

NGT40N65PT



N-Channel Enhancement Type IGBT With FRD

Voltage: 650 Volts

Current: 40 Ampers

Package: TO-247

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

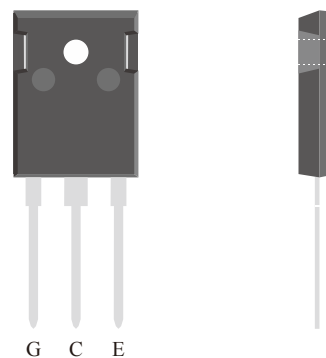
Typical Applications

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

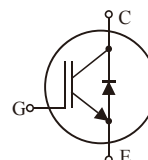
Product Summary

V _{CES} Min.@T _J	650	V
I _C Min.@100℃	40	A
V _{CE(sat)} @25℃	1.5	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	80	A
	Ta= 100 ℃		40	
Drain Current-Pulse (Note 1)	T _J < 175 ℃	I _{CM}	160	A
Maximum Power Dissipation Power	Ta= 25 ℃	P _D	266	W
Dissipation Derating Factor Above 25℃	Ta= 100 ℃		133	
Derating Factor		D _F	1.77	W/℃

Thermal Characteristics (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-50 to 175	℃
Storage Temperature Range		T _{STD}	-50 to 175	℃
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With Ta=25℃	R _{θJA}	40	℃/W
Thermal Resistance Junction-Case(IGBT) With Steady-State	Device Mounted On 75mm x 45mm x 2.5mm Alu. Heat.	R _{θJC}	0.565	
Thermal Resistance Junction-Case(FRD) With Steady-State	Device Mounted On 75mm x 45mm x 2.5mm Alu. Heat.	R _{θJC}	0.831	

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

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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}	--	--	250	nA	
Forward Transconductance	IC= 20.0 A, VCE= 15 V	gfs	--	28	--	S	
Static On Characteristics							
Gate Threshold Voltage	VGE= VCE, IC=250uA	V _{GE(TH)}	4.5	5	6	V	
Collector-Emitter Saturation Voltage	IC= 20.0 A, VGE= 15.0 V, Tj=25℃	V _{CE(SAT)}	--	1.50	1.80	V	
	IC= 20.0 A, VGE= 15.0 V, Tj=125℃		--	1.85	--		
Dynamic Characteristics							
Input Capacitance	VCE= 25 V VGE= 0 V F= 1 MHZ	C _{ies}	--	3000	--	pF	
Output Capacitance		C _{oes}	--	72	--	pF	
Reverse Transfer Capacitance		C _{res}	--	11	--	pF	
Switching Paramters (Test Circuit & Waveform See Fig.21)							
Turn-On Delay Time	Inductive Load VCE= 312 V IC= 20 A VGE= 15.0 V RG= 10 Ω	Tj=25℃	t _{d(on)}	--	28	--	ns
		Tj=175℃	--	26	--		
Tj=25℃		t _r	--	60	--	ns	
Tj=175℃			--	58	--		
Turn-Off Delay Time		Tj=25℃	t _{d(off)}	--	134	--	ns
		Tj=175℃		--	144	--	
Turn-Off Rise Time		Tj=25℃	t _f	--	60	--	ns
		Tj=175℃		--	74	--	
Turn-On Switching Loss		Tj=25℃	E _{on}	--	1040	--	μJ
		Tj=175℃		--	1120	--	
Turn-Off Switching Loss	Tj=25℃	E _{off}	--	730	--	μJ	
	Tj=175℃		--	940	--		
Total Switching Energy	Tj=25℃	E _{tot}	--	1770	--	μJ	
	Tj=175℃		--	2060	--		
Gate Charge Paramters (Test Circuit & Waveform See Fig.22)							
Total Gate Charge	VCE= 312 V VGE= 15 V IC= 20.0 A	Q _g	--	110	--	nC	
Gate-Emitter Charge		Q _{ge}	--	25	--	nC	
Gate-Collector Charge		Q _{gc}	--	38	--	nC	

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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	--	--	80.0	A
tp Limited by Tj(max)	Tj= 100 °C			--	--	40.0	
Max. Pulsed Forward Cuurent			I _{SM}	--	--	160	A
Diode Forward Voltage	IF= 40.0 A,VGE=-0V		V _F	--	1.62	2.10	V
Reverse Recovery Time	IF= 20.0 A	Tj=25°C	t _{rr}	--	110	--	ns
	di/dt= 200 A/us	Tj=175°C		--	195.0	--	
Reverse Recovery Charge	VGE= 0.0 V	Tj=25°C	Q _{rr}	--	426	--	nC
	VCE= 40 V	Tj=175°C		--	2366.0	--	
Reverse Recovery Current		Tj=25°C	I _{rrm}	--	8.0	--	A
		Tj=175°C		--	24.0	--	
Reverse Recovery Energy		Tj=25°C	E _{rr}	--	17.6	--	μJ
		Tj=175°C		--	93.6	--	

