

HALF BRIDGE IGBT Module

Features

- Trench+ Field Stop Technology
- Ultrasonic Welding of Terminal
- Aluminum Wire Bonding
- High Strength Ceramic Substrate

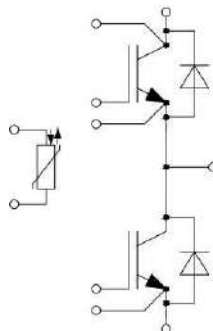
Application

- Inverter for motor drive
- Automotive Application
- Wind Turbines

Mechanical Data

- Case: Econo Dual3 Package

Block Diagram



Econo Dual3



Product Summary		
V _{CES} (V)	V _{CESAT} (V) Typ	I _C (A)
1200	1.76 @ 15V, 450A	450

IGBT, Inverter

Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameters	Symbol	Value	Unit
Collector-Emmitter Voltage	V _{CES}	1200	V
Gate-Emmitter Voltage	V _{GES}	±20	V
Collector DC Current-continuous T _C =100° C, T _J max=175°C	I _C	450	A
Repetitive peak collector current tp=1ms	I _{CRM}	900	A
Total power dissipation	P _D	2000	W

Table 2. Electrical Chatacteristics (T_J=25°C, unless otherwise specified)

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emmitter saturation Voltage	V _{CESAT}	V _{GE} =15V, I _C =450A, T _J =25° C		1.76		V
		V _{GE} =15V, I _C =450A, T _J =125° C		2.05		
		V _{GE} =15V, I _C =450A, T _J =150° C		2.12		
Gate Threshold Voltage	V _{GE(TH)}	V _{CE} =V _{GE} , I _C =7.6mA		5.9		V
Internal gate resistor	R _{gint}	T _J =25° C		4.5		Ω
Gate charge	Q _G	V _{GE} =-8V~+15V		2.29		μC
Zero Gate Voltage Collector Current	I _{CES}	V _{CE} =1200V, V _{GE} =0V			1	mA
Gate-body Leakage Current	I _{GES}	V _{CE} =0V, V _{GE} =20V			500	nA

Input Capacitance	C_{IES}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		50.4		nF
Reverse Transfer Capacitance	C_{RES}			1.13		nF
Turn-On Delay Time	$t_d(on)$	$V_{CE}=600V, I_C=450A,$ $V_{GE}=-8V/\pm 15V, R_G=2.0\Omega,$ $dI/dt_{on}=5050A/us$ $dV/dt_{off}=5570V/us,$ $T_J=25^\circ C$		180		ns
Turn-On Rise Time	t_r			74		ns
Turn-Off Delay Time	$t_d(off)$			518		ns
Turn-Off Fall Time	t_f			114		ns
Turn-On energy	E_{on}			32.4		mJ
Turn-Off energy	E_{off}			38.3		mJ
Turn-On Delay Time	$t_d(on)$	$V_{CE}=600V, I_C=450A,$ $V_{GE}=-8V/\pm 15V, R_G=2.0\Omega,$ $dI/dt_{on}=5250A/us$ $dV/dt_{off}=4680V/us,$ $T_J=125^\circ C$		184		ns
Turn-On Rise Time	t_r			76		ns
Turn-Off Delay Time	$t_d(off)$			568		ns
Turn-Off Fall Time	t_f			222		ns
Turn-On energy	E_{on}			46.72		mJ
Turn-Off energy	E_{off}			45.61		mJ
Turn-On Delay Time	$t_d(on)$	$V_{CE}=600V, I_C=450A,$ $V_{GE}=-8V/\pm 15V, R_G=2.0\Omega,$ $dI/dt_{on}=4800A/us$ $dV/dt_{off}=4280V/us,$ $T_J=150^\circ C$		184		ns
Turn-On Rise Time	t_r			76		ns
Turn-Off Delay Time	$t_d(off)$			570		ns
Turn-Off Fall Time	t_f			264		ns
Turn-On energy	E_{on}			52.7		mJ
Turn-Off energy	E_{off}			49.5		mJ
Temperature under switching conditions	T_{vjop}		-40		175	$^\circ C$
SC data	I_{sc}	$t_p \leq 10us, V_{GE}=15V,$ $V_{CC}=800V, V_{CEM} \leq 1200V,$ $T_J=25^\circ C$		2350		A
		$t_p \leq 10us, V_{GE}=15V,$ $V_{CC}=800V, V_{CEM} \leq 1200V,$ $T_J=150^\circ C$		2020		A

