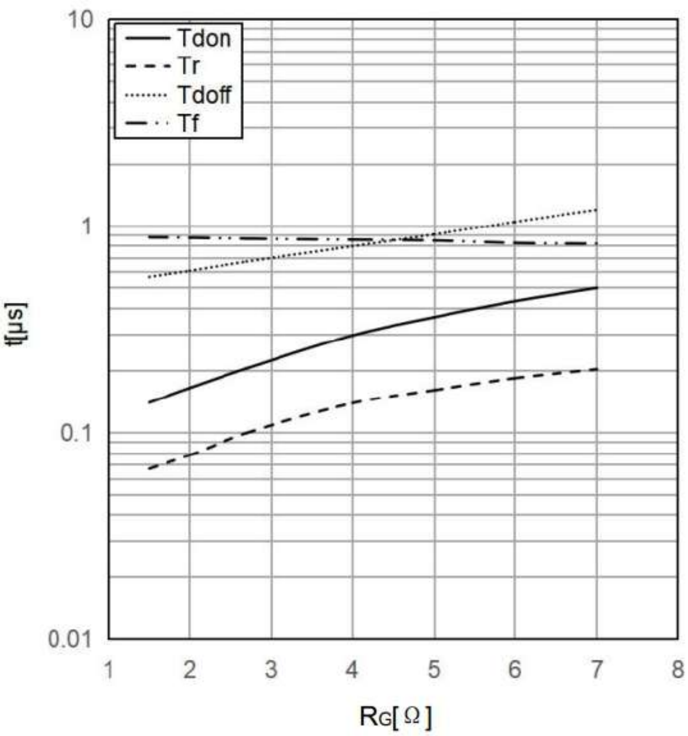
Switching losses IGBT, Inverter (Typical), Inclusive $R_{CC'+EE'}$
$E = f(R_G)$
V_{GE} = +15V/-8V, I_C = 450A, V_{CE} = 900V



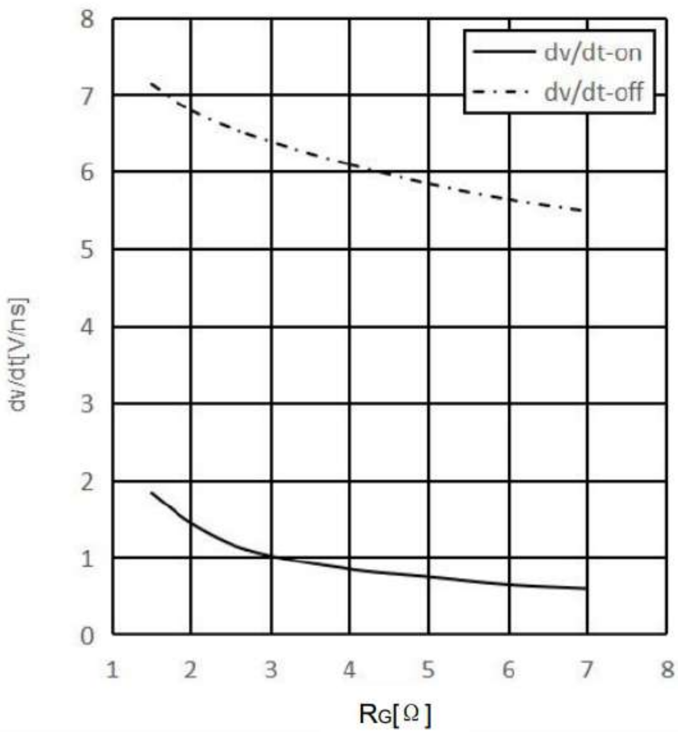
Switching times IGBT, Inverter (typical) IGBT
$t_{don} = f(I_C)$, $t_r = f(I_C)$, V_{GE} = +15V/-8V, V_{CE} = 900V
R_{gon} = 1.5Ω，R_{Goff} = 5Ω，T_j = 175°C



