

600A 1200V Half bridge module

1 Description

These Insulated Gate Bipolar Transistor used advanced trench and Fieldstop technology design, provided excellent V_{CEsat} and switching speed, low gate charge. Which accords with the RoHS standard.

2 Features

- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage: $V_{CE(sat)}$, typ = 1.79V @ $I_C = 600A$ and $T_j = 25^\circ C$
- Extremely enhanced avalanche capability
- AEC-Q101 qualified

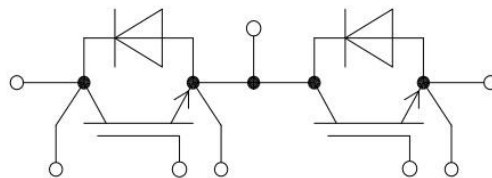
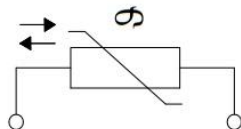
3 Applications

- Welding
- UPS
- Three-level Inverter
- AC and DC servo drive amplifier



Type	V_{CE}	$I_C(T_j=100^\circ C)$	$V_{CEsat}, T_j=25^\circ C$	T_{jop}	Package
DGD600H120L2T	1200V	600A	1.79V (Typ)	150°C	EconoDUAL3

4 Equivalent Circuit Schematic



5 Electrical Characteristics

5.1 Absolute Maximum Ratings (IGBT) (Tc=25°C, unless otherwise specified)

Parameter		Symbol	Value	Units
Collector-to-Emitter Voltage		V_{CE}	1200	V
Gate-to-Emitter Voltage		V_{GE}	±25	V
Short circuit	$V_{GE}=15V, V_{CC}=600V, T_j=150^{\circ}C$	tsc	10	us
DC Collector current	$T_C=100^{\circ}C$	I_C	600	A
Pulsed Collector Current #1		I_{CM}	1200	A

Notes: #1 Pulse duration is limited by $T_{j,max}$

5.2 Absolute Maximum Ratings (Diode) (Tc=25°C, unless otherwise specified)

PARAMETER		SYMBOL	VALUE	UNIT
Peak Repetitive Reverse Voltage		V_{RRM}	1200	V
DC Blocking Voltage		V_R	1200	V
Average Rectified Forward Current		$I_{F(AV)}$	600	A
Repetitive Peak Surge Current	tp=1ms	I_{FRM}	1200	A
I^2t -value	tp=10ms, $V_R=0V, T_{vj} = 150^{\circ}C$	I^2t	35000	A
Nonrepetitive Peak Surge Current	tp=10ms	I_{FSM}	3000	A

5.3 IGBT Module

Parameter	Symbol	VALUE	Units
Junction Temperature Range	T_{jmax}	-40~175	°C
Operating Junction Temperature	T_{jop}	-40~150	°C
Storage Temperature Range	T_{stg}	-40~125	°C
Isolation Voltage $R_{MS}, f=50Hz, t=1min$	V_{ISO}	3500	V

5.4 Thermal Characteristics (IGBT Module)

Parameter	Symbol	Rating	Units
Thermal Resistance Junction to Case	IGBT(Each)	0.033	°C/W
	Diode(Each)	0.065	

5.5 Module characteristics

Parameter	Symbol	Conditions	VALUE	Units
Material of module baseplate			Cu	
Internal isolation	Ms	M5	3.0-6.0	N·m
Internal isolation	Mt	M6	3.0-6.0	N·m
Comperative tracking index	CTI		>200	
Flatness of base plate			0.3	mm
Weight			356	g
Stray Inductance	L_{CE}		26	nH
Internal isolation		ceramics	Si_3N_4	

