VGTF120N400NA

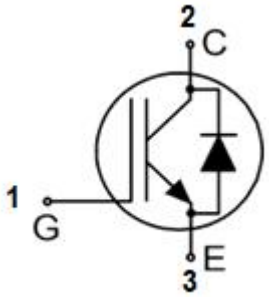
Datasheet

40A, 1200V, Insulated Gate Bipolar Transistor VGTF120N400NA

General Description

V_{CE}	1200	V
I_C	40	A
V_{CEsat}.Typ T_{vj} = 25 °C	2.2	V
T_{jmax}	175	℃

Symbol



Symbol of VGTF120N400NA

Features

- Offers high breakdown voltage to 1200V for improved reliability
- Low V_{CEsat}
- Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- Powerful monolithic body diode with low forward voltage designed for soft commutation only
- Very tight parameter distribution
- Qualified according to JEDEC fortarget applications RoHS product
- Halogen and antimony free. “Green” Device

Package Type

TO-247

Package Type of VGTF120N400NA

Application

- Solar converters
- Uninterruptible power supplies
- Welding converters
- Mid to high range switching frequency convertesrs

Product Validation

- Qualified for industrial applications according to the relevant tests of JESD-022

Ordering Information

Product Name	Package
VGTF120N400NA	TO-247

Absolute Maximum Ratings (T_A= 25 ºC, unless otherwise specified)

Parameter		Symbol	Rating	Unit
Collector-emitter voltage		V_{CE}	1200	V
DC collector current, limited by $T_{vj\ max}$	Tc = 25 °C	I_C	80	A
	Tc = 100 °C		40	
Pulsed collector current, tp limited by $T_{vj\ max}$		$I_{C,pulse}$	120	A
Turn off safe operating area V_{CE} ⩽1200V, Tvj⩽175°C		-	120	A
Diode forward current, limited by T_{vjmax}	Tc = 25 °C	I_F	80	A
	Tc = 100 °C		40	
Diode pulsed current, tp limited by T_{vjmax}		$I_{F,pulse}$	120	A
Gate-emitter voltage		V_{GE}	±30	V
Short circuit withstand time V_{GE} =15V, V_{CC}≤4000V, Allowed number of short circuits<1000,Times between short circuits: ≥1.0s, T_j ≤25°C		tsc	10	us
Power dissipation	Tc = 25 °C	Ptot	357	W
	Tc = 100 °C		125	
Operating junction temperature		Tstg	-40 to 175	ºC
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		T_L	260	ºC

Thermal Resistance

Parameter	Symbol	Min	Typ	Max	Unit
IGBT Thermal Resistance, Junction to Case max.	$R_{\theta JC}$	-	0.40	-	ºC/W
Diode Thermal Resistance, Junction to Case max.	$R_{\theta JC}$	-	0.80	-	
Thermal Resistance, Junction to Ambient max.	$R_{\theta JA}$	-	40	-	