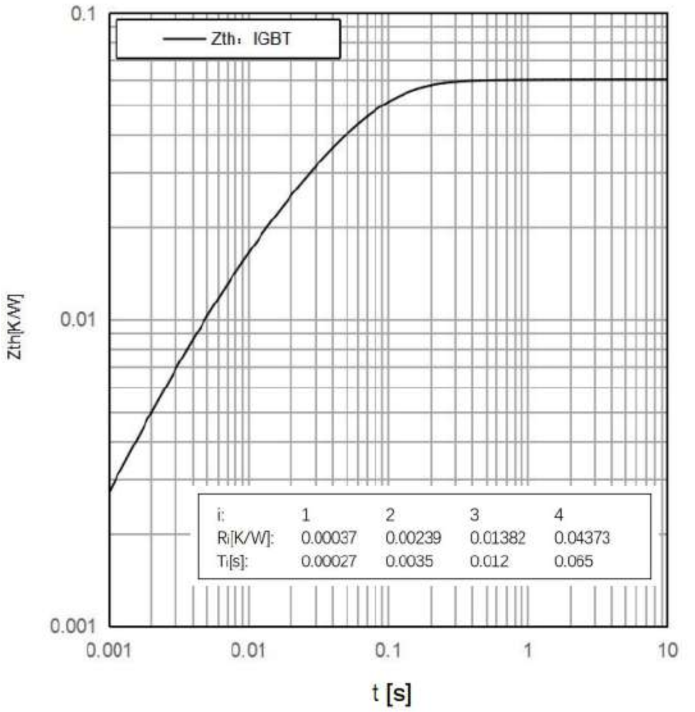
Switching times IGBT, Inverter (typical) IGBT
$t_{don} = f(R_G)$, $t_r = f(R_G)$, V_{GE} = +15V/-8V,
I_C = 450A, V_{CE} = 900V, T_j = 175°C



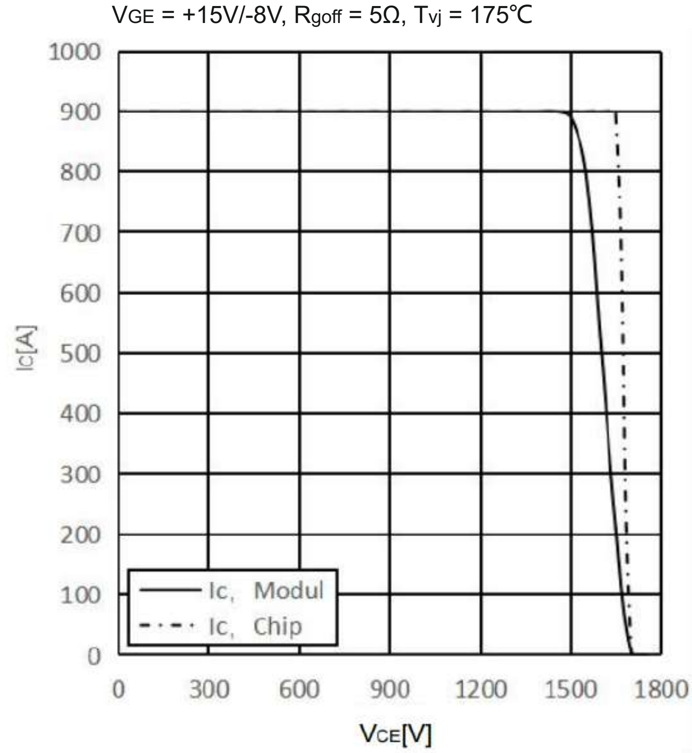
Inverter (typical) IGBT
$dv/dt = f(R_G)$, V_{GE} = +15V/-8V
I_C = 450A, V_{CE} = 900V, T_j = 25°C



