

NGT20N65D



N-Channel Enhancement Type IGBT With FRD

Voltage: 650 Volts

Current: 20 Ampers

Package: TO-263

Features

- NH'S Advanced IGBT Technology
- Low Vcesat For Low On-State Loss
- Very Soft Ultra-Fast Recovery Antiparallel Diode
- High Frequency Operation For High Reliability

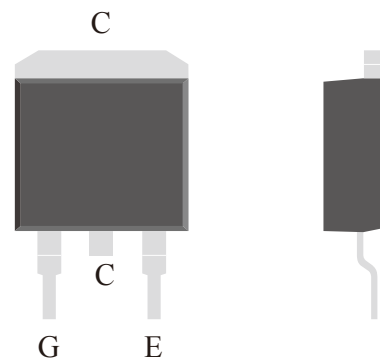
Typical Applications

- Power Factor Correction(PFC)
- Motor Drives
- Uninterruptible Power Supplies(UPS)
- High Frequency Inverters

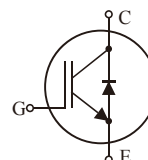
Product Summary

V _{CES} Min.@T _j	650	V
I _C Min.@100℃	20	A
V _{CE(sat)} @25℃	1.56	V

Diagram:



Polarity:



Absolute Maximum Ratings (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Collector-Emitter Voltage (V _{GS} =0)		V _{CES}	650	V
Gate-Emitter Voltage		V _{GES}	±30	V
Continuous Collector Current (Note 1)	Ta= 25 ℃	I _C	40	A
	Ta= 100 ℃		20	
Drain Current-Pulse (Note 1)	T _j < 175 ℃	I _{CM}	80	A
Maximum Power Dissipation Power	Ta= 25 ℃	P _D	300	W
Dissipation Derating Factor Above 25℃	Ta= 100 ℃		150	
Derating Factor		D _F	2.00	W/℃

Thermal Characteristics (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 175	℃
Storage Temperature Range		T _{STD}	-55 to 175	℃
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With Ta=25℃	R _{θJA}	62	℃/W
Thermal Resistance Junction-Case(IGBT) With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	R _{θJC}	0.5	
Thermal Resistance Junction-Case(FRD) With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	R _{θJC}	1.6	

Notes: 1.Pulse Width Limited By Max. Junction Temperature. (See Fig. 20).

NGT20N65D

N-Channel Enhancement Type IGBT With FRD
Electrical Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions		Symbol	Min.	Typ.	Max.	Unit
Static Off Characteristics							
Collector To Emitter Voltage	VGE=0V, IC=1mA		BV _{CES}	650	--	--	V
Collector To Emitter Leakage Current	VCE= 650 V, VGE=0V, Tj=25℃		I _{CES}	--	--	0.5	uA
	VCE= 520 V, VGE=0V, Tj=125℃			--	--	2	mA
Gate To Emitter Leakage Current	VGE= 20 V, VCE=0V		I _{GES}	--	--	500	nA
Emitter To Gate Leakage Current	VGE= -20 V, VCE=0V		I _{EGS}	--	--	500	nA
Forward Transconductance	IC= 10.0 A, VCE= 15 V		g _{fs}	--	7.2	--	S
Static On Characteristics							
Gate Threshold Voltage	VGE= VCE, IC=250uA		V _{GE(TH)}	5	5.7	6.5	V
Collector-Emitter Saturation Voltage	IC= 10.0 A, VGE= 15.0 V, Tj=25℃		V _{CE(SAT)}	--	1.56	2.10	V
	IC= 10.0 A, VGE= 15.0 V, Tj=125℃			--	1.95	--	
Dynamic Characteristics							
Input Capacitance	VCE= 25 V		C _{ies}	--	1680	--	pF
Output Capacitance	VGE= 0 V		C _{oes}	--	56	--	pF
Reverse Transfer Capacitance	F= 1 MHZ		C _{res}	--	5	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.21)							
Turn-On Delay Time	VCE= 312 V IC= 10 A	Tj=25℃	t _{d(on)}	--	32	--	ns
		Tj=175℃		--	35	--	
Turn-On Rise Time	VGE= 15.0 V RG= 10 Ω	Tj=25℃	t _r	--	35	--	ns
		Tj=175℃		--	39	--	
Turn-Off Delay Time		Tj=25℃	t _{d(off)}	--	108	--	ns
		Tj=175℃		--	140	--	
Turn-Off Rise Time		Tj=25℃	t _r	--	15	--	ns
		Tj=175℃		--	19	--	
Turn-On Switching Loss	Inductive Load	Tj=25℃	E _{on}	--	55	--	μJ
Tj=175℃		--		60	--		
Turn-Off Switching Loss		Tj=25℃	E _{off}	--	23	--	μJ
Tj=175℃		--		29	--		
Total Switching Energy		Tj=25℃	E _{tot}	--	78	--	μJ
		Tj=175℃		--	89	--	
Gate Charge Paramters (Test Circuit & Waveform See Fig.22)							
Total Gate Charge	VCE= 312 V		Q _g	--	58	--	nC
Gate-Emitter Charge	VGE= 15 V		Q _{ge}	--	18	--	nC
Gate-Collector Charge	IC= 10.0 A		Q _{gc}	--	23	--	nC