Electrical Characteristics (T_J= 25 ºC, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=1mA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=40A,T_{vj}=25ºC	-	2.2	2.6	V
		V_{GE}=15V, I_C=40A,T_{vj}=150ºC	-	2.8	3.1	V
Diode forward voltage	V_F	V_{GE}=0V, I_C=40A,T_{vj}=25ºC	-	3.0	3.8	V
		V_{GE}=0V, I_C=40A,T_{vj}=150ºC	-	2.4	3.2	V
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1mA,T_{vj}=25ºC	5.3	5.9	6.5	V
		V_{GE}=V_{CE},I_C=1mA,T_{vj}=150ºC	3.2	3.8	4.6	V
Zero voltage gate collector current	I_{CES}	V_{CE}=1200V,V_{GE}=0V,T_{vj}=25ºC	-	-	0.6	mA
		V_{CE}=1200V,V_{GE}=0V,T_{vj}=150ºC	-	-	10.0	mA
Gate-emitter leakage current	I_{GES}	V_{GE}=20V, V_{CE}=0V	-	-	200	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	-	6010	-	pF
Output Capacitance	C_{oes}		-	150	-	pF
Reverse Transfer Capacitance	C_{res}		-	90	-	pF
Gate total charge	Q_G	V_{CE}=600V V_{GE}=15V I_C=40A	-	235	-	nC
Gate-Emitter charge	Q_{GE}		-	50	-	
Gate-Collector charge	Q_{GC}		-	110	-	
Switching Characteristic, Inductive Load IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_{Vj} = 25°C V_{CE}=600V V_{GE}=15V I_C=40A R_G=10Ω	-	64	-	ns
Rise time	t_r		-	70	-	ns
Turn-off delay time	$t_{d(off)}$		-	250	-	ns
Fall time	t_f		-	50	-	ns
Turn-on energy	Eon		-	1.22	-	mj
Turn-off energy	Eoff		-	1.32	-	mj
Turn-on delay time	$t_{d(on)}$	T_{Vj} = 150°C V_{CE}=600V V_{GE}=15V I_C=40A R_G=10Ω	-	60	-	ns
Rise time	t_r		-	66	-	ns
Turn-off delay time	$t_{d(off)}$		-	290	-	ns
Fall time	t_f		-	100	-	ns
Turn-on energy	Eon		-	1.30	-	mj
Turn-off energy	Eoff		-	1.80	-	mj
Diode Characteristic						
Diode reverse recovery time	t_{rr}	T_{Vj} = 25°C V_R=600V I_F=40A, d_{iF}/dt=200A/us	-	180	-	ns
Diode reverse recovery charge	Q_{rr}		-	860	-	μC
Diode peak reverse recovery current	I_{rrm}		-	11.4	-	A

Diode peak rate of fall of reverse recovery current during tb recovery current during tb	dirr/dt		-	85.5	-	A/us
Diode reverse recovery time	t_{rr}	T_{Vj} = 150°C V_R=600V I_F=40A, d_{iF}/dt=200A/us	-	280	-	ns
Diode reverse recovery charge	Q_{rr}		-	2760	-	μC
Diode peak reverse recovery current	I_{rrm}		-	20.0	-	A
Diode peak rate of fall of reverse recovery current during tb recovery current during tb	dirr/dt		-	123.8	-	A/us

Typical Performance Characteristics

Fig 1: Typical switching time vs IC Characteristics(Tc=25℃)

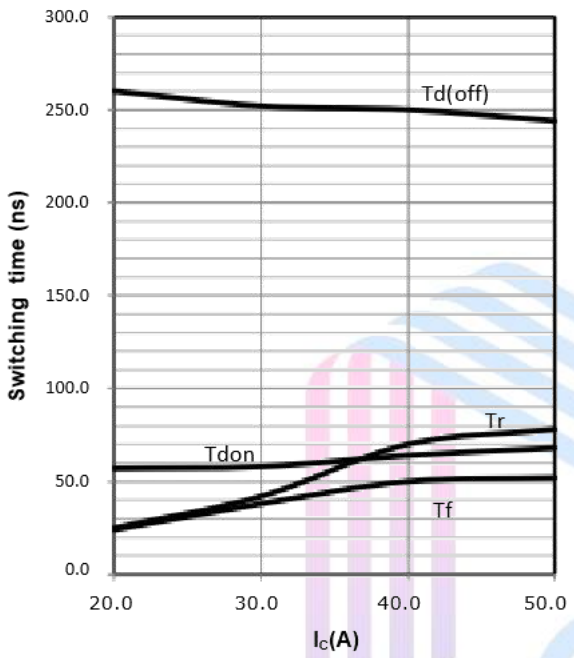


Fig 2: Typical switching Energy vs IC Characteristics(Tc=25°C)