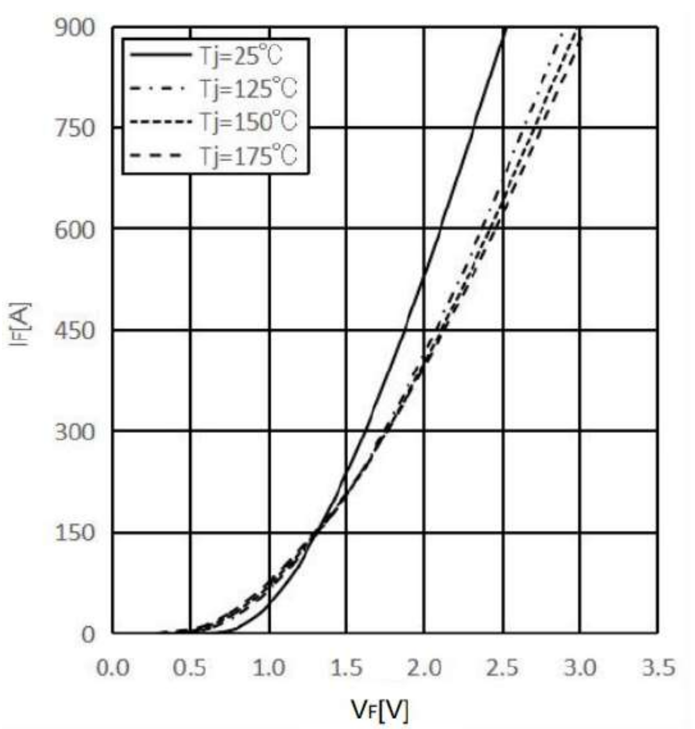
Transient thermal impedance IGBT, Inverter
$Z_{thJC} = f(t)$



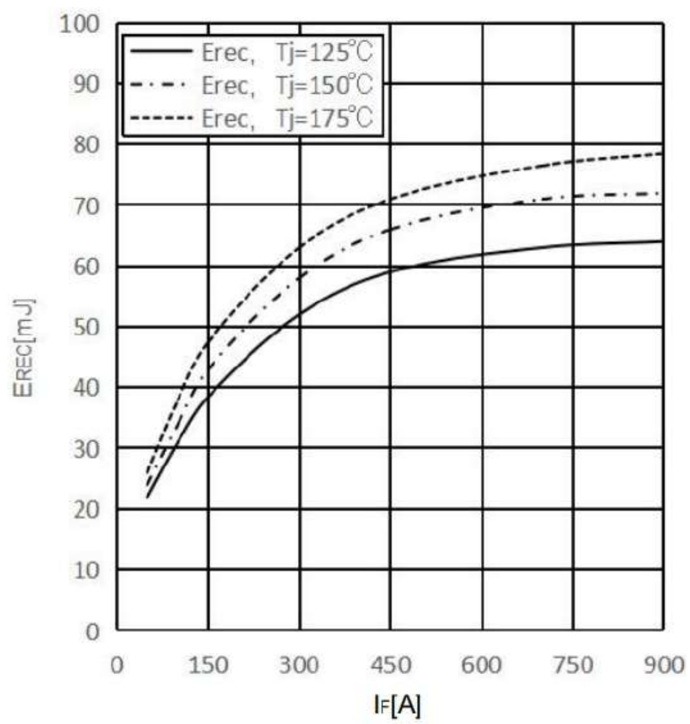
Reverse bias safe operating area IGBT, Inverter(RBSOA) $I_C = f(V_{CE})$
V_{GE} = +15V/-8V, R_{goff} = 5Ω, T_{vj} = 175℃



Forward characteristic FRD, Inverter (typical)
$I_F = f(V_F)$

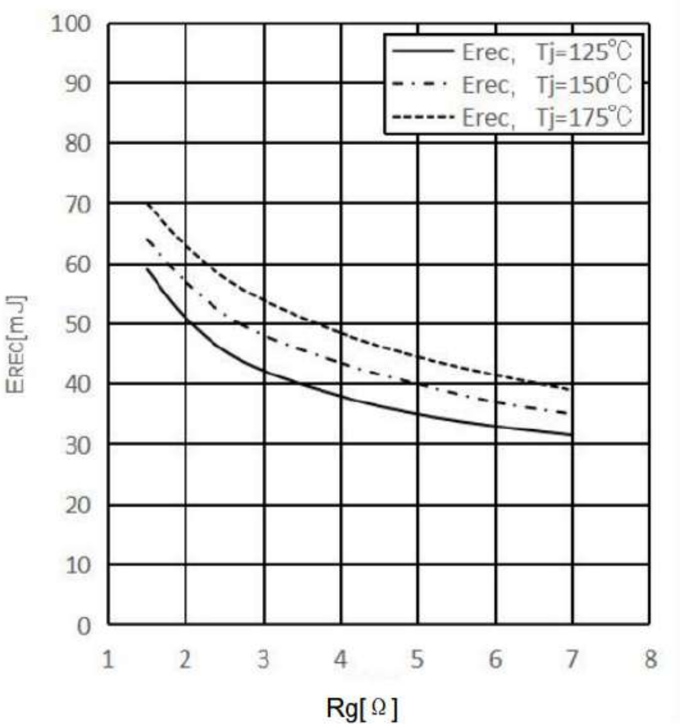


Switching Losses FRD, Inverter (typical), Inclusive $R_{CC'+EE'}$
$E_{rec} = f(I_F)$, R_{Gon} = 1.5Ω, V_{CE} = 900V