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Typical Characteristics Curves

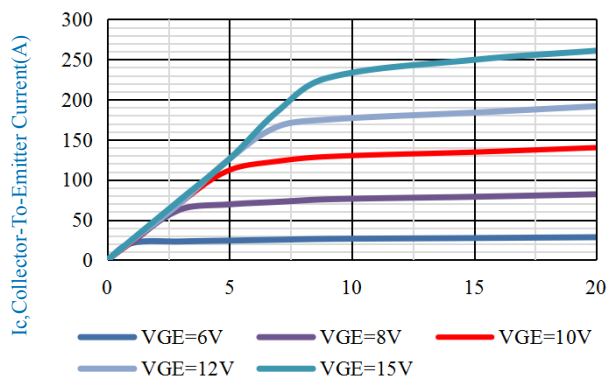


Fig.1-Output Characteristic@ $T_j = 25^\circ\text{C}$

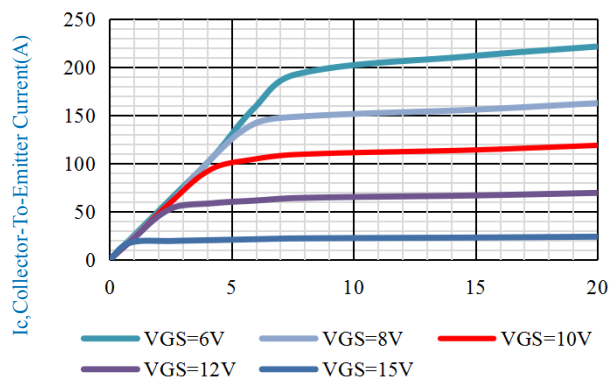


Fig.2-Output Characteristic@ $T_j = 175^\circ\text{C}$

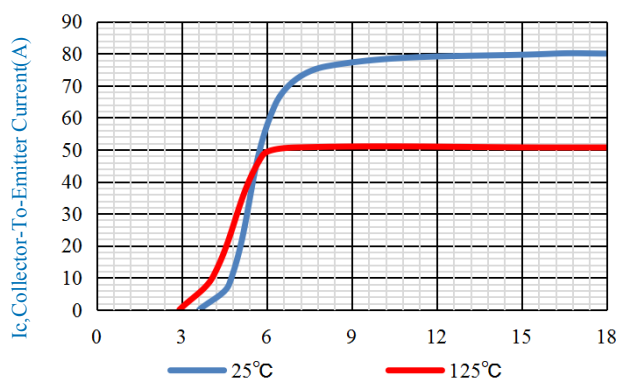


Fig.3-Transfer Characteristic

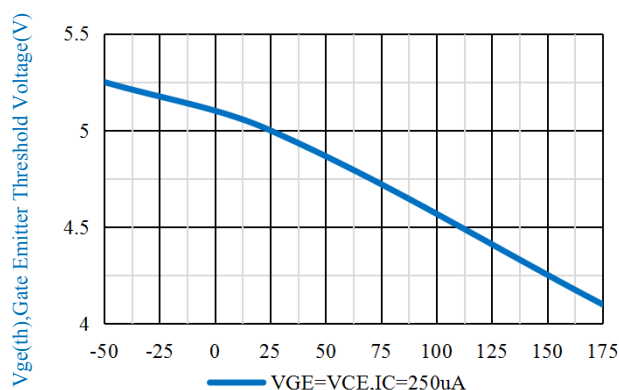


Fig.4-Gate Emitter Threshold Voltage Vs. Junction Temperature

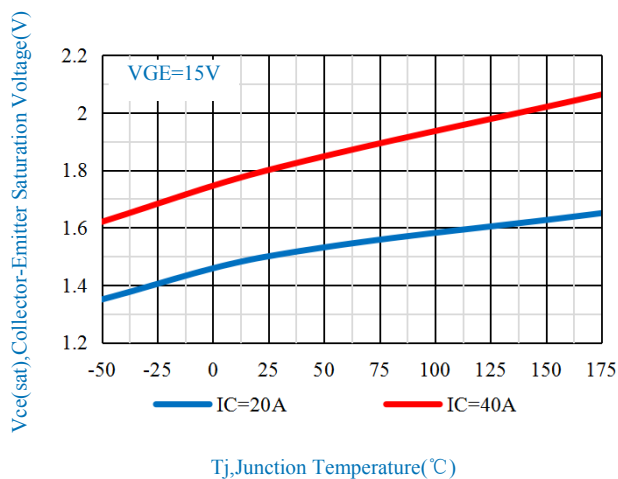


Fig.5-Saturation Voltage vs. Junction Temperature

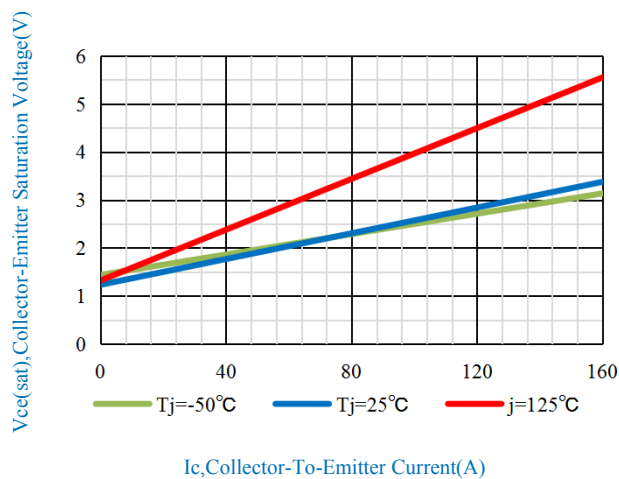


Fig.6-Saturation Voltage vs. Collector-To-Emitter Current

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Typical Characteristics Curves