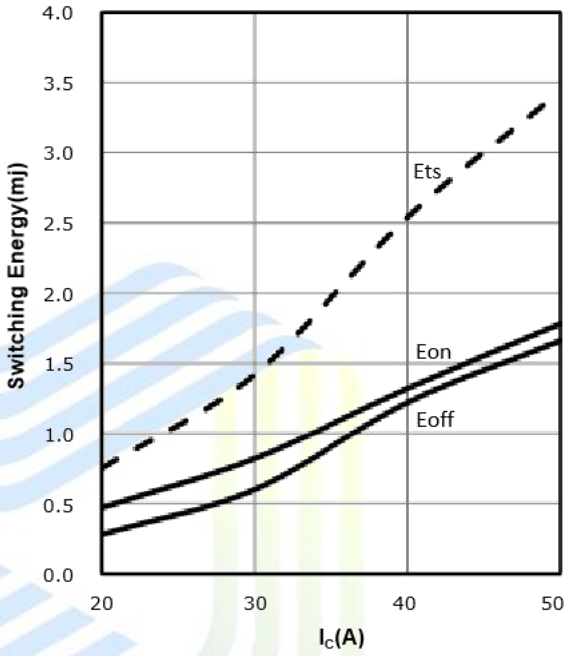


Fig 3: Typical switching time vs Rg Characteristics(Tc=25℃)

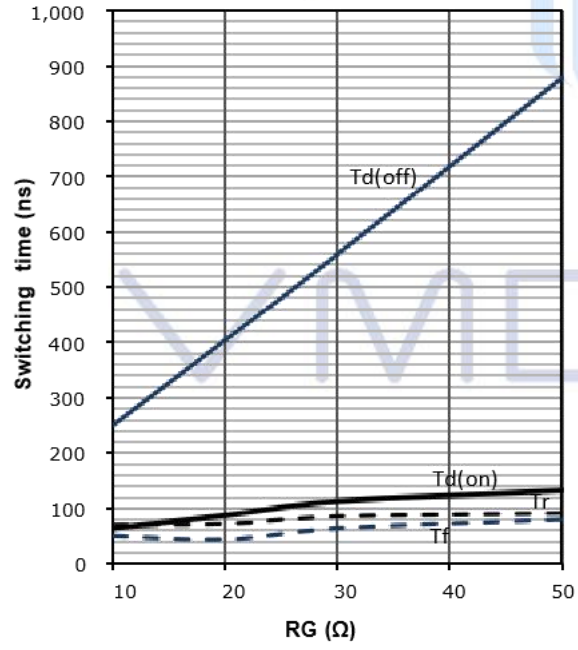


Fig 4: Typical switching Energy vs Rg Characteristics(Tc=25°C)