NGT20N65D



N-Channel Enhancement Type IGBT With FRD

Electrical Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions		Symbol	Min.	Typ.	Max.	Unit
Collector-Emitter Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.24)							
Max. Diode Forward Cuurent	Tj= 25 °C		I _F	--	--	40.0	A
tp Limited by Tj(max)	Tj= 100 °C			--	--	20.0	
Max. Pulsed Forward Cuurent			I _{SM}	--	--	80	A
Diode Forward Voltage	IF= 20.0 A,VGE=-0V		V _F	--	1.77	2.20	V
Reverse Recovery Time	IF= 10.0 A	Tj=25°C	t _{rr}	--	128	--	ns
	di/dt= 200 A/us	Tj=175°C		--	220.0	--	
Reverse Recovery Charge	VGE= 0.0 V	Tj=25°C	Q _{rr}	--	411	--	nC
	VCE= 40 V	Tj=175°C		--	1376.9	--	
Reverse Recovery Current		Tj=25°C	I _{rrm}	--	6.0	--	A
		Tj=175°C		--	12.5	--	
Reverse Recovery Energy		Tj=25°C	E _{rr}	--	15.4	--	μJ
		Tj=175°C		--	55.1	--	

NGT20N65D



N-Channel Enhancement Type IGBT With FRD

Typical Characteristics Curves

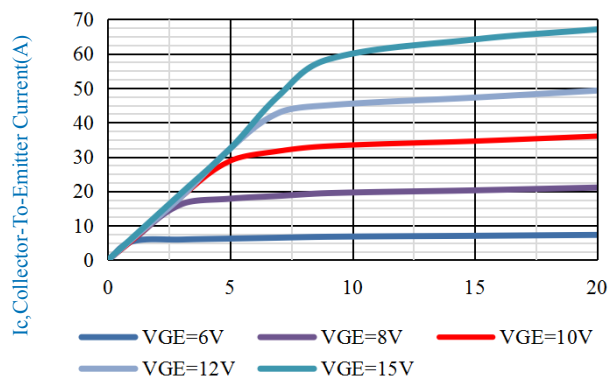


Fig.1-Output Characteristics@ $T_j=25^\circ\text{C}$

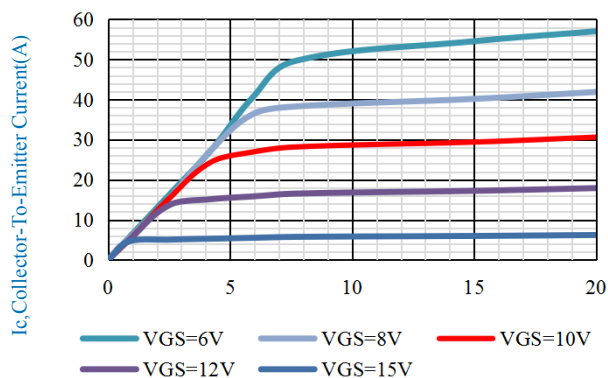


Fig.2-Output Characteristics@ $T_j=175^\circ\text{C}$

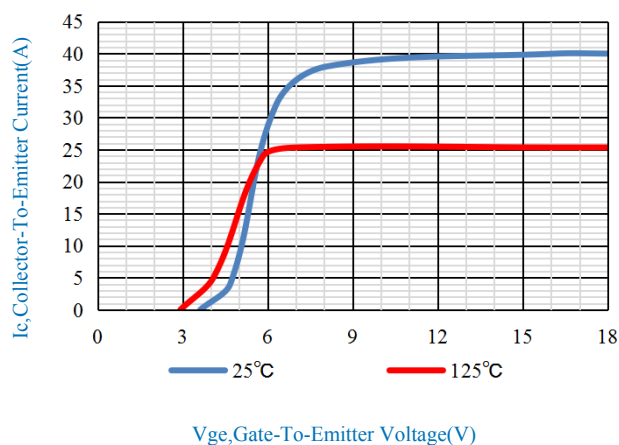


Fig.3-Transfer Characteristics

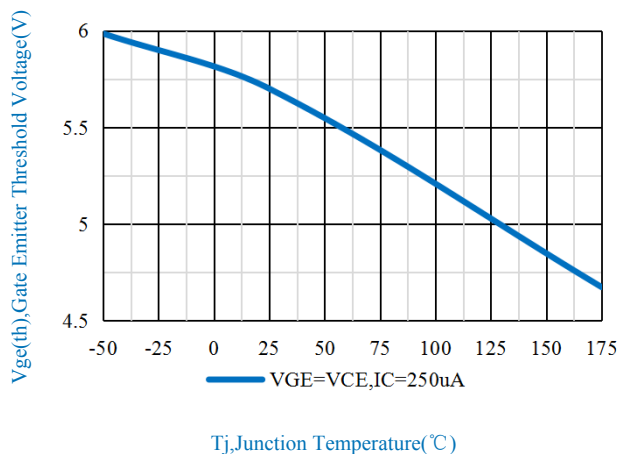


Fig.4-Gate Emitter Threshold Voltage Vs. Junction Temperature

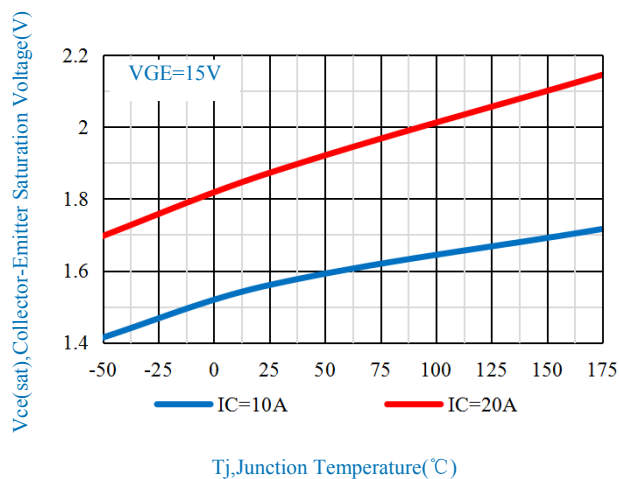


Fig.5-Saturation Voltage vs. Junction Temperature

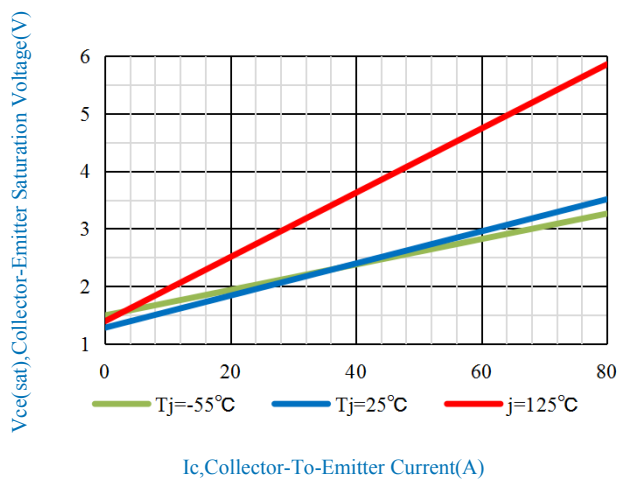


Fig.6-Saturation Voltage vs. Collector-To-Emitter Current

NGT20N65D



N-Channel Enhancement Type IGBT With FRD

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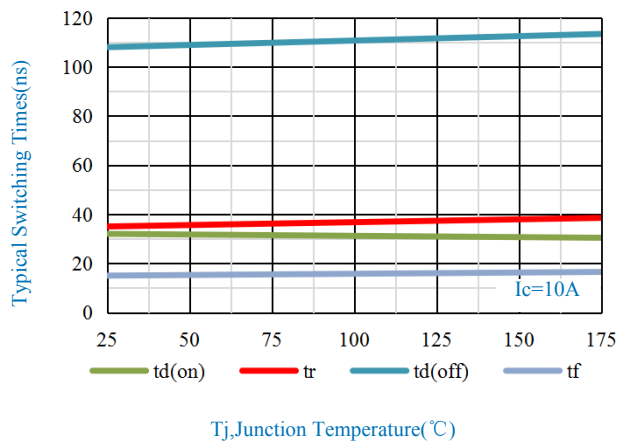


