

PIM with Trench Field-Stop IGBT, Emitter Controlled Diode and NTC

Features

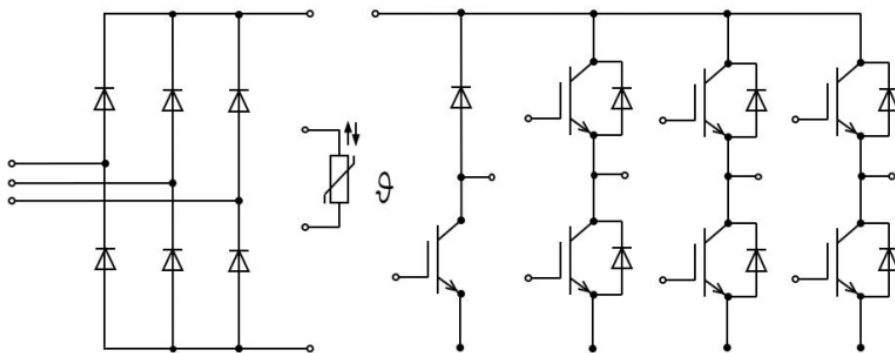
- $V_{CE}=1200V$ $I_C=40A$
- Low $V_{CE(sat)}$
- V_{CEsat} with positive temperature coefficient

Applications

- The inverter
- Motor control and drives



Equivalent Circuit Schematic



IGBT - Inverter

Maximum Rated Values

Symbol	Description	Conditions	Values	Unit
V_{CES}	Collector-Emitter Voltage	$T_{vj}=25^{\circ}C$	1200	V
V_{GES}	Gate-Emitter Peak Voltage	$T_{vj}=25^{\circ}C$	± 30	V
I_C	Continuous DC Collector Current	$T_C=100^{\circ}C$	40	A
I_{CRM}	Repetitive Peak Collector Current	$t_p=1ms$	70	A
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vj\ max}=150^{\circ}C$	193	W

Characteristic Values

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=40A, T_{vj}=25^{\circ}C$	---	1.83	--	V
		$V_{GE}=15V, I_C=40A, T_{vj}=125^{\circ}C$	---	2.23	--	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=2mA$	--	6.2	--	V
I_{CES}	Collector-Emitter Cut-Off Current	$V_{CE}=1200V, V_{GE}=0V$	---	---	1.2	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=15V, V_{CE}=0V$	---	---	410	nA
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=\pm 15V$ $I_C=40A$ $R_G=15\Omega$ Inductive Load $T_{vj}=25^{\circ}C$	---	50	---	ns
t_r	Turn-on Rise Time		---	48	---	ns
$t_{d(off)}$	Turn-off Delay Time		---	200	---	ns
t_f	Turn-off Fall Time		---	156	---	ns
E_{on}	Turn-on Switching Loss		---	2.64	---	mJ
E_{off}	Turn-off Switching Loss		---	1.87	---	mJ
I_{SC}	Short Circuit data	$V_{GE}\leq 15V, V_{CC}=600V$ $t_p\leq 10\mu s, T_{vj}=25^{\circ}C$	---	160	---	A
R_{thJC}	Thermal Resistance, Junction to Case	Per IGBT	---	---	0.65	K/W
T_{VJOP}	Virtual Junction Temperature	Under Switching	-40	---	125	$^{\circ}C$

**Diode - Inverter
Maximum Rated Values**

Symbol	Description	Conditions	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj}=25^{\circ}C$	1200	V
I_F	Continuous DC Forward Current	$T_C=100^{\circ}C$	40	A
I_{FRM}	Repetitive Peak Collector Current	$t_p=1ms$	70	A

Characteristic Values

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
V _F	Forward Voltage	I _F =40A, V _{GE} =0V, T _{vj} =25°C	---	2.2	---	V
		I _F =40A, V _{GE} =0V, T _{vj} =125°C	---	2.3	---	V
t _{rr}	Reverse Recovery time	I _F =40A, di/dt=100A/us V _R =600V, T _{vj} =25°C	---	170	---	ns
Q _r	Recovered Charge		---	0.98	---	uC
E _{rec}	Reverse Recovery Energy		---	0.35	---	mJ
R _{thJC}	Thermal Resistance, Junction to Case	Per Diode	---	---	1	K/W
T _{VJ OP}	Virtual Junction Temperature	Under Switching	-40	---	125	°C