Diode, Inverter

Table1 Absolute Maximum Ratings ($T_C=25^\circ C$, unless otherwise specified)

Parameters	Symbol	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	1200	V
Continuous DC forward current	I_F	450	A
Repetitive peak forward current $t_p=1ms$	I_{FRM}	900	A

Table 2. Electrical Characteristics (T_J=25°C, unless otherwise specified)

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V _F	I _F =450A, T _J =25° C		2.174		V
		I _F =450A, T _J =125° C		2.297		
		I _F =450A, T _J =150° C		2.223		
Diode Peak Reverse Recovery Current	I _{rrm}	I _F =450A V _R =600V		204		A
Reverse Recovery Charge	Q _{rr}	-diF/dt =5150A/μs		18.75		μC
Reverse recovery energy	E _{rec}	T _J =25° C		5.17		mJ
Diode Peak Reverse Recovery Current	I _{rrm}	I _F =450A V _R =600V		243		A
Reverse Recovery Charge	Q _{rr}	-diF/dt =4940A/μs		37.90		μC
Reverse recovery energy	E _{rec}	T _J =125° C		12.94		mJ
Diode Peak Reverse Recovery Current	I _{rrm}	I _F =450A V _R =600V		267		A
Reverse Recovery Charge	Q _{rr}	-diF/dt =4740A/μs		48.68		μC
Reverse recovery energy	E _{rec}	T _J =150° C		16.43		mJ
Temperature under switching conditions	T _{vjop}		-40		175	°C

NTC-Thermistor

Table 1. Electrical Characteristics

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated resistances	R ₂₅	T _C =25°C, ±5%		5		KΩ
B-value	R _{25/50}	R ₂ =R _{25exp} [B _{25/50} (1/T ₂ -1/(298.15K))]		3375		K
Deviation of R100	ΔR/R	T _C =100°C, R ₁₀₀ =493.3Ω	-5		5	%
Power dissipation	P ₂₅				20	mW

Module

Table 1. Electrical Characteristics (T_J=25°C, unless otherwise specified)

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Isolation test voltage	V _{ISOL}	RMS, f=50Hz, t=60s	2500			V
Maximum junction temperature	T _{jmax}				175	°C
Storage temperature	T _{stg}		-40		125	°C
Operating junction temperature	T _{jop}		-40		150	°C
Stray inductance	L _{CE}			20		nH
Module lead resistance, terminals-chip	R _{CC'} +R _{EE'}			1.5		mΩ
Mounting torque for modul mounting	M		3.0		6.0	Nm
Weight	W			350		g

Electrical Characteristics (curves)