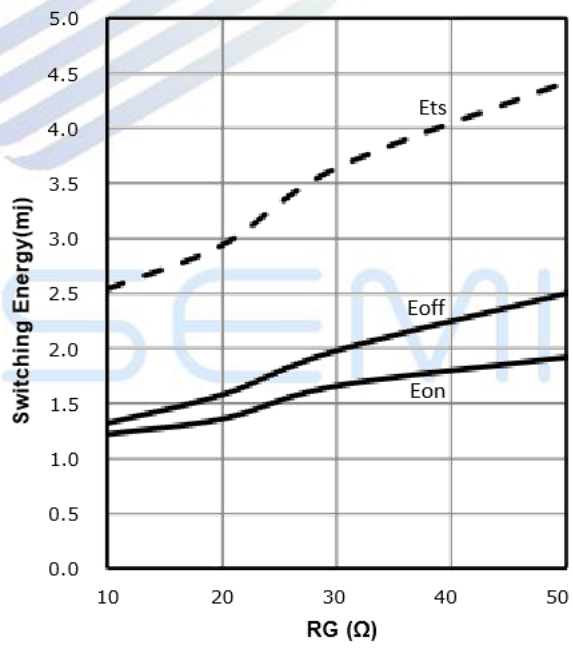


Fig 5: Capacitance Characteristics

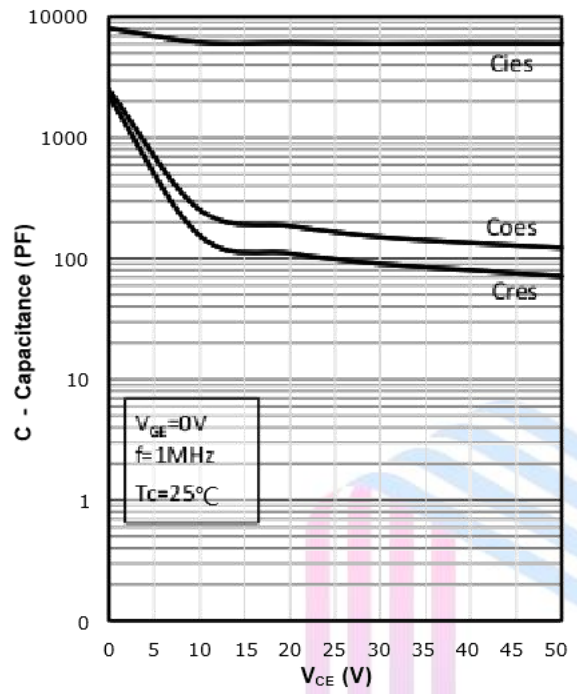


Fig 6: Gate Charge Characteristics

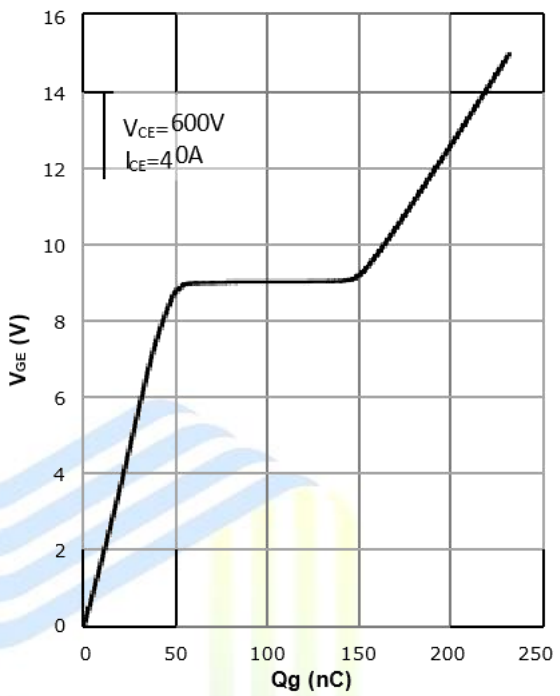


Fig 7: $V_{CE(sat)}$ vs Temperature Characteristics

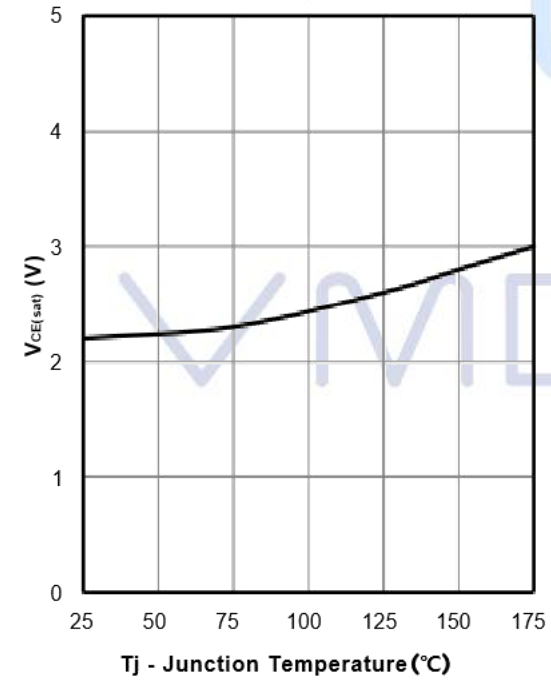


Fig 8: E. vs Temperature

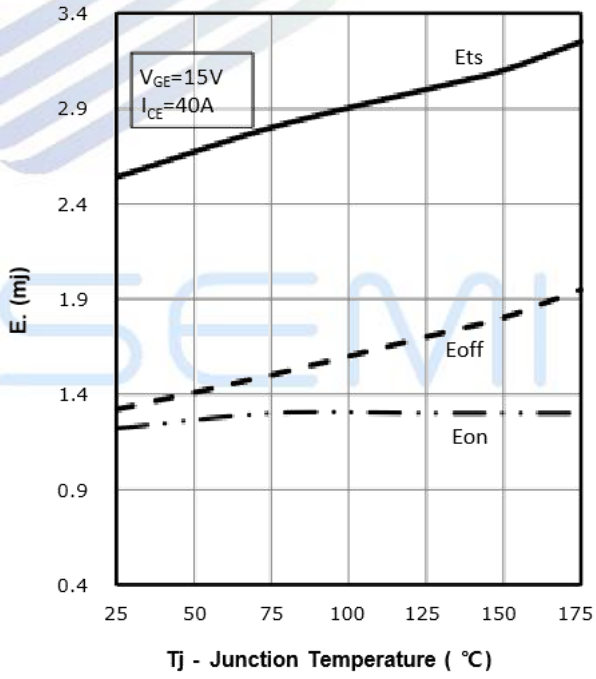