**Diode - Rectifier
Maximum Rated Values**

Symbol	Description	Conditions	Values	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	T _{vj} =25°C	1800	V
I _{FSM}	Surge Forward Current	t _p =10ms, T _j =25°C	420	A
I ² t	I ² t Value	t _p =10ms, T _j =25°C	880	A ² s

Characteristic Values

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
V _F	Forward Voltage	I _F =40A, V _{GE} =0V, T _{vj} =25°C	---	0.9	---	V
I _R	Recovery Current	V _R =1800V	---	1.1	---	mA
R _{thJC}	Thermal Resistance, Junction to Case	Per Diode	---	0.78	---	K/W
T _{VJ OP}	Virtual Junction Temperature	Under Switching	-40	---	150	°C

IGBT – Brake

Maximum Rated Values

Symbol	Description	Conditions	Values	Unit
V_{CES}	Collector-Emitter Voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Peak Voltage	$T_{vj}=25^{\circ}\text{C}$	± 20	V
I_C	Continuous DC Collector Current	$T_C=100^{\circ}\text{C}$	25	A
I_{CRM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	50	A

Characteristic Values

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15\text{V}, I_C=25\text{A}, T_{vj}=25^{\circ}\text{C}$	---	2.01	--	V
		$V_{GE}=15\text{V}, I_C=25\text{A}, T_{vj}=125^{\circ}\text{C}$	---	2.53	--	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=5.0\text{mA}$	---	5.8	---	V
I_{CES}	Collector-Emitter Cut-Off Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}$	---	---	1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=15\text{V}, V_{CE}=0\text{V}$	---	---	410	nA
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $I_C=25\text{A}$ $R_G=15\Omega$ Inductive Load $T_{vj}=25^{\circ}\text{C}$	---	170	---	ns
t_r	Turn-on Rise Time		---	160	---	ns
$t_{d(off)}$	Turn-off Delay Time		---	170	---	ns
t_f	Turn-off Fall Time		---	150	---	ns
E_{on}	Turn-on Switching Loss		---	3.7	---	mJ
E_{off}	Turn-off Switching Loss		---	1.4	---	mJ
R_{thJC}	Thermal Resistance, Junction to Case	Per IGBT	---	---	0.89	K/W
T_{VJOP}	Virtual Junction Temperature	Under Switching	-40	---	150	$^{\circ}\text{C}$

Diode - Brake

Maximum Rated Values

Symbol	Description	Conditions	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V
I_F	Continuous DC Forward Current	$T_C=100^{\circ}\text{C}$	25	A
I_{FRM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	50	A

Characteristic Values

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage	$T_{vj}=25^{\circ}\text{C}$	---	2.03	---	V
		$T_{vj}=125^{\circ}\text{C}$	---	2.05	---	V
t_{rr}	Reverse Recovery Time	$I_F=25\text{A}$, $di/dt=-250\text{A/us}$ $V_R=600\text{V}$, $T_{vj}=25^{\circ}\text{C}$	---	220	---	ns
Q_r	Recovered Charge		---	0.8	---	μC
E_{rec}	Reverse Recovery Energy		---	0.2	---	mJ
R_{thJC}	Thermal Resistance, Junction to Case	Per Diode	---	---	1.24	K/W
T_{VJOP}	Virtual Junction Temperature	Under Switching	-40	---	150	$^{\circ}\text{C}$