Fig.7-Typical Switching Times Vs. Junction Temperature

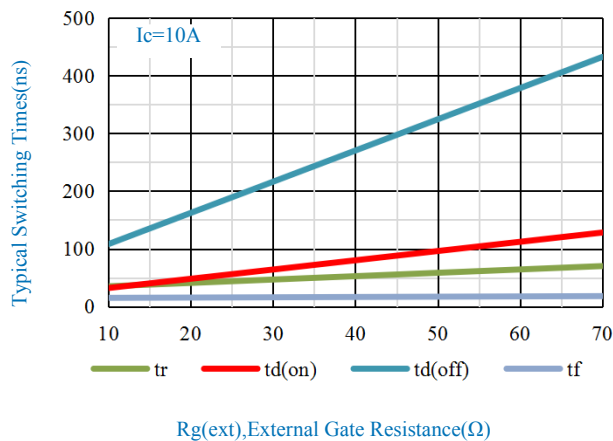


Fig.8-Typical Switching Times Vs. External Gate Resistance

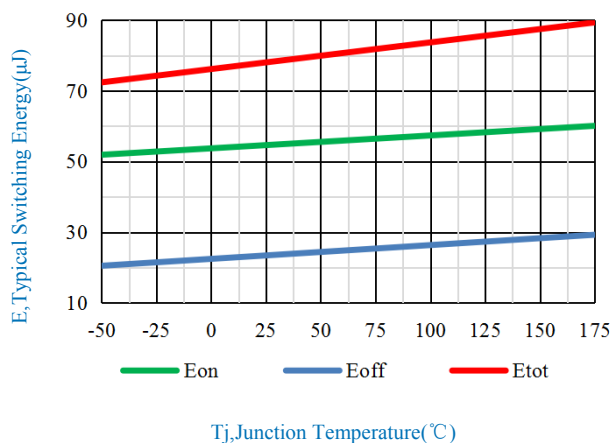


Fig.9-Typical Switching Energy Vs. Junction Temperature

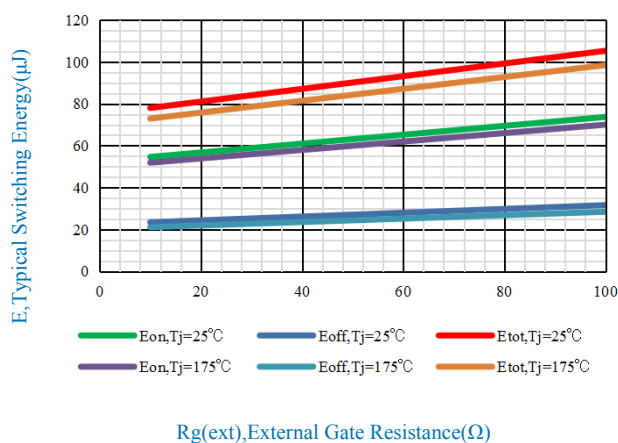


Fig.10-Typical Switching Energy Vs. External Gate Resistance

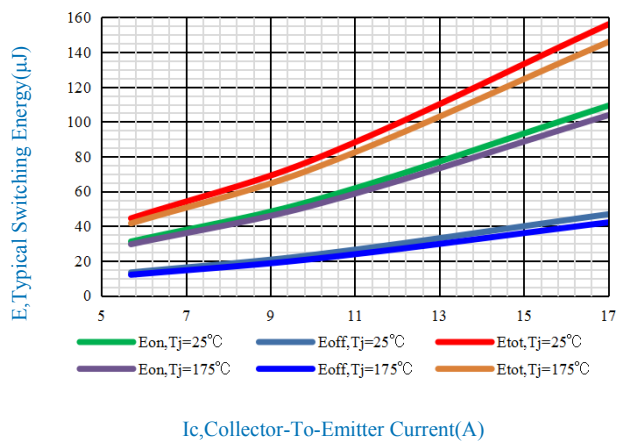


Fig.11-Typical Switching Energy Vs. Collector-To-Emitter Current

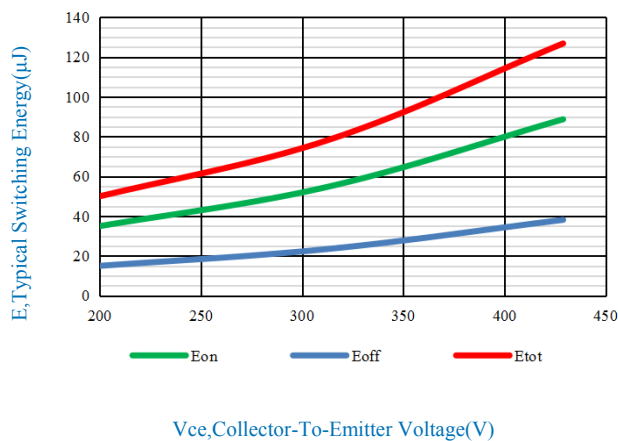


Fig.12-Typical Switching Energy Vs. Collector-To-Emitter Voltage

NGT20N65D



N-Channel Enhancement Type IGBT With FRD

Typical Characteristics Curves