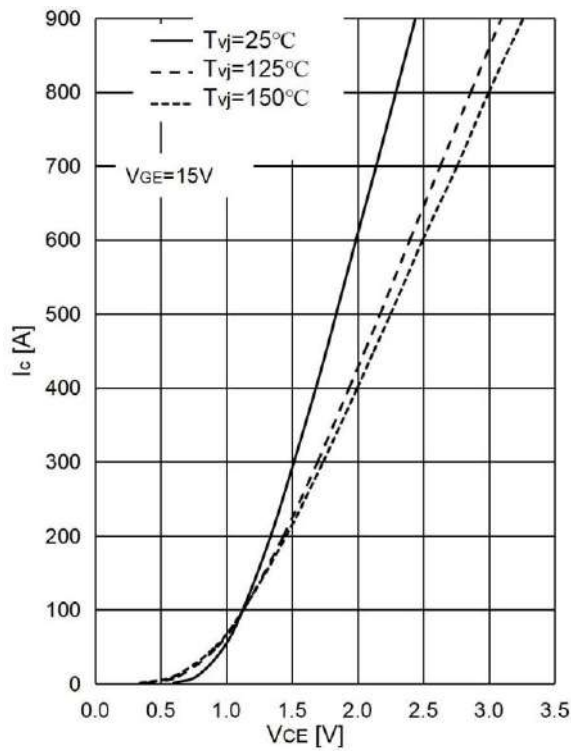


Fig 1. IGBT, Inverter Output Characteristic

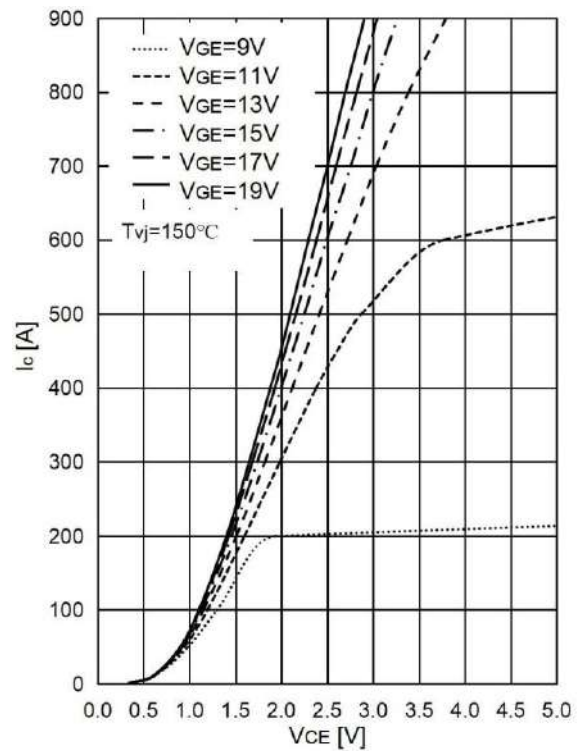


Fig 2. IGBT, Inverter Output Characteristic

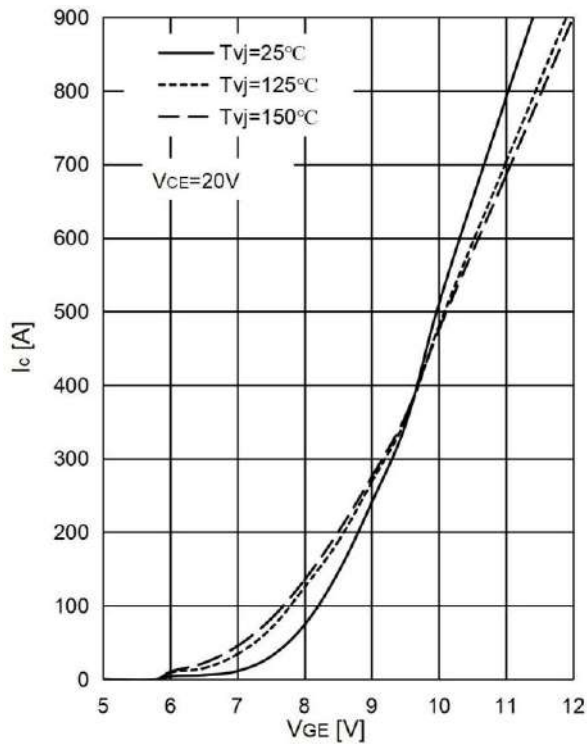