NTC-Thermistor

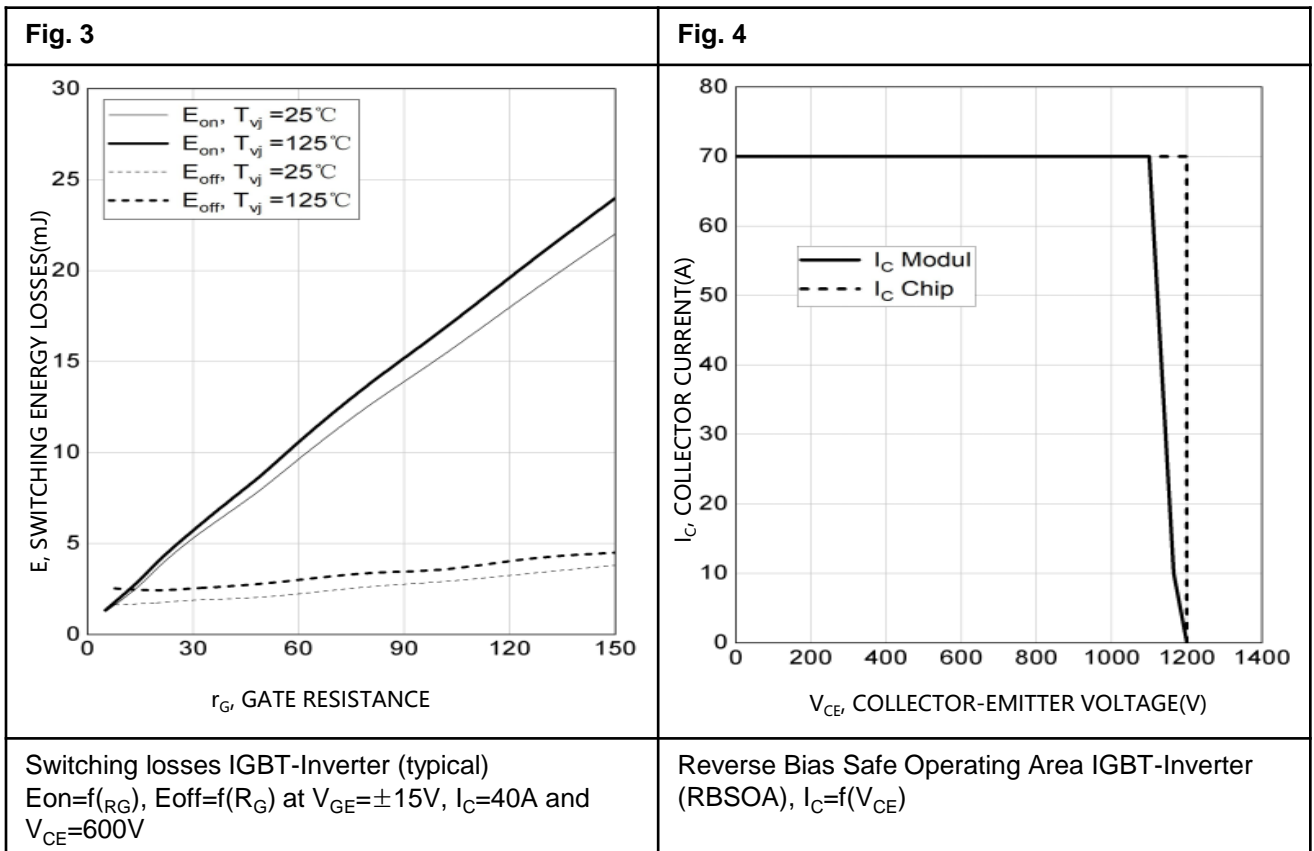