5.5 Electrical Characteristics (IGBT) (Tc=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Value			Units
			Min	Typ	Max	
Static Characteristics						
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CES}$	$I_C=0.25mA, V_{GE}=0V, T_C=25^\circ C$	1200	--	--	V
		$I_C=1mA, V_{GE}=0V, T_C=125^\circ C$	--	1425	--	V
Collector-to-Emitter Leakage Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V, T_C=25^\circ C$	--	5.0	100	μA
		$V_{CE}=1200V, V_{GE}=0V, T_C=125^\circ C$	--	500	--	μA
		$V_{CE}=1200V, V_{GE}=0V, T_C=150^\circ C$	--	--	5.0	mA
Gate-to-Emitter Leakage	I_{GES}	$V_{GE}=\pm 25V, V_{CE}=0V, T_C=25^\circ C$	--	--	± 300	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=10mA$	5.0	5.7	6.5	V
Collector-emitter saturation voltage	V_{CEsat}	$V_{GE}=15V, I_C=600A, T_C=25^\circ C$	--	1.87	2.4	V
		$V_{GE}=15V, I_C=600A, T_C=125^\circ C$	--	2.15	--	V
		$V_{GE}=15V, I_C=600A, T_C=150^\circ C$	--	2.25	--	V
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_a=25^\circ C$	--	30	--	nF
Reverse Transfer Capacitance	C_{riss}		--	1.6	--	
IGBT Characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CE}=600V, I_C=600A, R_g=5.1\Omega, V_{GE}=-15/15V, L=75\mu H, T_C=25^\circ C$	--	436	--	nS
Rise time	t_r		--	175	--	nS
Turn-off delay time	$t_{d(off)}$		--	973	--	nS
Fall time	t_f		--	128	--	nS
Turn-on energy	E_{on}		--	69	--	mJ
Turn-off energy	E_{off}		--	82	--	mJ
Total switching energy	E_{ts}		--	151	--	mJ
Turn-on delay time	$t_{d(on)}$	$V_{CE}=600V, I_C=600A, R_g=5.1\Omega, V_{GE}=-15/15V, L=75\mu H, T_C=150^\circ C$	--	374	--	nS
Rise time	t_r		--	226	--	nS
Turn-off delay time	$t_{d(off)}$		--	1036	--	nS
Fall time	t_f		--	374	--	nS
Turn-on energy	E_{on}		--	123	--	mJ
Turn-off energy	E_{off}		--	104	--	mJ
Total switching energy	E_{ts}		--	227	--	mJ
Gate charge	Q_G	$V_{GE}=-15/15V,$	--	3.5	--	μC