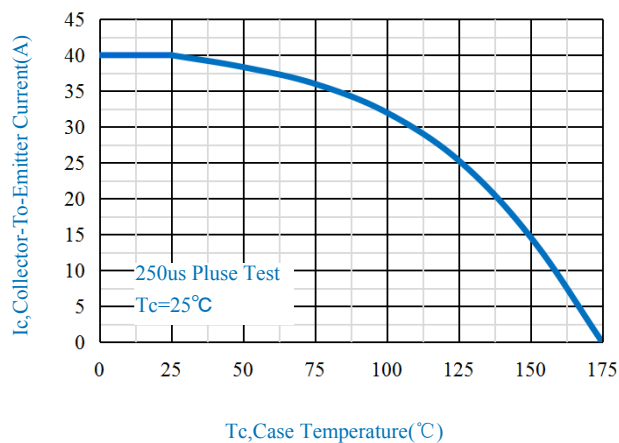


Fig.13-Maximum Continuous Collector Current Vs. Case Temperature

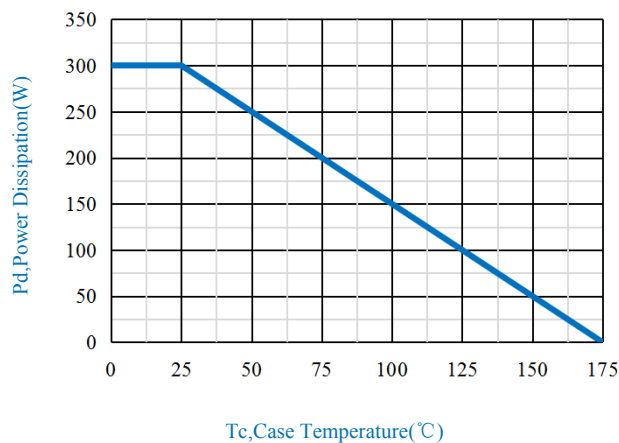


Fig.14-Maximum Power Dissipation Vs. Case Temperature

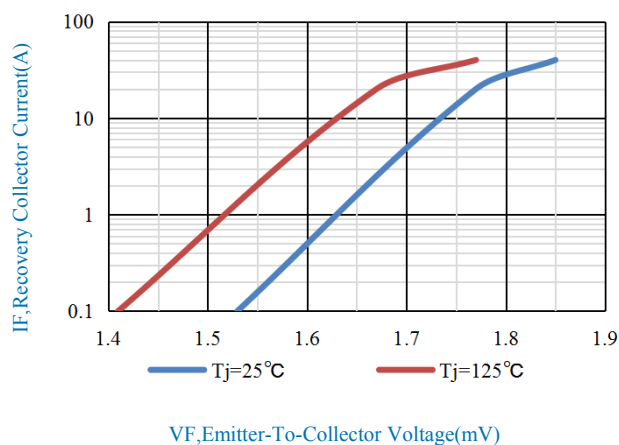


Fig.15-Emitter-To-Collector Diode Forward Voltage

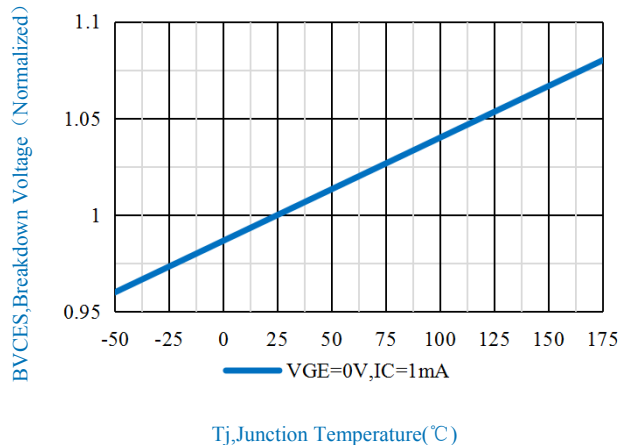


Fig.16-Breakdown Voltage Vs. Junction Temperature

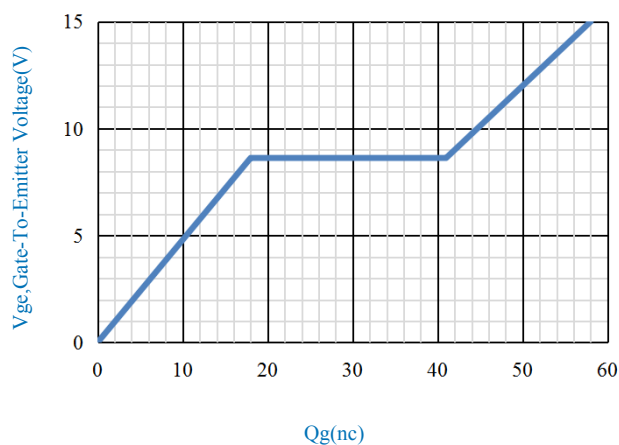


Fig.17-Gate Charge Waveform

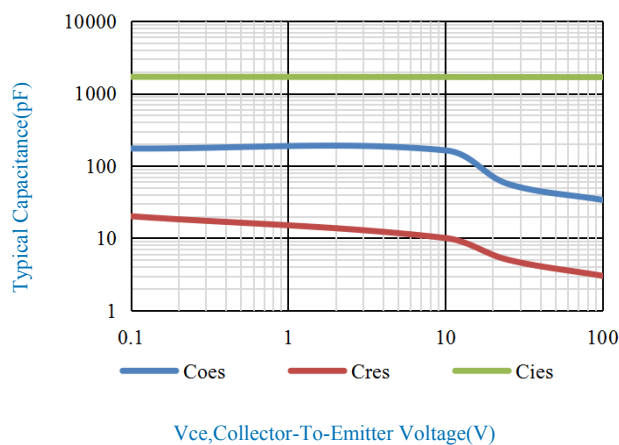


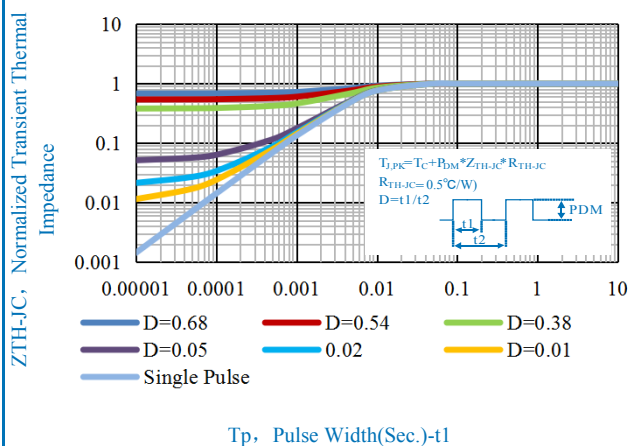
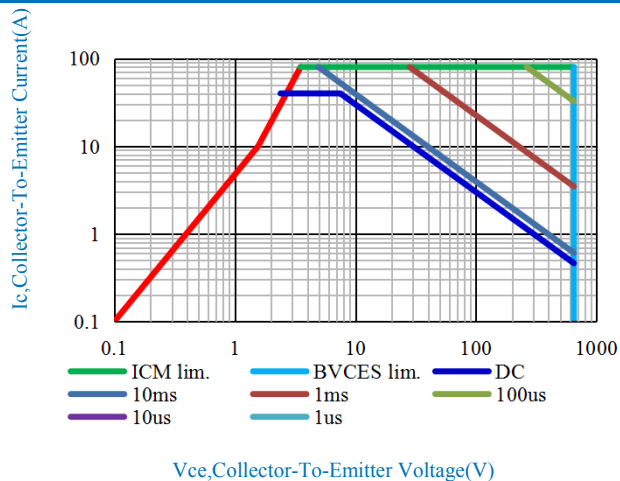
Fig.18-Typical Capacitance Vs. Collector-To-Emitter Voltage