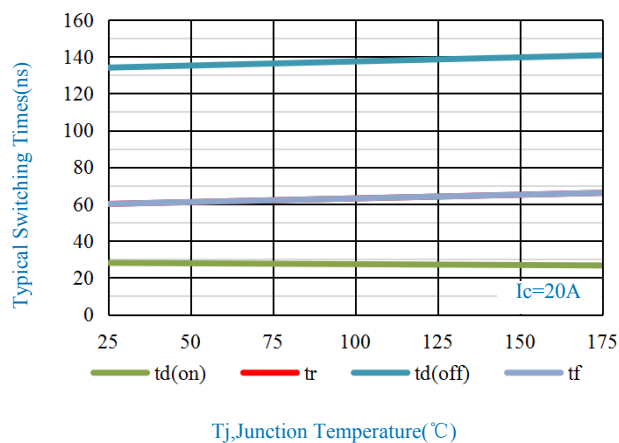


Fig.7-Typical Switching Times Vs. Junction Temperature

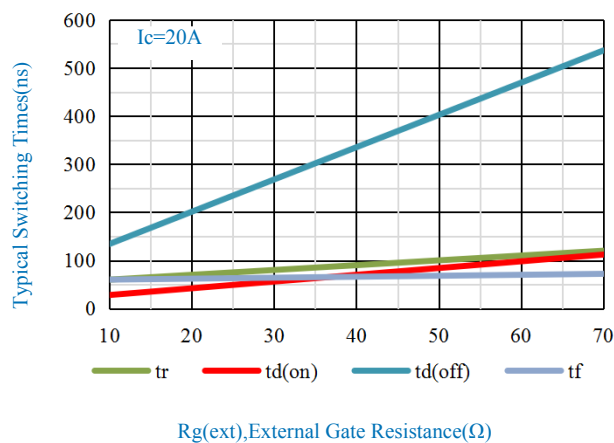


Fig.8-Typical Switching Times Vs. External Gate Resistance

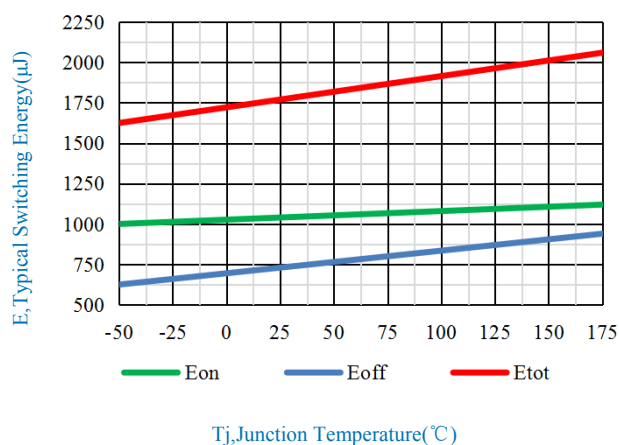


Fig.9-Typical Switching Energy Vs. Junction Temperature

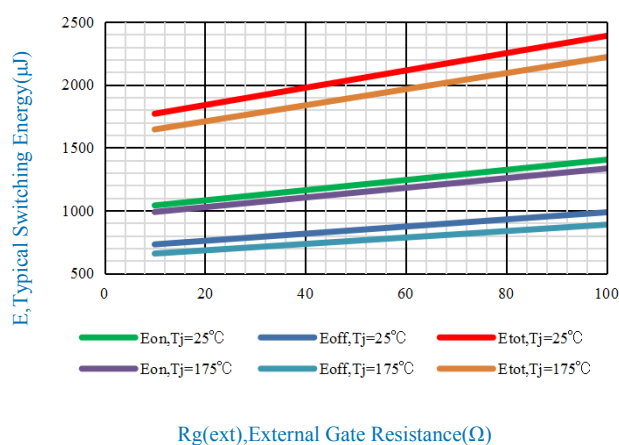