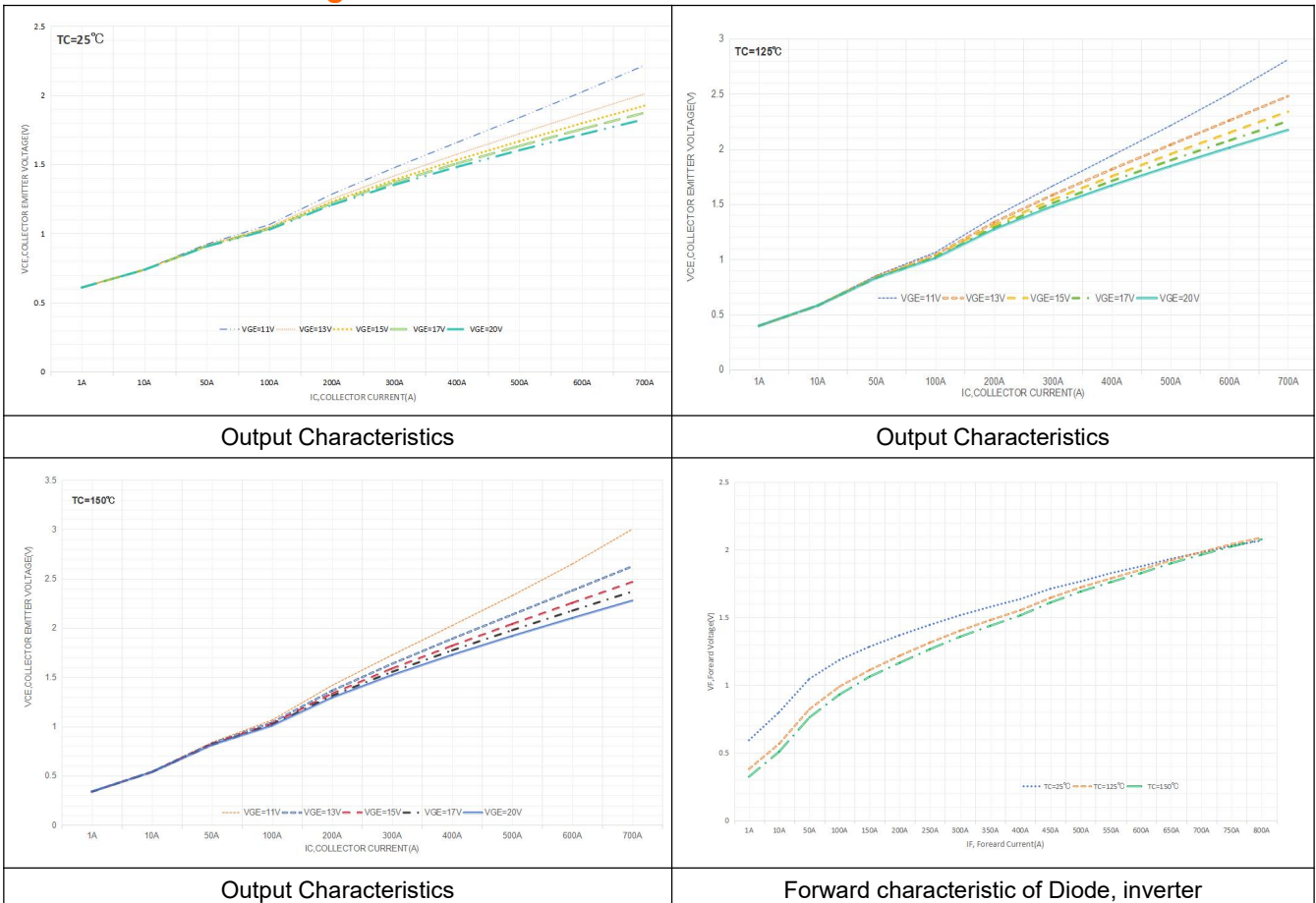
5.6 Electrical Characteristics (Diode)(Tc=25°C, unless otherwise specified)

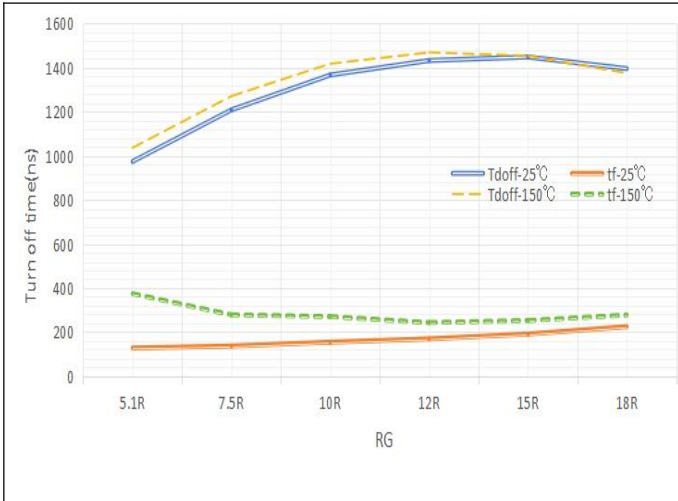
Parameter	Symbol	Conditions	Value			Units
			Min	Typ	Max	
Diode forward voltage	V _F	I _F =600A, T _C =25°C	--	1.87	2.4	V
		I _F =600A, T _C =125°C	--	1.85	--	V
		I _F =600A, T _C =150°C	--	1.82	--	V
Diode reverse recovery time	t _{rr}	T _{vj} = 25°C, V _{CC} = 600V,	--	746	--	ns
Diode peak reverse recovery current	I _{rrm}	I _C = 600A, R _g =5.1RΩ,	--	122	--	A
Diode reverse recovery charge	Q _{rr}	V _{GE} = -15/15V	--	52	--	uC
Reverse recovery energy	E _{rec}		--	19	--	mJ
Diode reverse recovery time	t _{rr}	T _C = 150°C, V _{CC} = 600V,	--	1312	--	ns
Diode peak reverse recovery current	I _{rrm}	I _C = 600A, V _{GE} = -15/15V,	--	164	--	A
Diode reverse recovery charge	Q _{rr}	R _g =5.1RΩ,	--	129	--	uC
Reverse recovery energy	E _{rec}		--	47	--	mJ