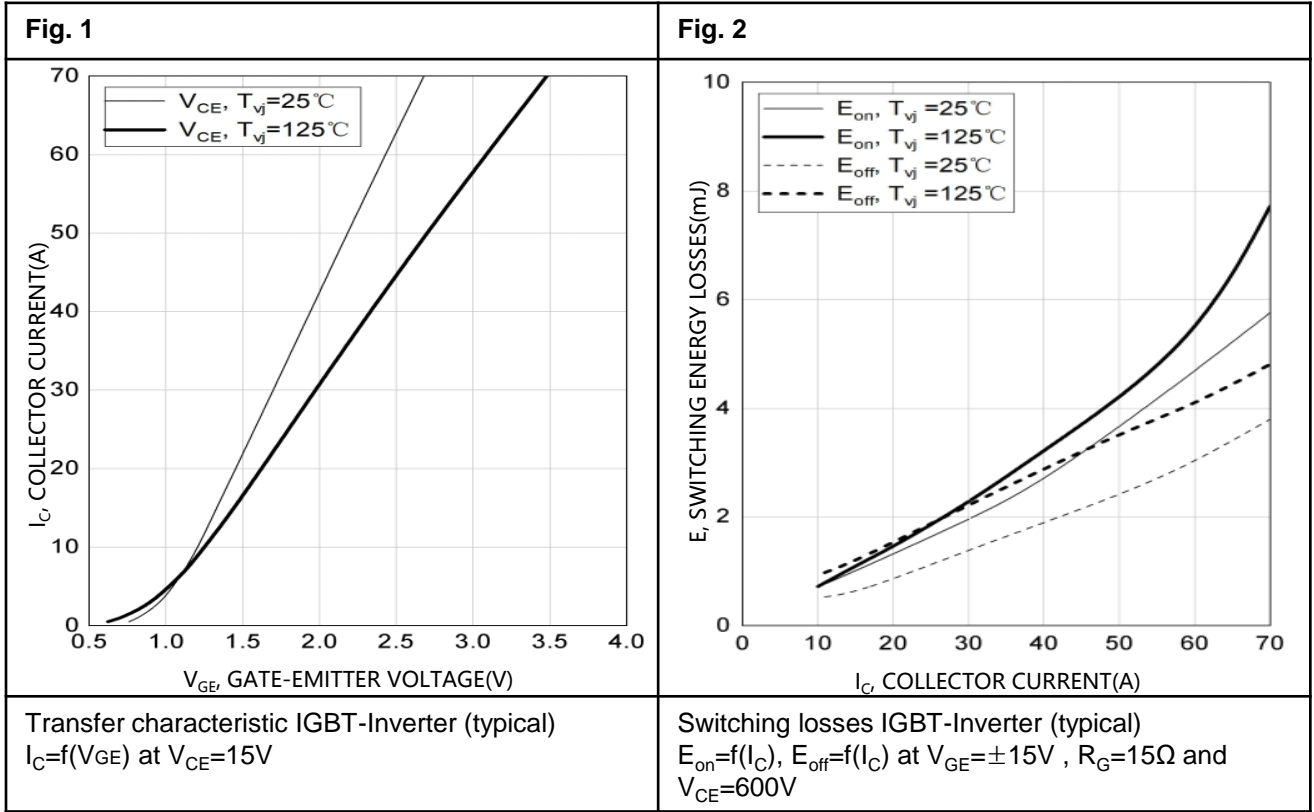
Characteristic Values