NGT20N65D

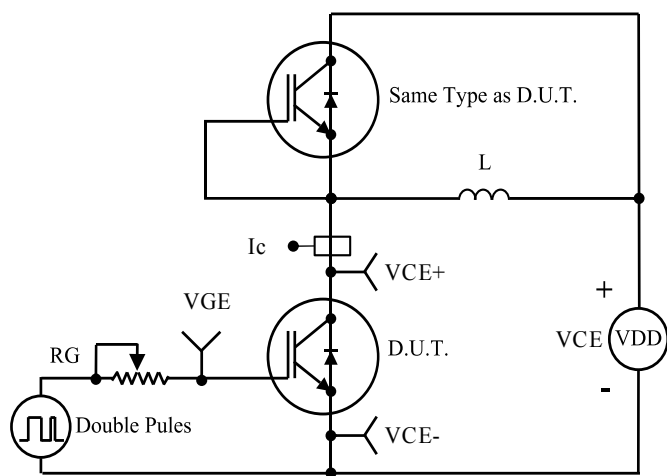


N-Channel Enhancement Type IGBT With FRD

Typical Characteristics Curves



Test Circuit & Waveform



NGT20N65D



N-Channel Enhancement Type IGBT With FRD

Test Circuit & Waveform

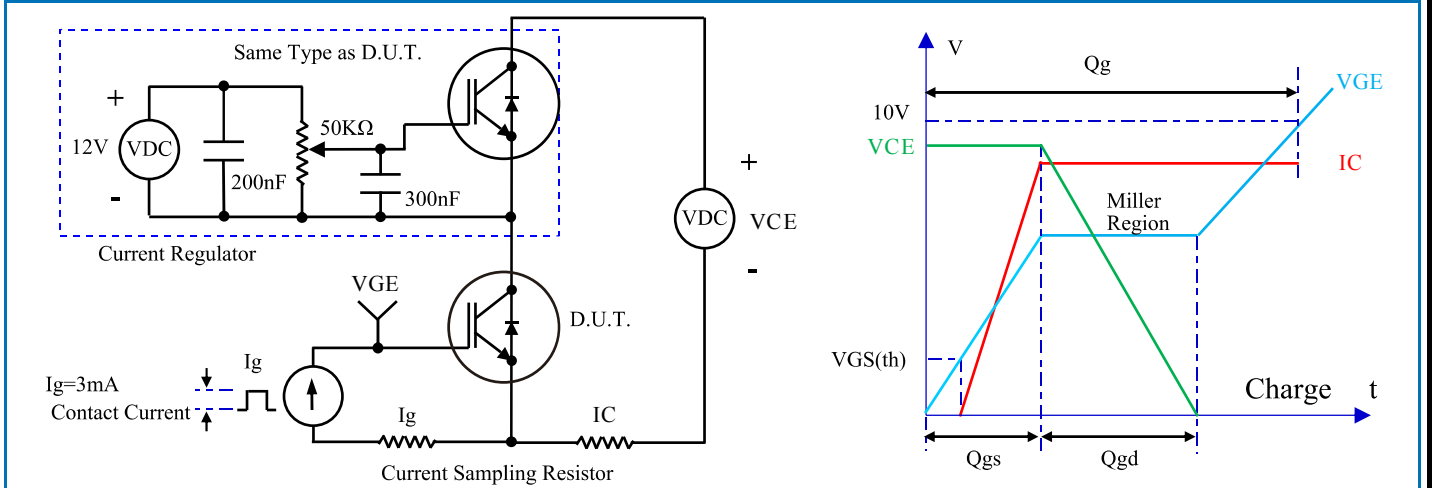


Fig.22- Gate Charge Test Circuit & Waveform

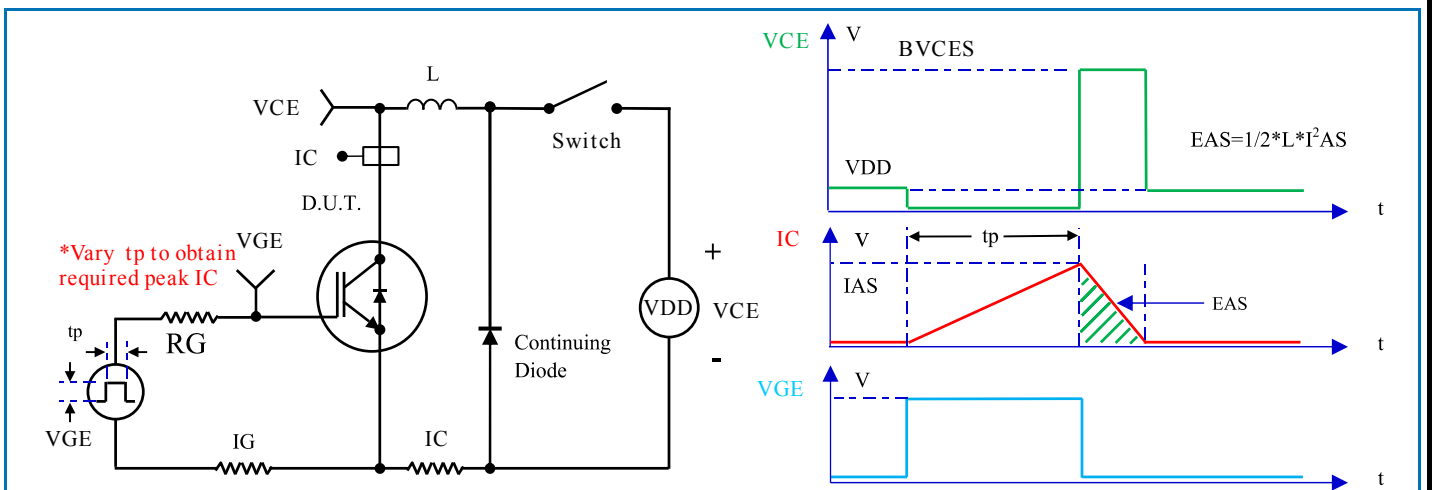


Fig.23- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

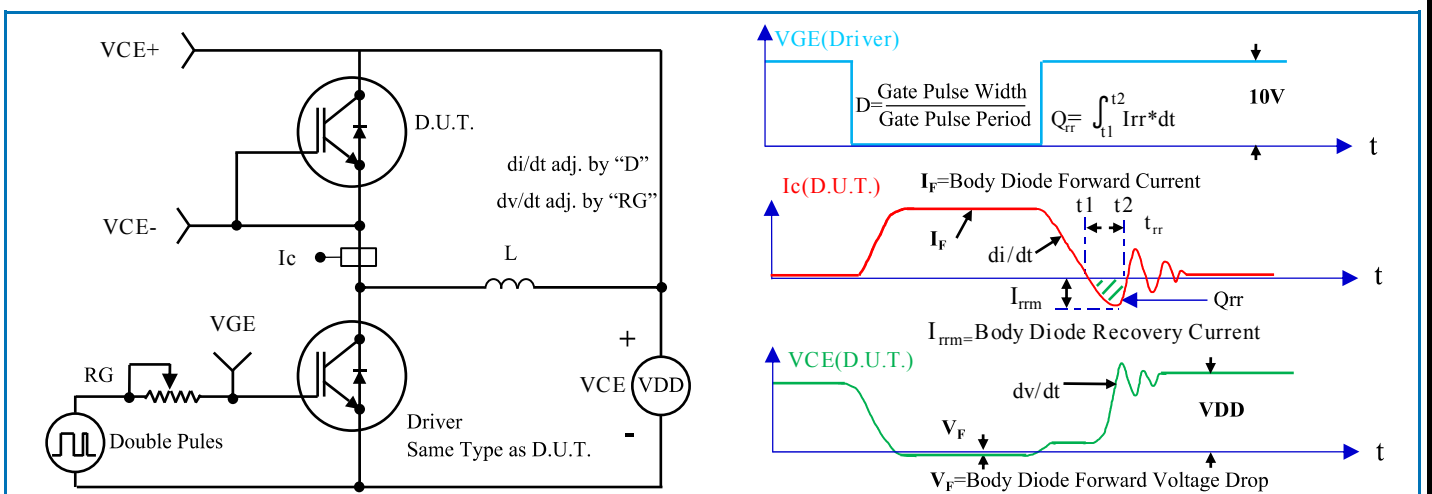


Fig.24- Diode Recovery Test Circuit & Waveform

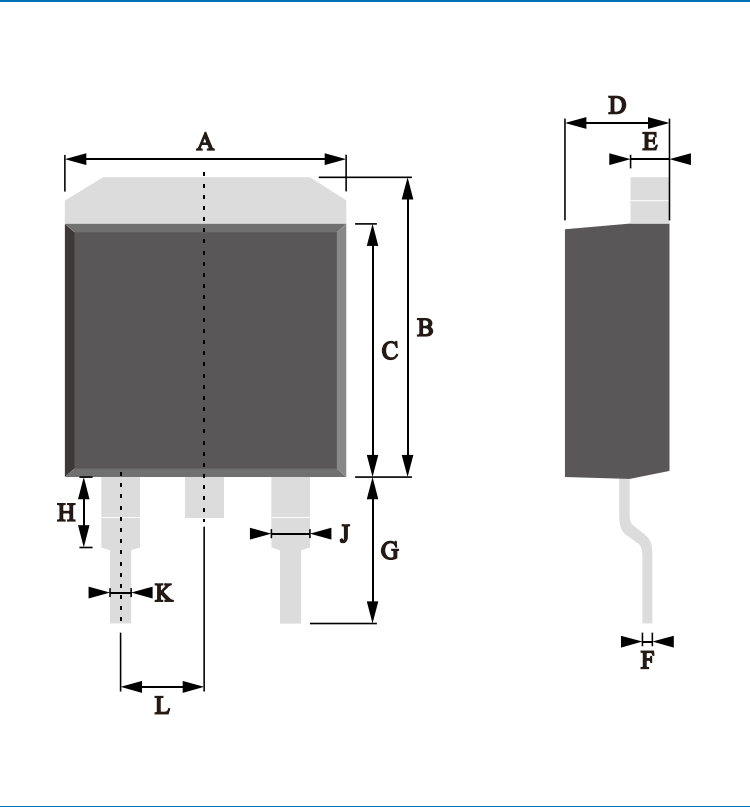
NGT20N65D

N-Channel Enhancement Type IGBT With FRD



OUTLINE DRAWINGS

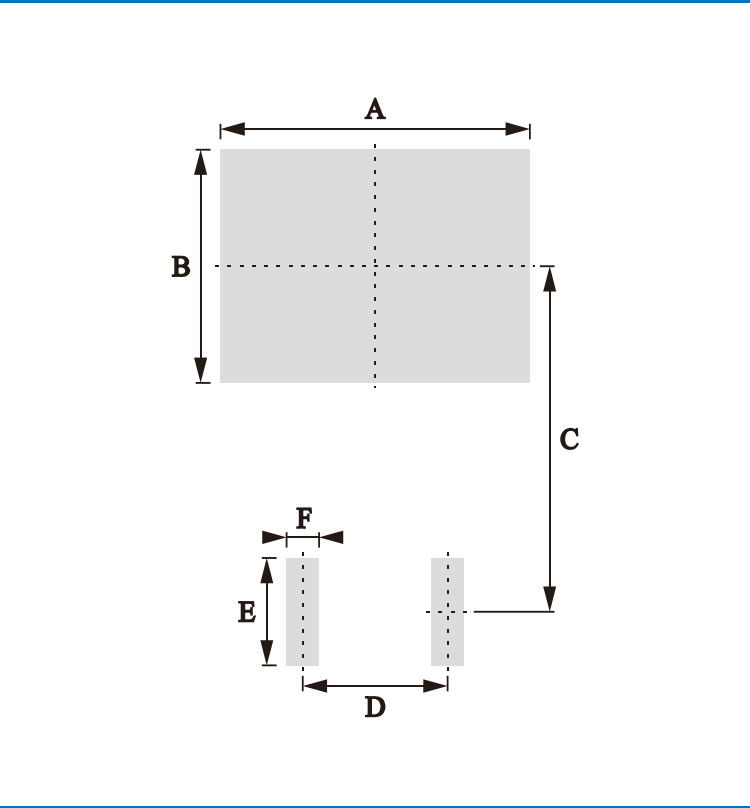
TO-263



OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.30	-	10.50	0.3661	-	0.4134
B	9.60	-	11.60	0.3780	-	0.4567
C	8.20	-	9.50	0.3228	-	0.3740
D	4.00	-	5.00	0.1575	-	0.1969
E	1.00	-	1.70	0.0394	-	0.0669
F	0.20	-	0.70	0.0079	-	0.0276