Fig 3. IGBT, Inverter Transfer Characteristic

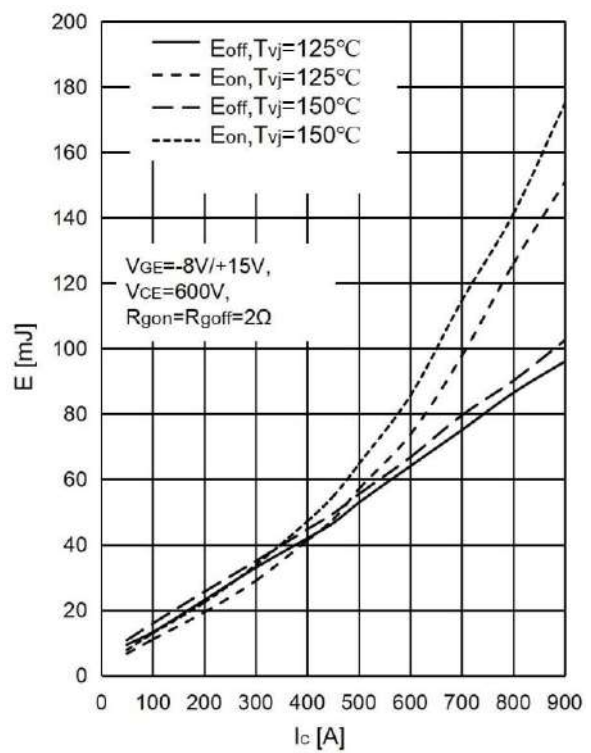


Fig 4. IGBT, Inverter Switching Loss Eon & Eoff vs. IC

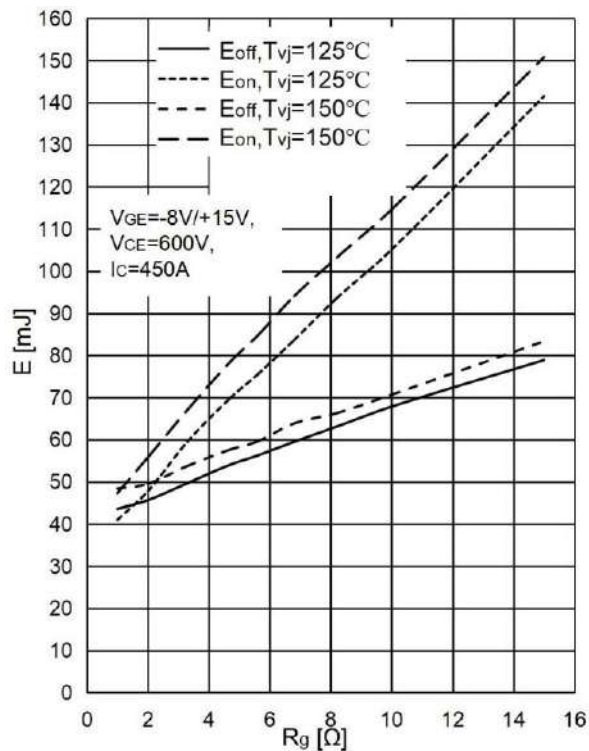