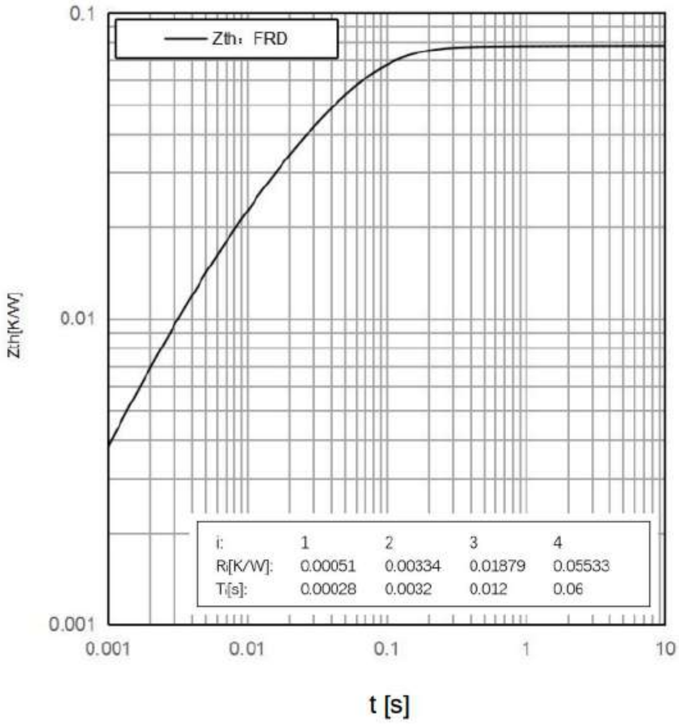


Switching Losses FRD, Inverter (typical),
Inclusive $R_{CC'+EE'}$

$E_{rec} = f(R_g)$

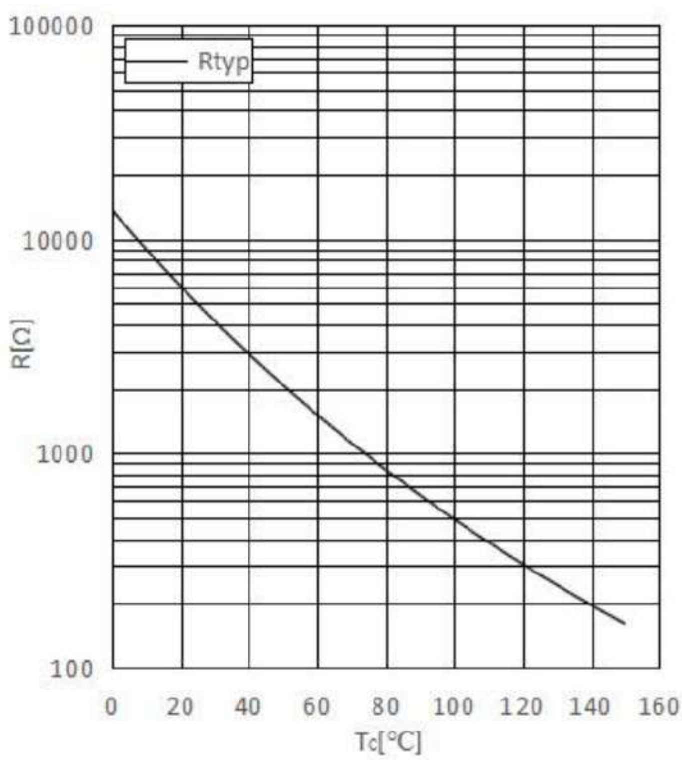


Transient thermal impedance IGBT, Inverter
$Z_{thJC} = f(t)$