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
R_{25}	Rated Resistance	$T_C=25^{\circ}\text{C}$	---	5	---	K Ω
$B_{25/50}$	B Value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	---	3450	---	K

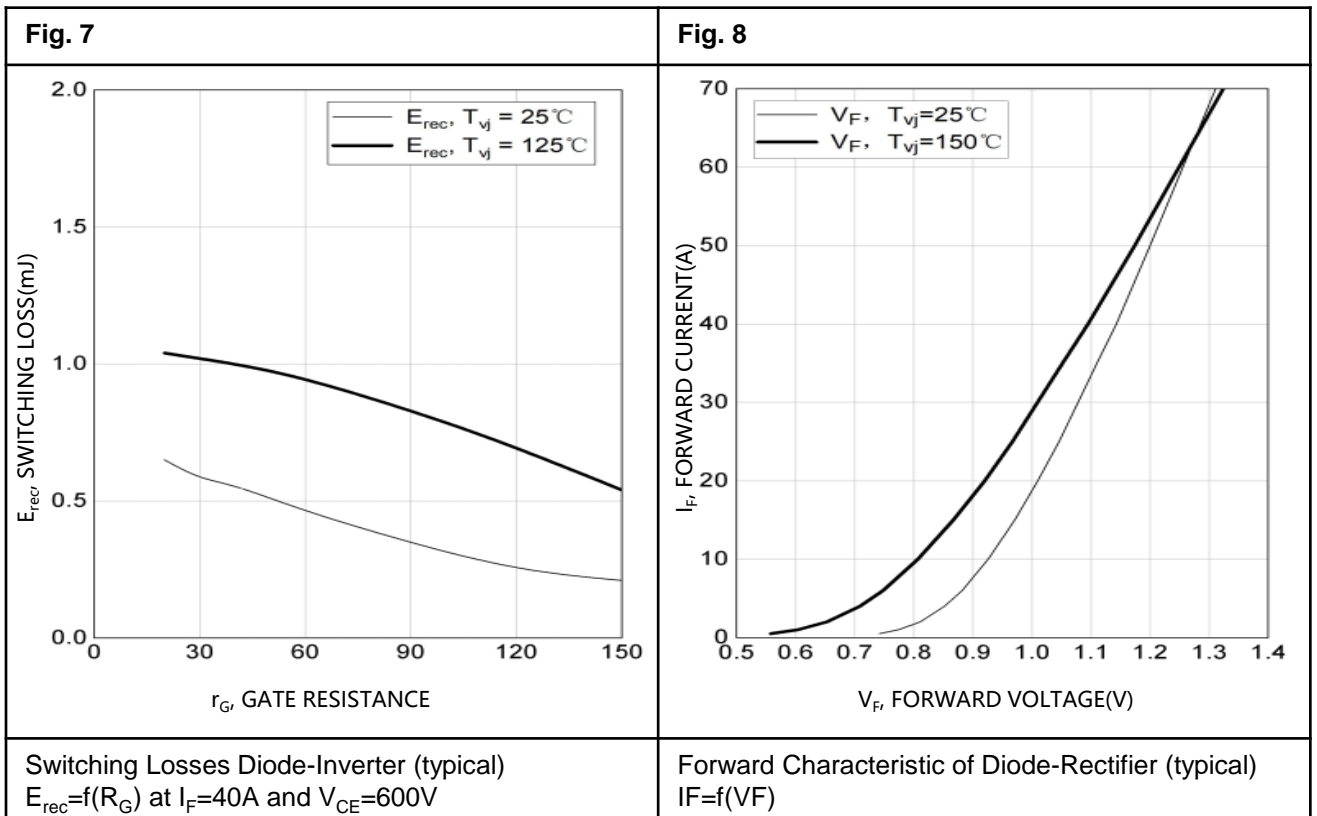
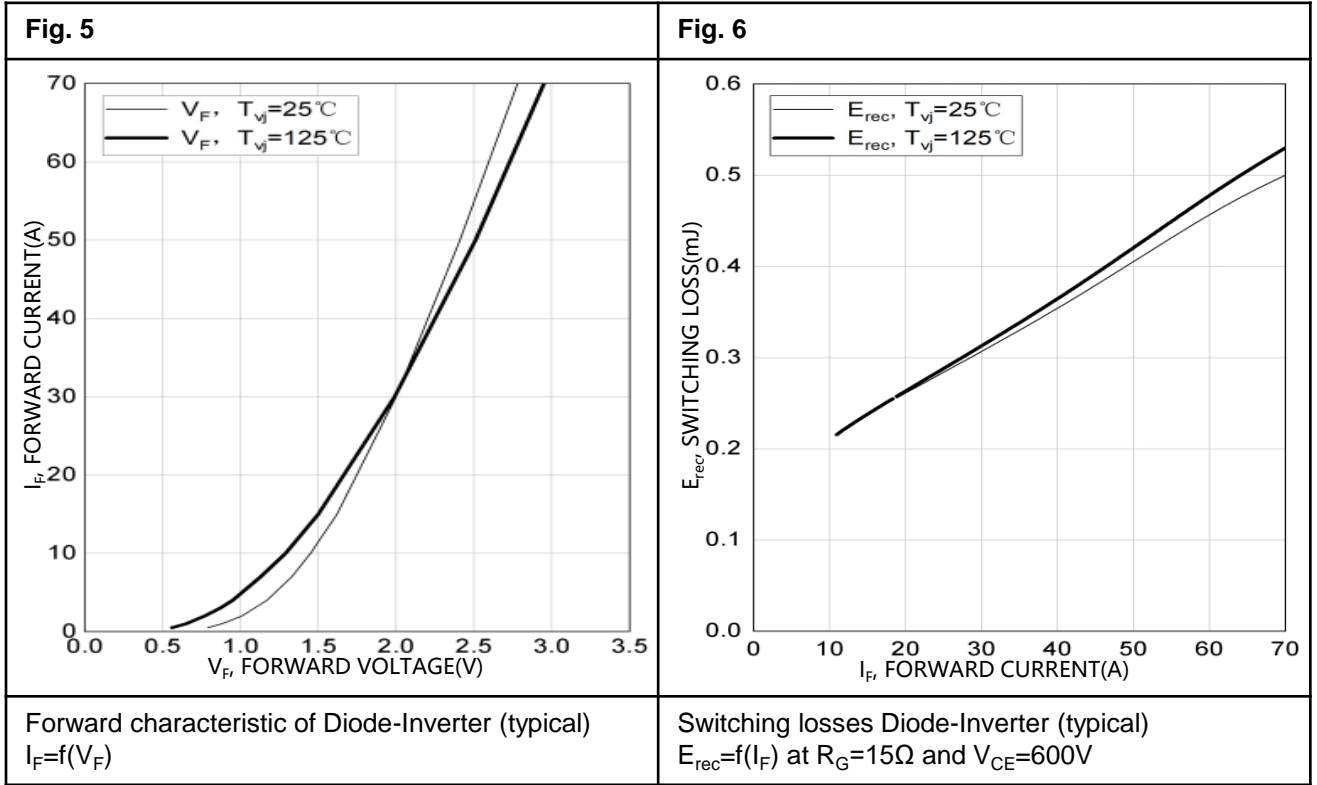
Module