Fig.10-Typical Switching Energy Vs. External Gate Resistance

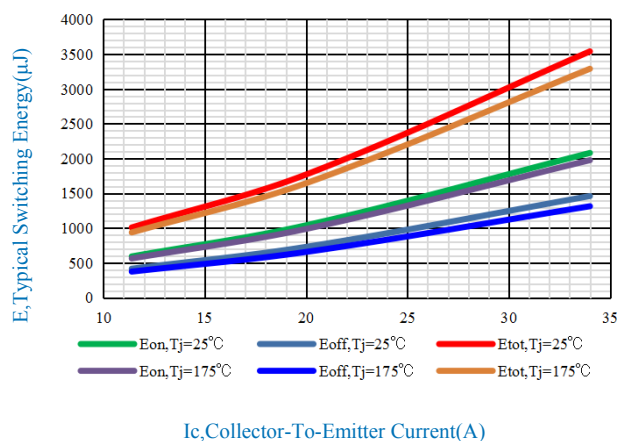


Fig.11-Typical Switching Energy Vs. Collector-To-Emitter Current

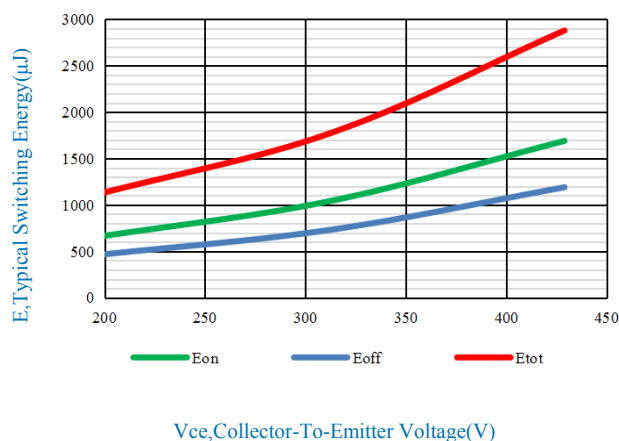


Fig.12-Typical Switching Energy Vs. Collector-To-Emitter Voltage

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Typical Characteristics Curves