Fig 5. IGBT, Inverter Switching Loss E_{on} & E_{off} vs. R_g

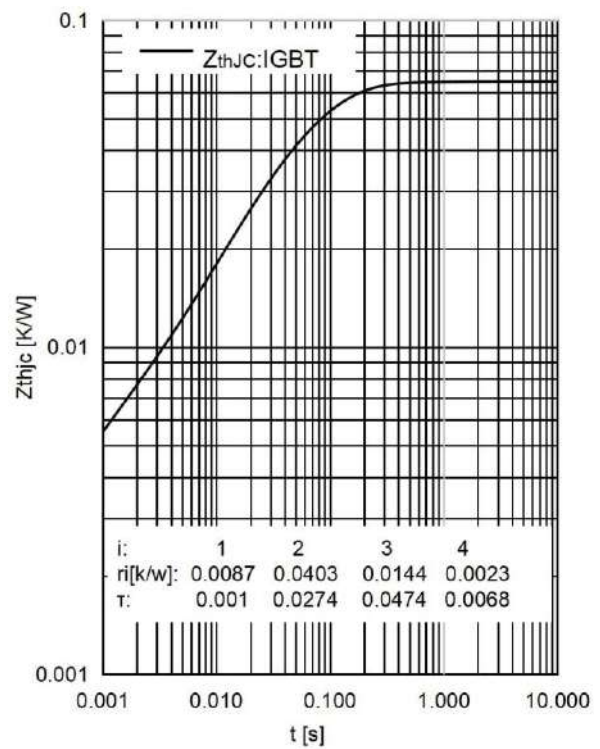


Fig 6. Transient thermal impedance IGBT, Inverter

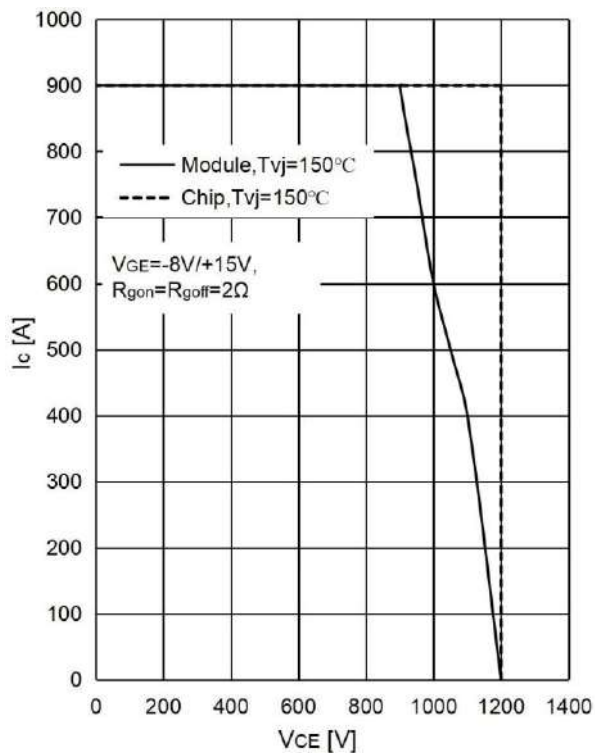


Fig 7. RBSOA (module)