5.7 Electrical Characteristics (NTC)(Tc=25°C, unless otherwise specified)

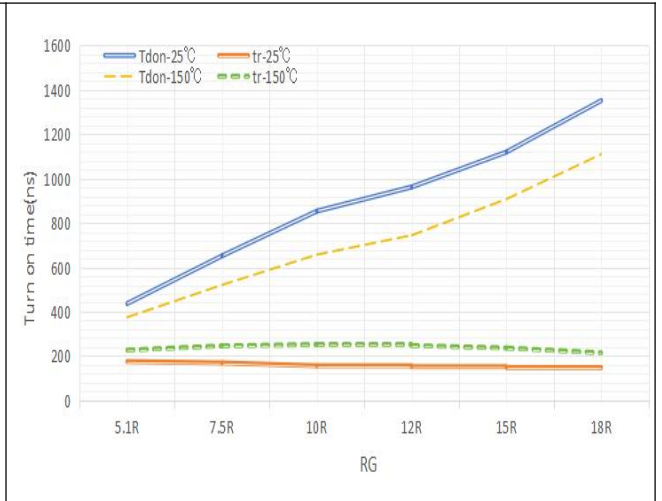
Parameter	Symbol	Conditions	Value			Units
			Min	Typ	Max	
Rated Resistance	R ₂₅	T _C =25°C	--	5.0	--	kΩ
B-value	B _{25/50}	B (25/50), tolerance ±3%	--	3375	--	k
B-value	B _{25/100}	B (25/100), tolerance ±3%	--	3433	--	k
Deviation of R100	ΔR/R	T _C = 100°C, R100 = 493 Ω	-5	--	+5	%
Power Dissipation	P ₂₅	TNTC = 25°C	--	--	60	mW