G	4.45	-	5.25	0.1752	-	0.2067
H	1.25	-	1.85	0.0492	-	0.0728
J	1.00	-	1.60	0.0394	-	0.0630
K	0.60	-	1.00	0.0236	-	0.0394
L	2.25	-	2.80	0.0886	-	0.1102

RECOMMEDND LAYOUT DRAWINGS

TO-263



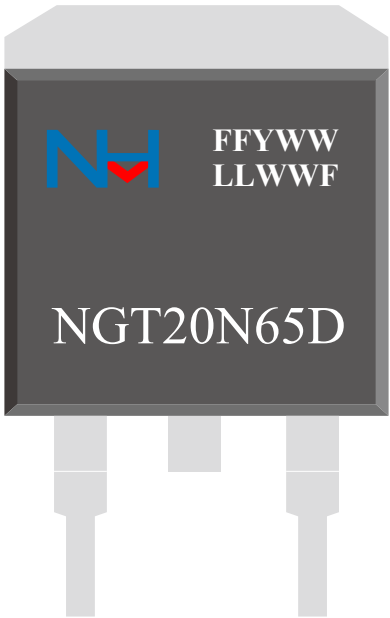
OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	10.86	-	-	0.4276	-
B	-	7.86	-	-	0.3094	-
C	-	11.64	-	-	0.4583	-
D	-	5.08	-	-	0.2000	-
E	-	3.62	-	-	0.1425	-
F	-	1.14	-	-	0.0449	-

NGT20N65D

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MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhang Trademark
FF=Product Line Code,According To Actual Changes
YWW=Date Code,According To Actual Changes
LLWWF=Inernal Code,According To Actual Changes
NGT20N65D=Model

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
TO-263	P1	1.4331	13" Reel	800	800	4000
TO-263	P2	1.4331	13" Reel	800	800	4800

NGT20N65D



N-Channel Enhancement Type IGBT With FRD

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow

	Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
	Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
	Preheat-Temperature Min (T _S min) -Temperature Max (T _S max) -Time(t _s min to t _s max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
	Time maintained above: -Temperature (T _L) - Time (t _L)	183°C 60-150 seconds	217°C 60-150 seconds
	Peak Temperature(T _P)	240 +0/-5 °C	260 +0/-5 °C
	Time within 5°C of actual peak temperature (t _p)	10-30 seconds	20-40 seconds
	Ramp down rate	6°C/second max.	6°C/second max.
	Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

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NGT20N65D

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Specification Revision History

Rev.	Date	Changed Items	Pre-Changed Content	Changed Content
A/1	2025-10-20	First Issue		
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