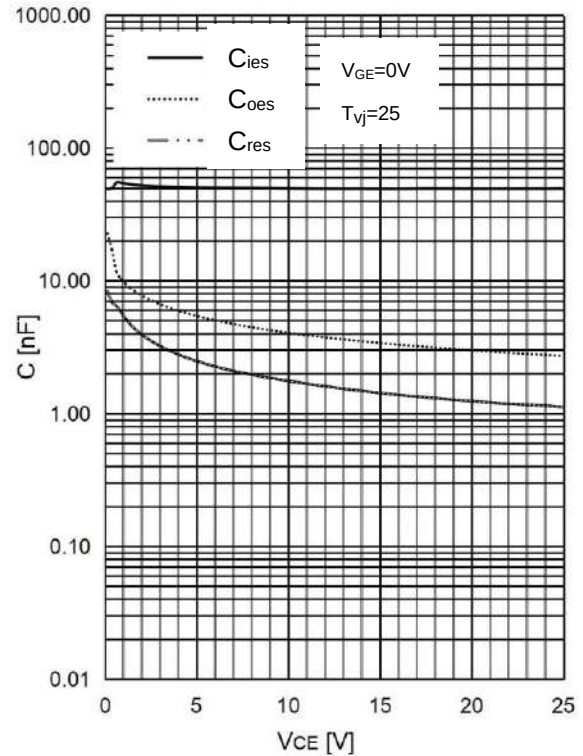


Fig 8. IGBT, Inverter Capacity Characteristic

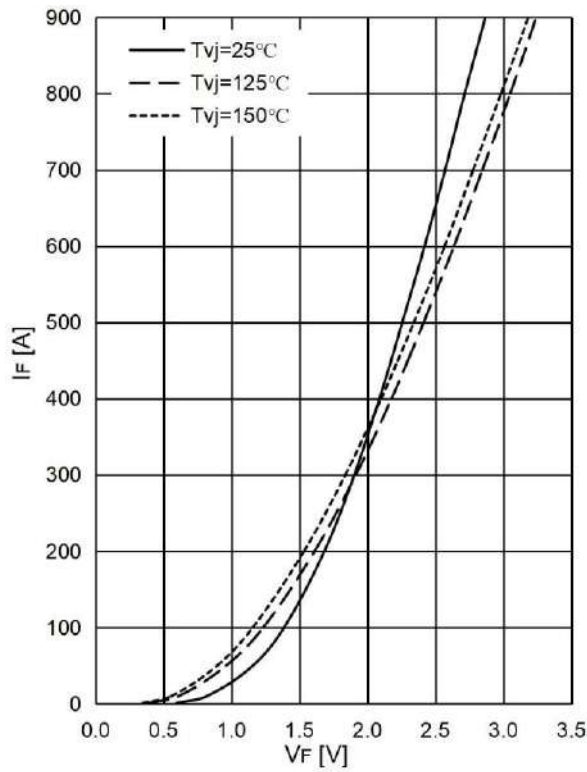


Fig 9. Diode, Inverter Forward Voltage V_F vs. I_F

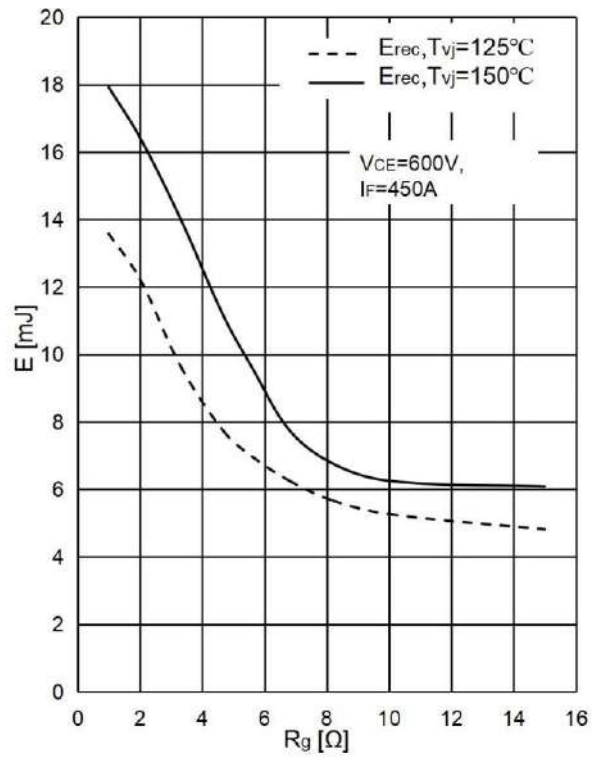


Fig 10. Diode, Inverter Switching Loss E_{rec} vs. R_g

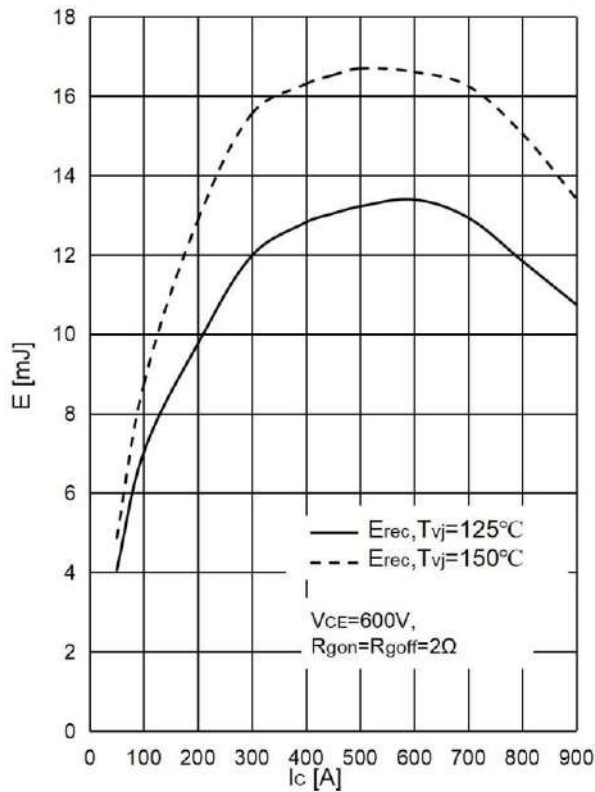