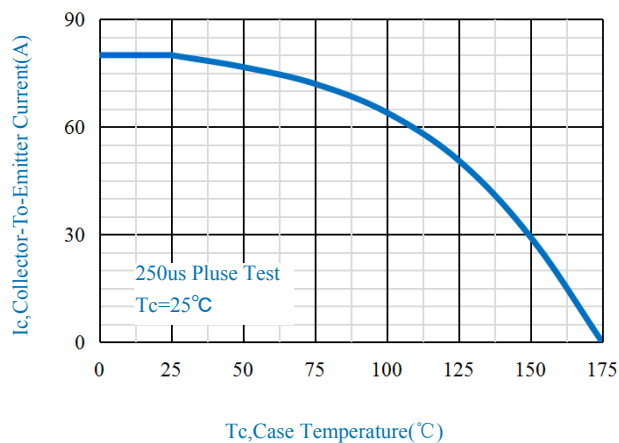


Fig.13-Maximum Continuous Collector Current Vs. Case Temperature

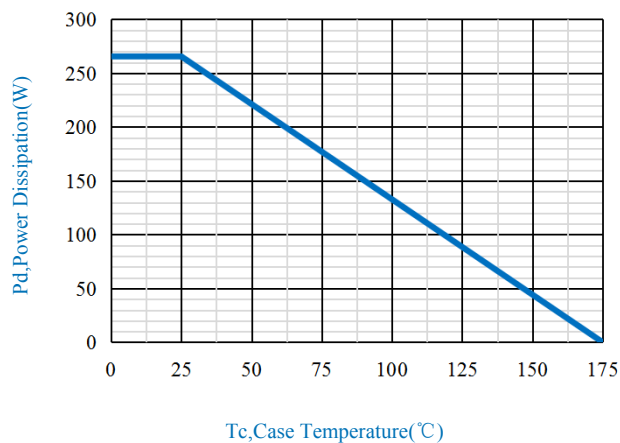


Fig.14-Maximum Power Dissipation Vs. Case Temperature

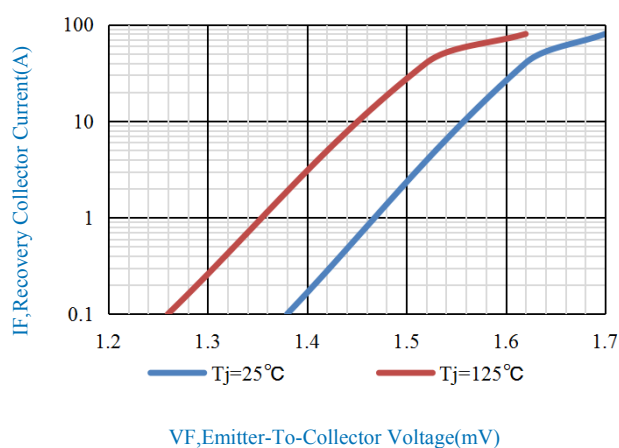


Fig.15-Emitter-To-Collector Diode Forward Voltage

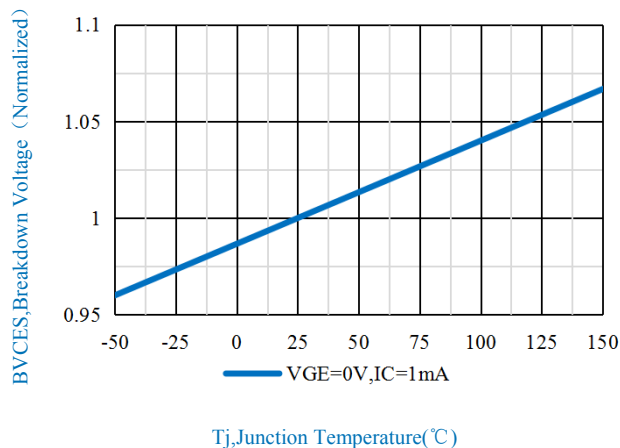


Fig.16-Breakdown Voltage Vs. Junction Temperature

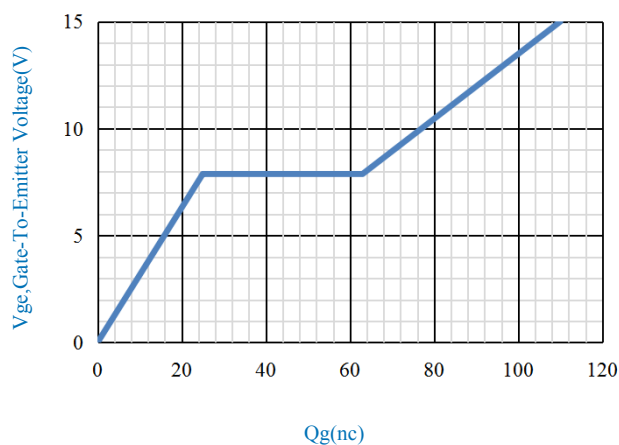