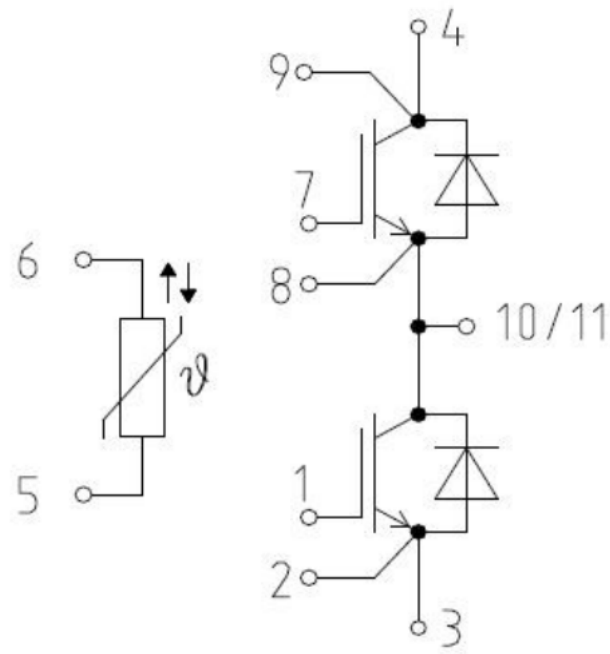


NTC Thermistor temperature characteristic
(typical)

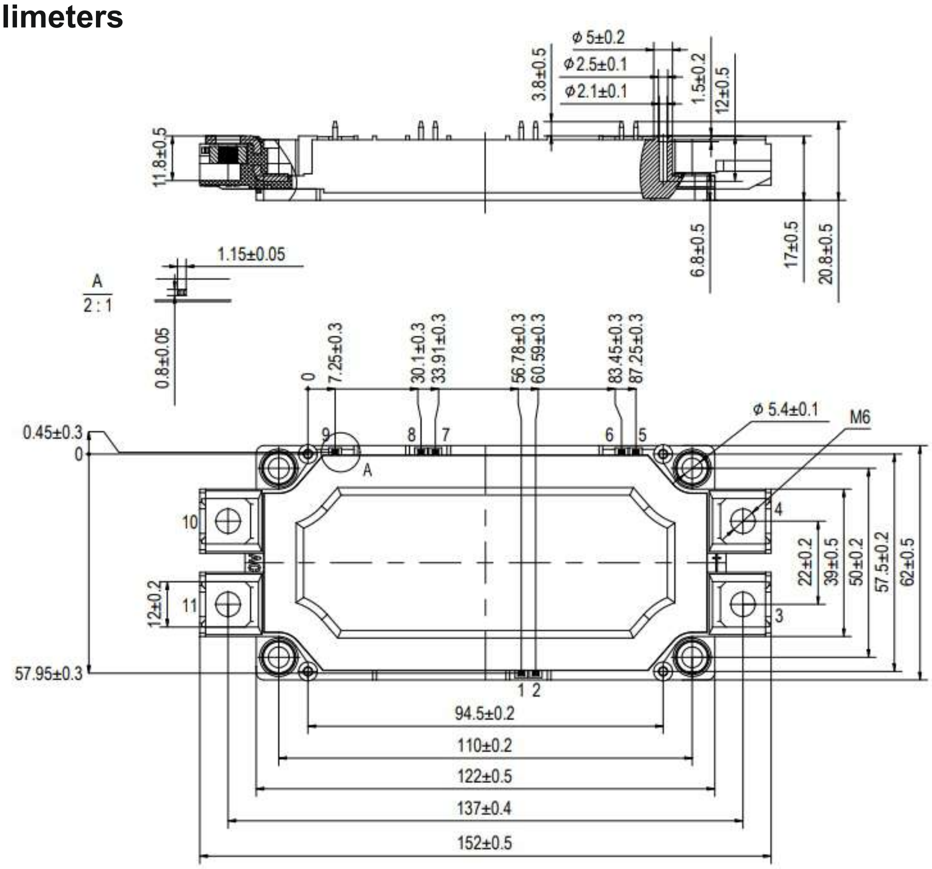
R = f(T)



Internal Circuit



Package Dimension/
Dimensions in Millimeters



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