6 Characteristics diagrams

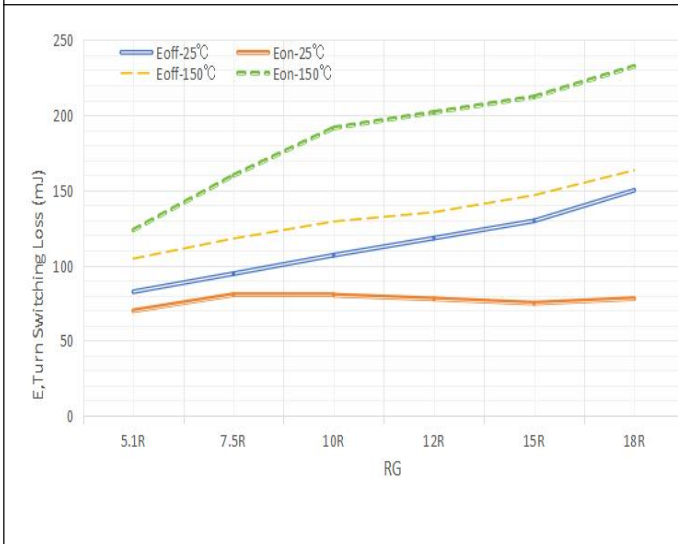




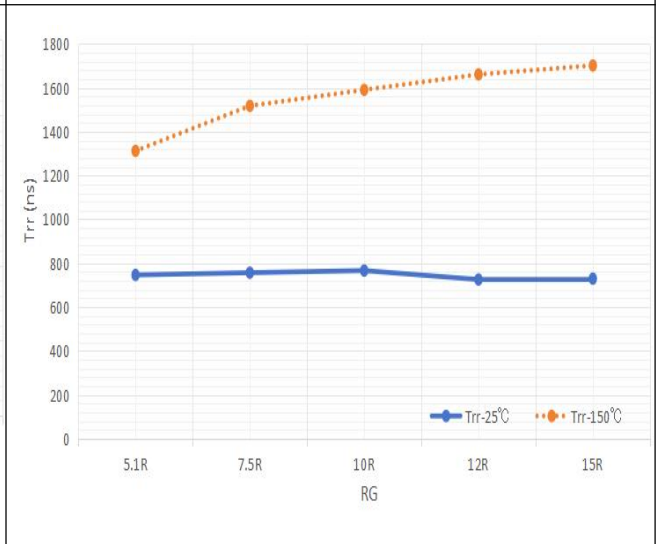
Typical Switching Time Toff VS Rg



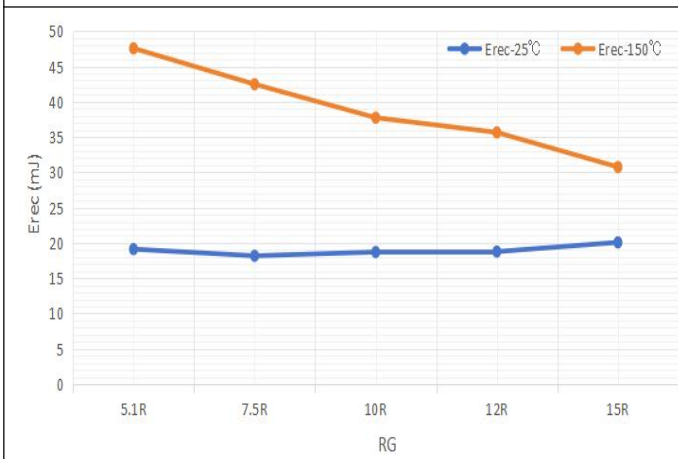
Typical Switching Time on VS Rg



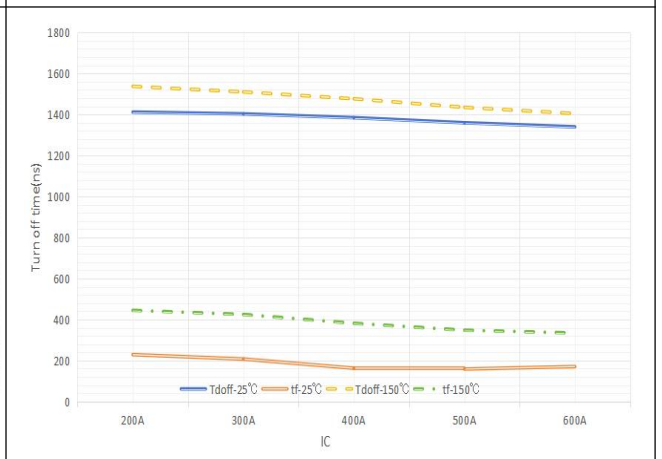
Typical Switching Loss vs. Rg



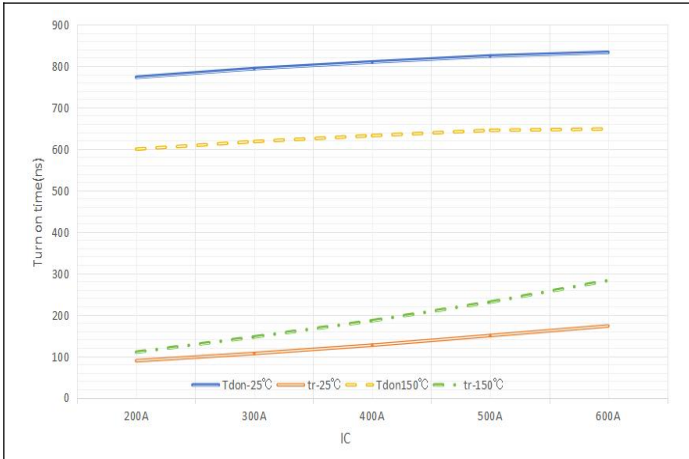
FRD Reverse recovery time vs Rg