Fig.17-Gate Charge Waveform

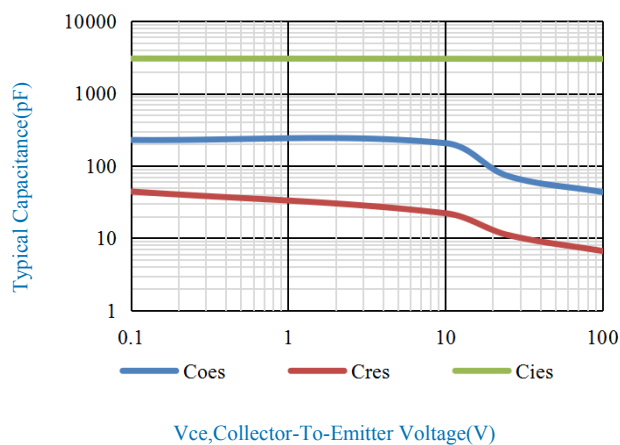


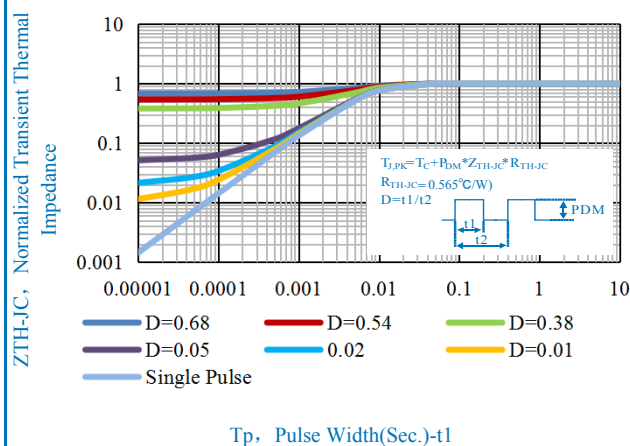
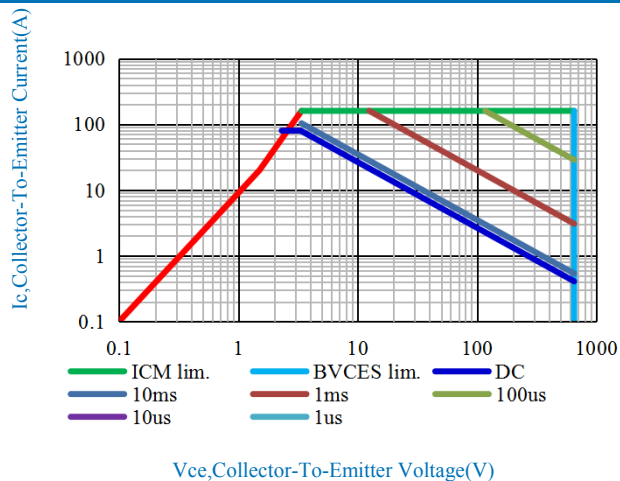
Fig.18-Typical Capacitance Vs. Collector-To-Emitter Voltage

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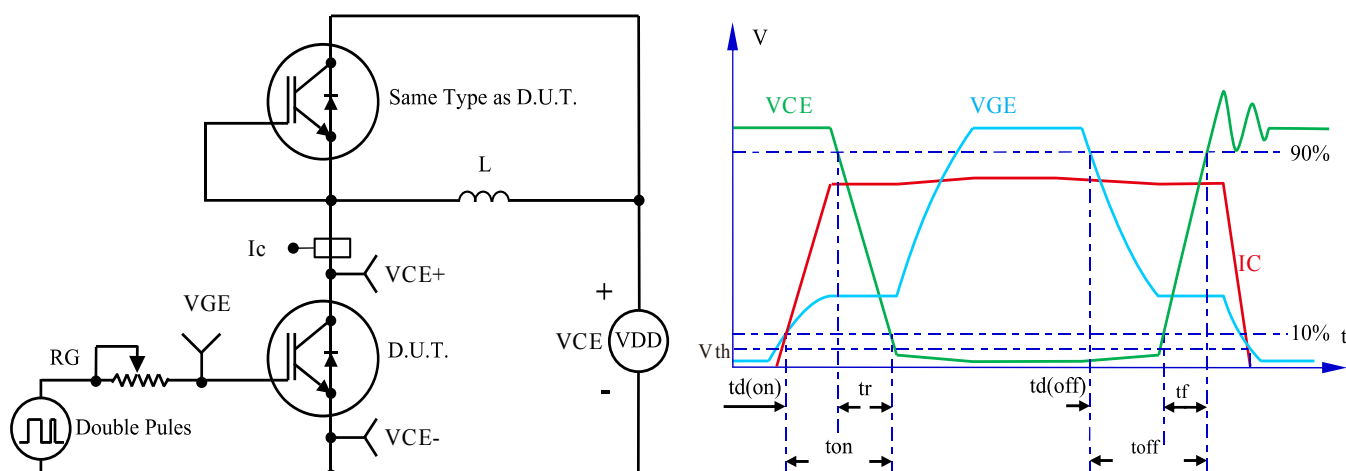


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Typical Characteristics Curves