Fig 9: $V_{GE(th)}$ vs Temperature

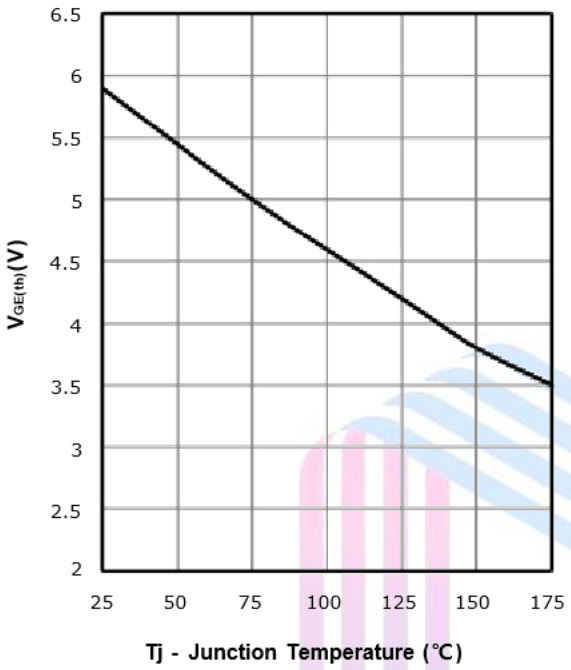


Fig 10: V_F vs Temperature

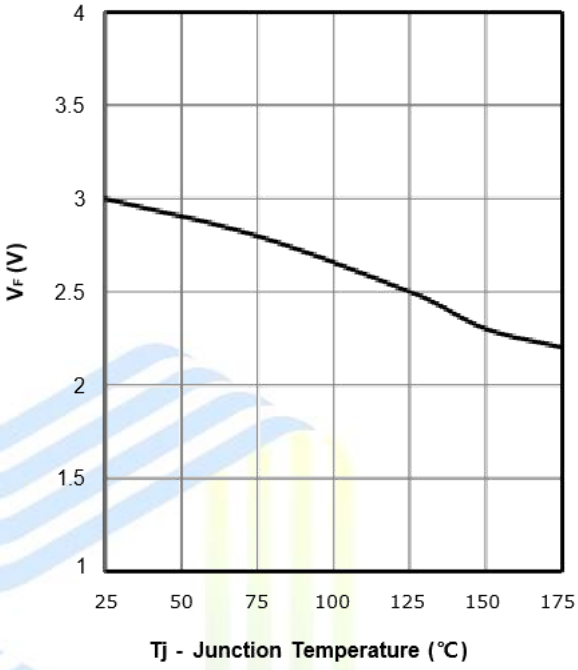


Fig 11: Trr vs Temperature

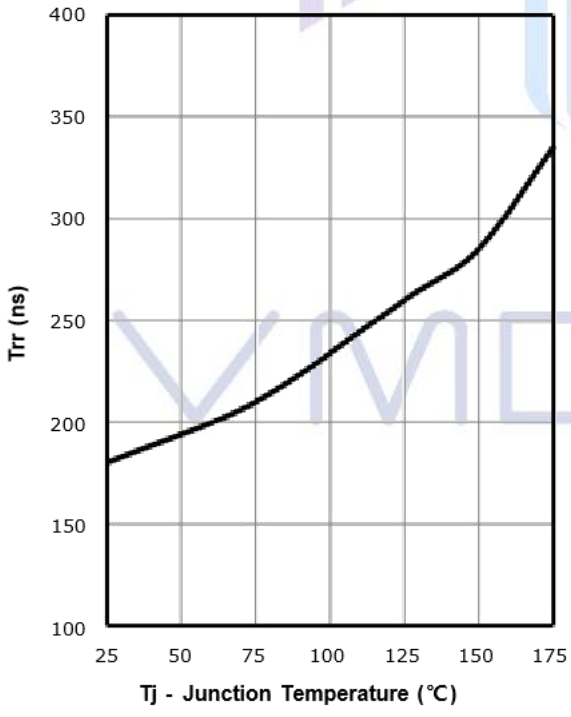
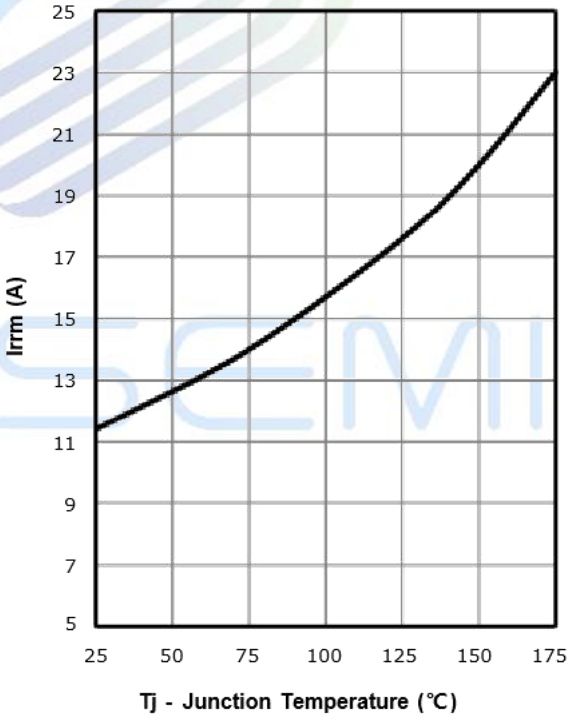
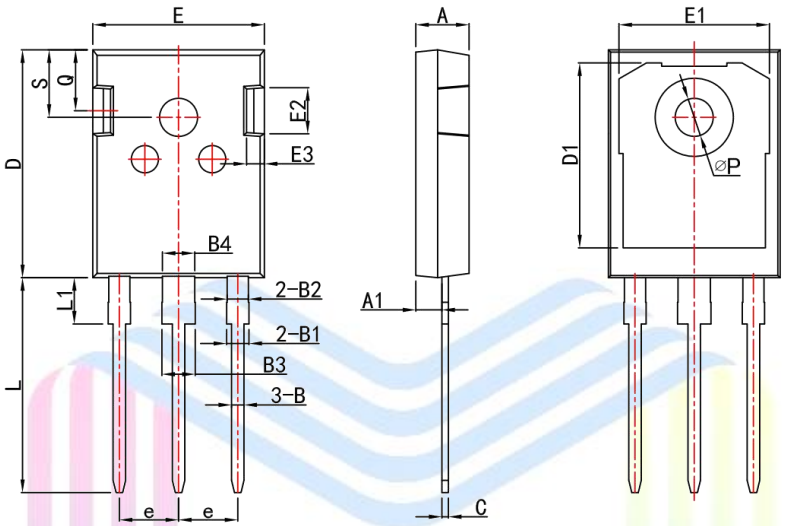


Fig 12: Irrm vs Temperature



Mechanical Dimensions

TO-247 Package Information



TOP VIEW SIDE VIEW(Left) BOTTOM VIEW

SYMBOL	MIN	MAX
A	4.60	5.20
A1	2.20	2.60
B	0.90	1.40
B1	1.75	2.35
B2	1.75	2.15
B3	2.80	3.35
B4	2.80	3.15
C	0.50	0.70
D	20.60	21.30
D1	16.00	18.00
E	15.50	16.10
E1	13.00	14.70
E2	3.80	5.30
E3	0.80	2.60
e	5.20	5.70
L	19.00	20.50
L1	3.90	4.60
ΦP	3.30	3.70
Q	5.20	6.00
S	5.80	6.60
All Dimensions in mm		

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