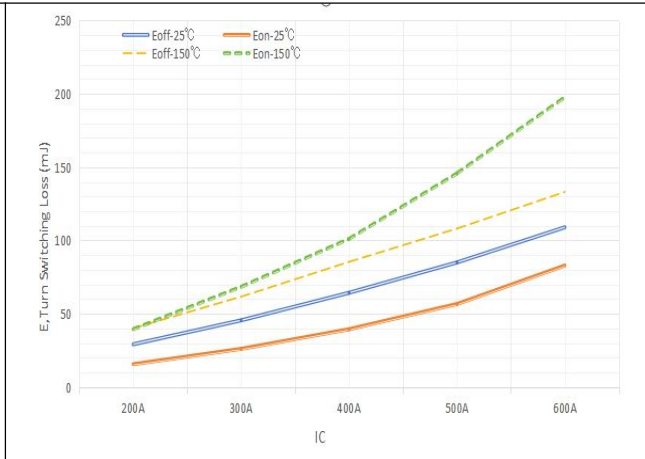
FRD Reverse recovery loss vs Rg



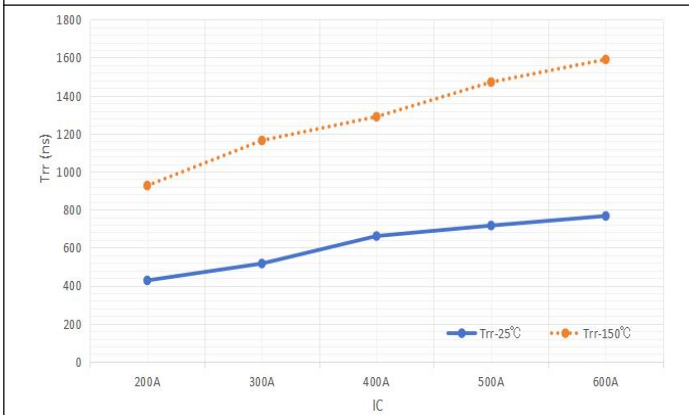
Typical Switching Time Toff VS IC



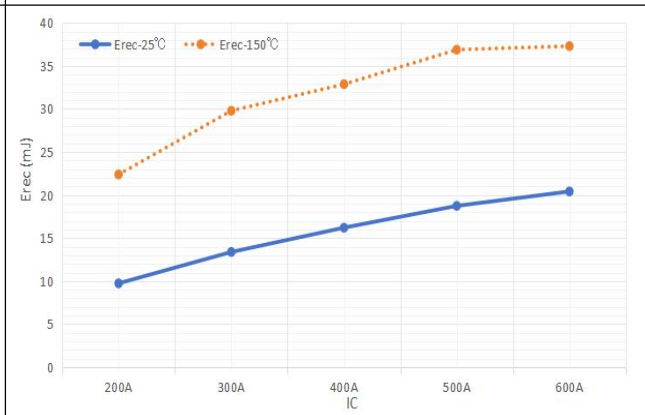
Typical Switching Time on VS IC



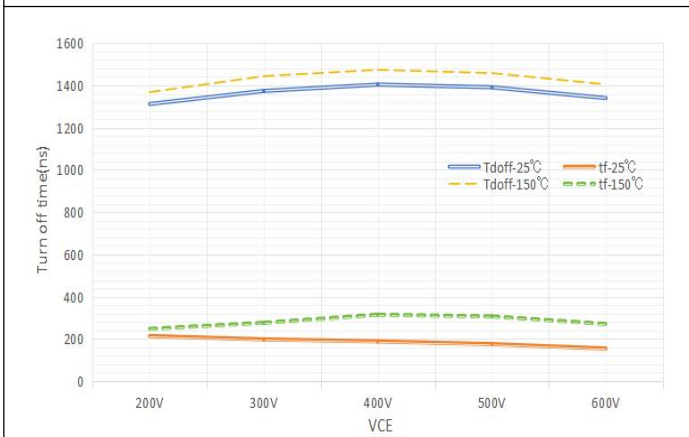
Typical Switching Loss vs. IC



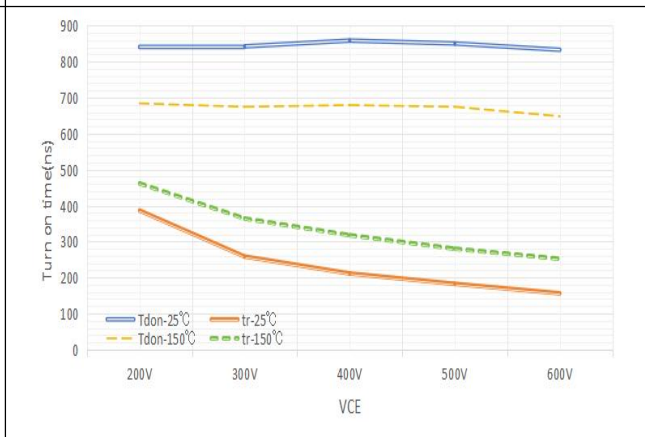
FRD Reverse recovery time vs IC