Test Circuit & Waveform



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Test Circuit & Waveform

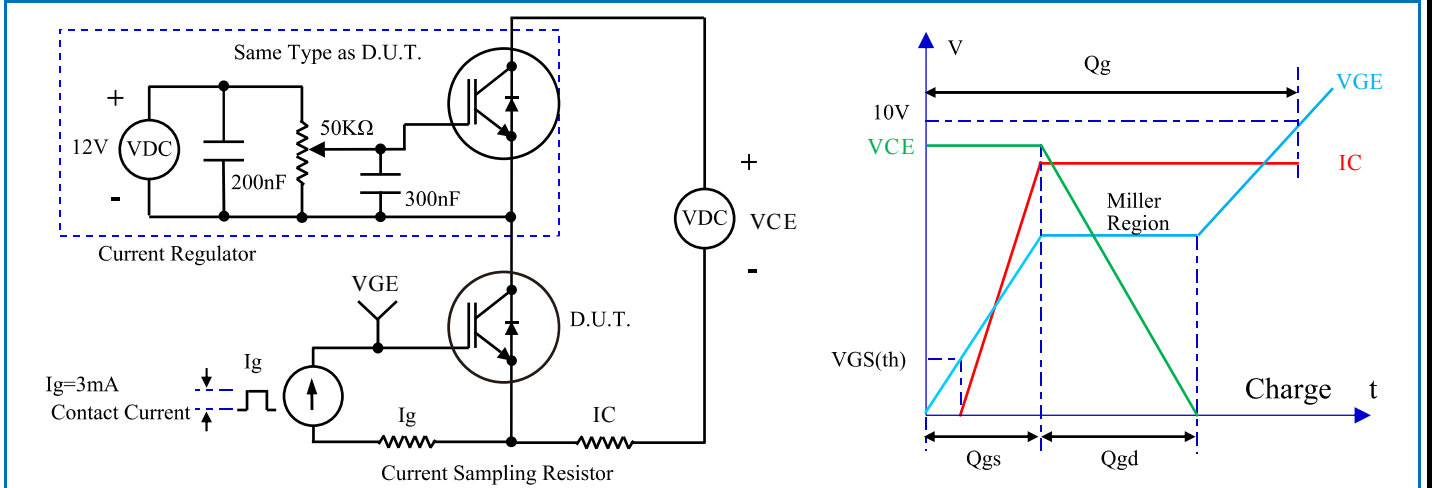


Fig.22- Gate Charge Test Circuit & Waveform

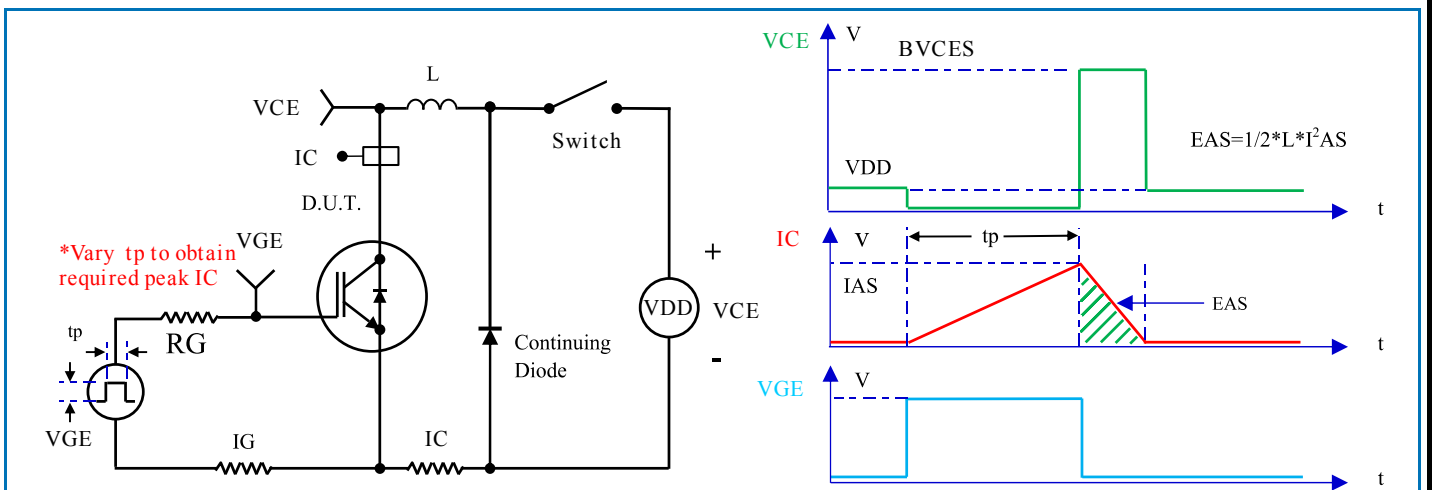


Fig.23- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

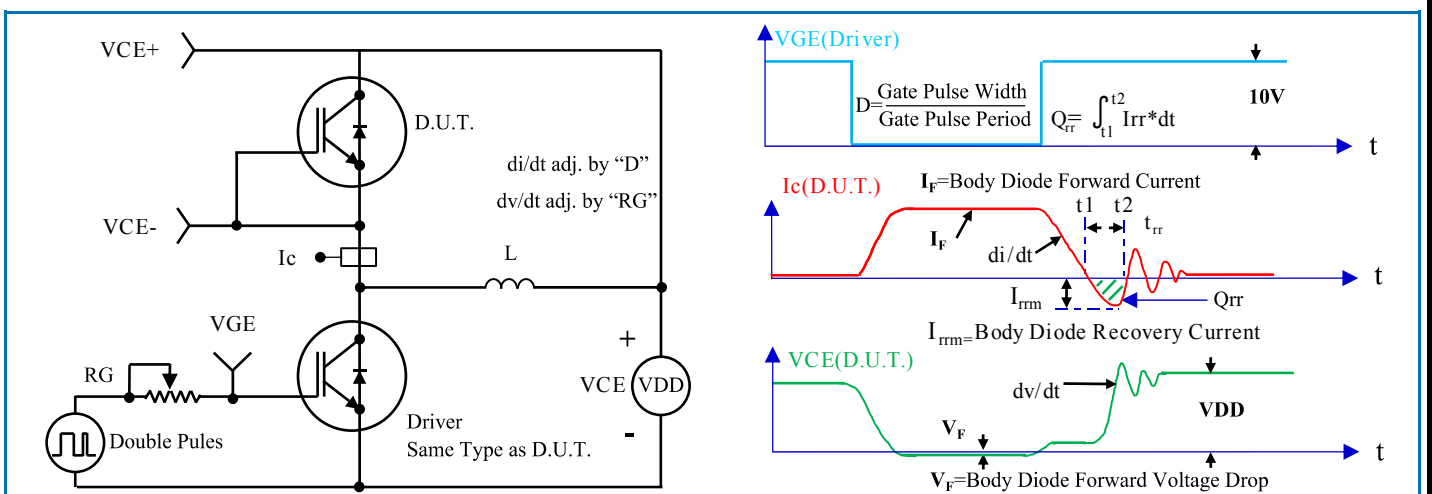


Fig.24- Diode Recovery Test Circuit & Waveform

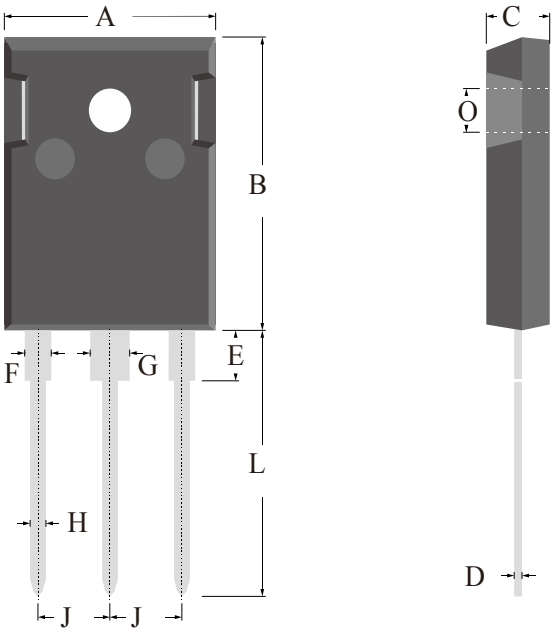
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OUTLINE DRAWINGS

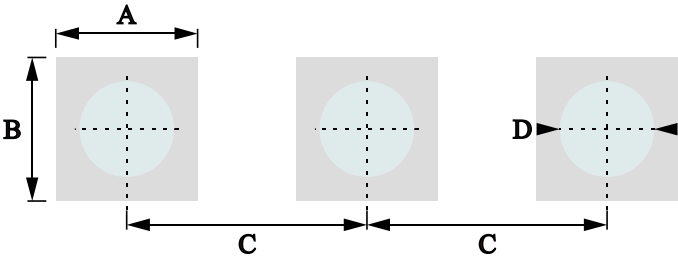
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OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.25	-	16.75	0.6004	-	0.6594
B	20.50	-	22.50	0.8071	-	0.8858
C	4.50	-	5.10	0.1772	-	0.2008
D	0.40	-	0.80	0.0157	-	0.0315
E	3.40	-	5.00	0.1339	-	0.1969
F	1.80	-	2.50	0.0709	-	0.0984
G	2.70	-	3.30	0.1063	-	0.1299
H	1.00	-	1.40	0.0394	-	0.0551
J	5.15	-	5.75	0.2028	-	0.2264
L	18.50	-	20.50	0.7283	-	0.8071
O	2.85	-	3.15	0.1122	-	0.1240

RECOMMEDND LAYOUT DRAWINGS

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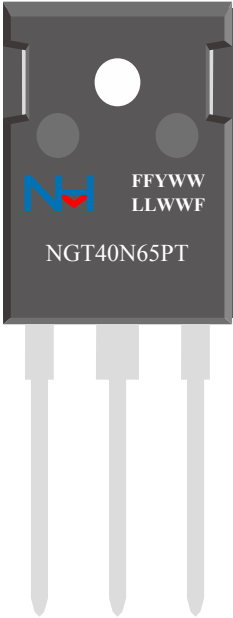
OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	2.00	-	-	0.0787	-
B	-	2.00	-	-	0.0787	-
C	-	5.50	-	-	0.2165	-
D	-	1.40	-	-	0.0551	-

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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
NGT40N65PT=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-247	P1	5.778	Tube	30	600	2400

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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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Specification Revision History

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