Fig 11. Diode, Inverter Switching Loss E_{rec} vs. I_F

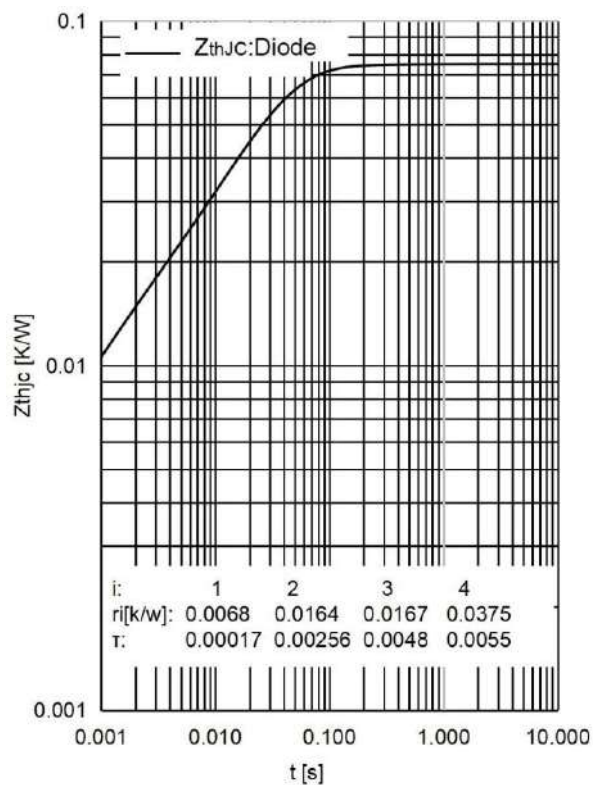


Fig 12. Transient thermal impedance Diode, Inverter

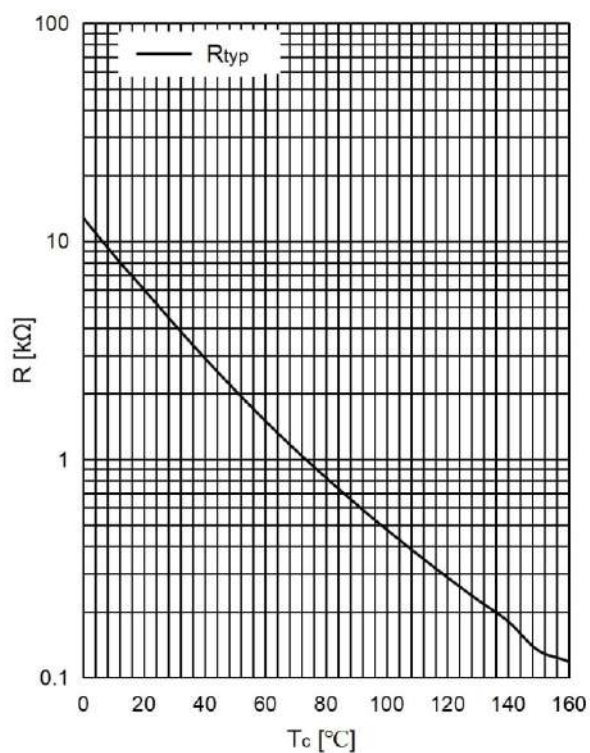
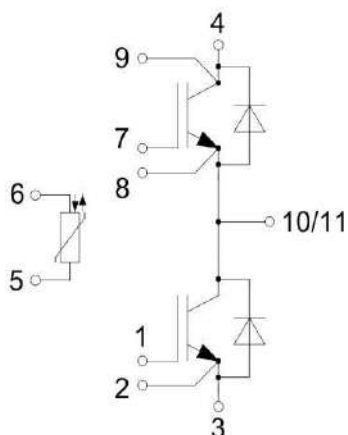


Fig 13. NTC Curve

Circuit diagram



Package outlines