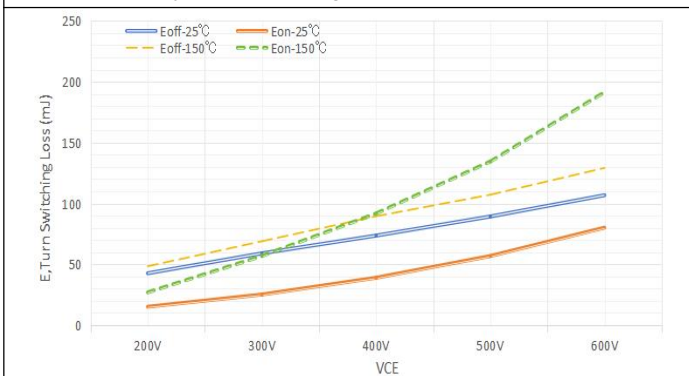
FRD Reverse recovery loss vs IC



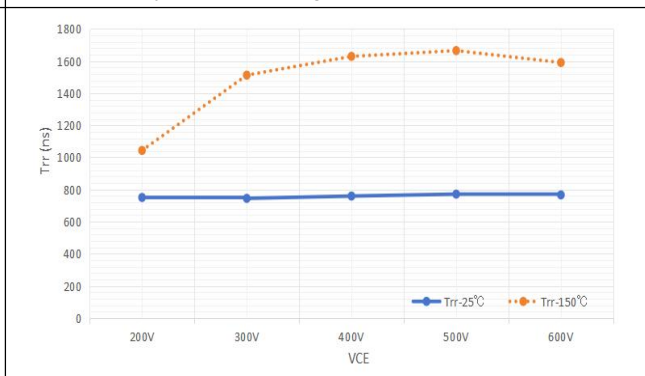
Typical Switching Time Toff VS VCE



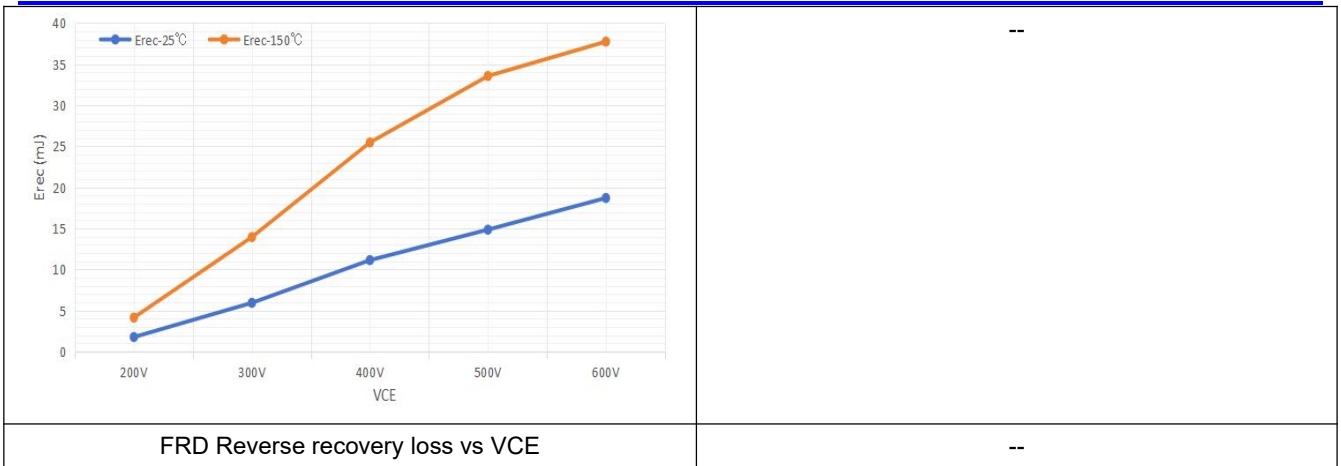
Typical Switching Time on VS VCE



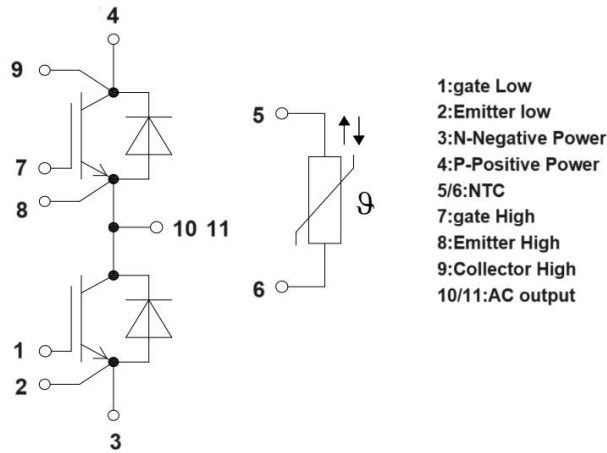
Typical Switching Loss vs. VCE



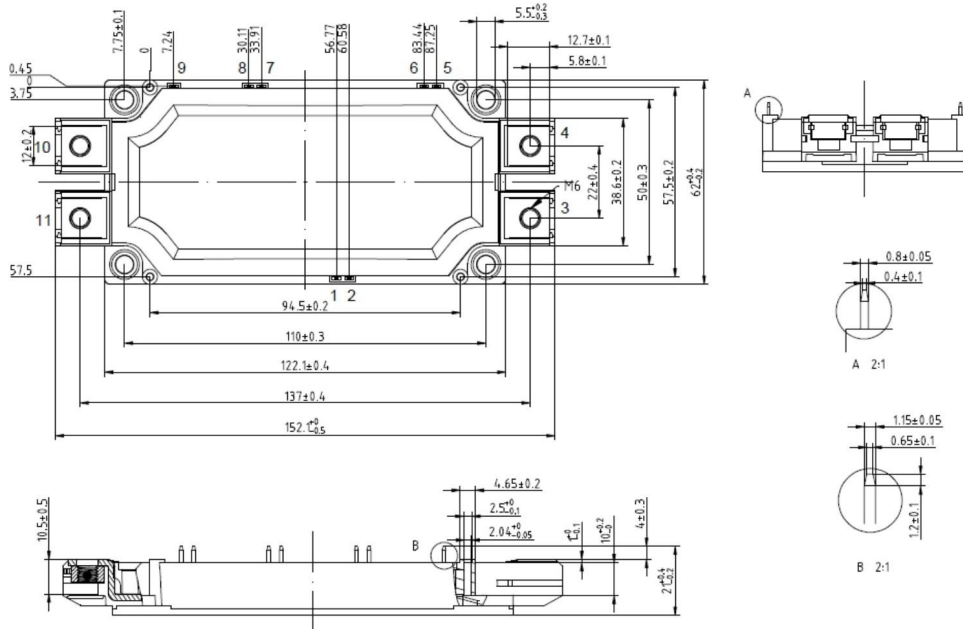
FRD Reverse recovery time vs VCE



7 Circuit Schematic



7.1 Dimensions



8 Attentions

- Jiangsu Donghai Semiconductor Technology CO.,LTD. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Donghai products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

9 Appendix

Revision history:

Date	REV.	Description	Page
2024.2.20	1.0	Original	
2024.3.5	1.1	Add AEC-Q101 identification	1Page