Symbol	Description	Conditions	Values			Unit
			Min.	Typ.	Max.	
V _{ISOL}	Isolation Test Voltage	RMS, f=50Hz, t=1min	2500			V
T _{stg}	Storage Temperature		-40	---	150	°C
F	Mounting Force Per Clamp		40	---	80	N
G	Weight		---	40	---	g

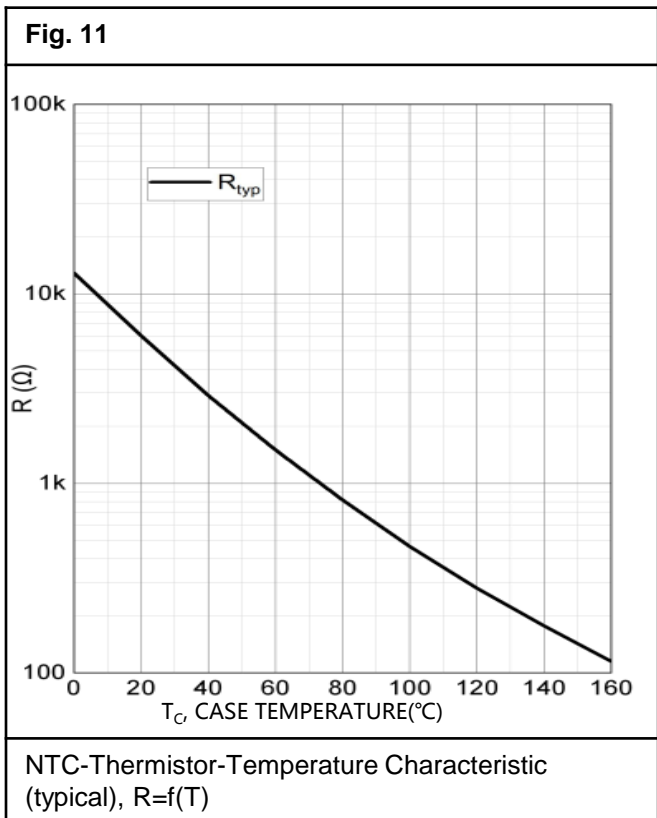
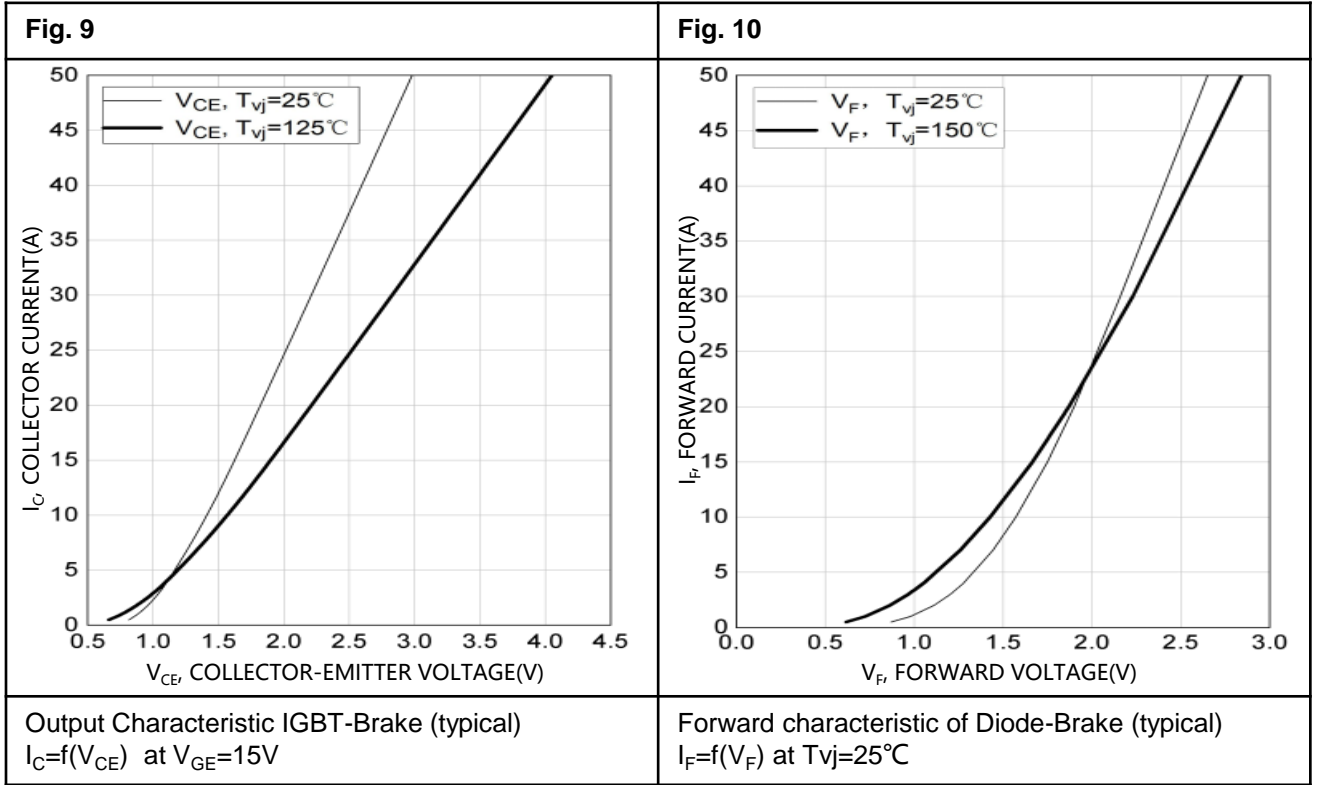
Typical Characteristics



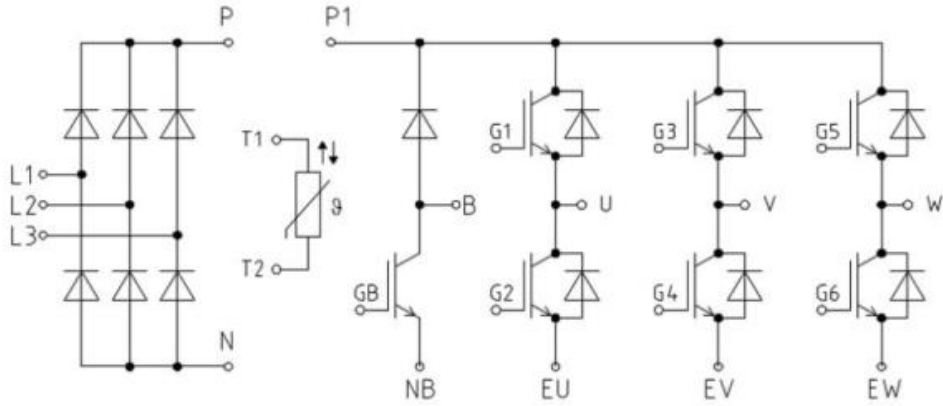
Typical Characteristics



Typical Characteristics



Circuit Diagram



Package Outlines (mm)

