

NGTB25N120FLWG

IGBT

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Trench construction, and provides superior performance in demanding switching applications, offering both low on state voltage and minimal switching loss. The IGBT is well suited for UPS and solar applications. Incorporated into the device is a soft and fast co-packaged free wheeling diode with a low forward voltage.

Features

- Low Saturation Voltage using Trench with Field Stop Technology
- Low Switching Loss Reduces System Power Dissipation
- 10 μ s Short Circuit Capability
- Low Gate Charge
- Soft, Fast Free Wheeling Diode
- These are Pb-Free Devices

Typical Applications

- Solar Inverter
- UPS Inverter

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	1200	V
Collector current @ $T_c = 25^\circ\text{C}$ @ $T_c = 100^\circ\text{C}$	I_C	50 25	A
Pulsed collector current, T_{pulse} limited by $T_{J\text{max}}$	I_{CM}	200	A
Diode forward current @ $T_c = 25^\circ\text{C}$ @ $T_c = 100^\circ\text{C}$	I_F	50 25	A
Diode pulsed current, T_{pulse} limited by $T_{J\text{max}}$	I_{FM}	200	A
Gate-emitter voltage	V_{GE}	± 20	V
Power Dissipation @ $T_c = 25^\circ\text{C}$ @ $T_c = 100^\circ\text{C}$	P_D	192 77	W
Short Circuit Withstand Time $V_{GE} = 15\text{ V}$, $V_{CE} = 500\text{ V}$, $T_J \leq 150^\circ\text{C}$	T_{SC}	10	μs
Operating junction temperature range	T_J	-55 to $+150$	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to $+150$	$^\circ\text{C}$
Lead temperature for soldering, 1/8" from case for 5 seconds(note 3)	T_{SLD}	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



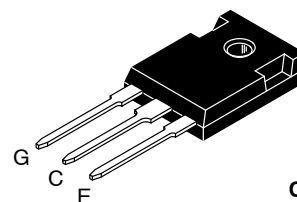
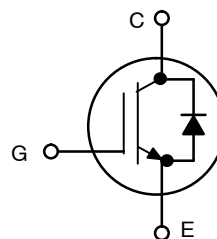
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25 A, 1200 V

$V_{CEsat} = 2.0\text{ V}$

$E_{off} = 0.95\text{ mJ}$



TO-247
CASE 340L
STYLE 4

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
NGTB25N120FLWG	TO-247 (Pb-Free)	30 Units / Rail

NGTB25N120FLWG

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case, for IGBT	$R_{\theta JC}$	0.65	$^{\circ}\text{C/W}$
Thermal resistance junction-to-case, for Diode	$R_{\theta JC}$	1.5	$^{\circ}\text{C/W}$
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
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STATIC CHARACTERISTIC

Collector-emitter breakdown voltage, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, I_C = 500\text{ }\mu\text{A}$	$V_{(BR)CES}$	1200	–	–	V
Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 25\text{ A}, T_J = 150^{\circ}\text{C}$	V_{CEsat}	1.55 –	2.0 2.2	2.2 –	V
Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 250\text{ }\mu\text{A}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$ $V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_J = 150^{\circ}\text{C}$	I_{CES}	– –	– –	0.5 2	mA
Gate leakage current, collector-emitter short-circuited	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	I_{GES}	–	–	100	nA

DYNAMIC CHARACTERISTIC

Input capacitance	$V_{CE} = 20\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{ies}	–	5200	–	pF
Output capacitance		C_{oes}	–	144	–	
Reverse transfer capacitance		C_{res}	–	94	–	
Gate charge total	$V_{CE} = 600\text{ V}, I_C = 25\text{ A}, V_{GE} = 15\text{ V}$	Q_g		220		nC
Gate to emitter charge		Q_{ge}		40		
Gate to collector charge		Q_{gc}		98		

SWITCHING CHARACTERISTIC, INDUCTIVE LOAD

Turn-on delay time	$T_J = 25^{\circ}\text{C}$ $V_{CC} = 600\text{ V}, I_C = 25\text{ A}$ $R_g = 10\text{ }\Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$	$t_{d(on)}$		91		ns
Rise time		t_r		26		
Turn-off delay time		$t_{d(off)}$		228		
Fall time		t_f		160		
Turn-on switching loss		E_{on}		1.50		mJ
Turn-off switching loss		E_{off}		0.95		
Total switching loss		E_{ts}		2.45		
Turn-on delay time	$T_J = 125^{\circ}\text{C}$ $V_{CC} = 600\text{ V}, I_C = 25\text{ A}$ $R_g = 10\text{ }\Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$	$t_{d(on)}$		88		ns
Rise time		t_r		28		
Turn-off delay time		$t_{d(off)}$		240		
Fall time		t_f		270		
Turn-on switching loss		E_{on}		1.8		mJ
Turn-off switching loss		E_{off}		1.6		
Total switching loss		E_{ts}		3.4		

NGTB25N120FLWG

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
DIODE CHARACTERISTIC						
Forward voltage	$V_{GE} = 0\text{ V}, I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}, I_F = 25\text{ A}, T_J = 150^\circ\text{C}$	V_F		2.2 2.5	2.8	V
Reverse recovery time	$T_J = 25^\circ\text{C}$ $I_F = 25\text{ A}, V_R = 400\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	t_{rr}		240		ns
Reverse recovery charge		Q_{rr}		1.5		μC
Reverse recovery current		I_{rrm}		15		A
Reverse recovery time	$T_J = 125^\circ\text{C}$ $I_F = 25\text{ A}, V_R = 400\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	t_{rr}		260		ns
Reverse recovery charge		Q_{rr}		2.0		μC
Reverse recovery current		I_{rrm}		19		A

NGTB25N120FLWG

TYPICAL CHARACTERISTICS

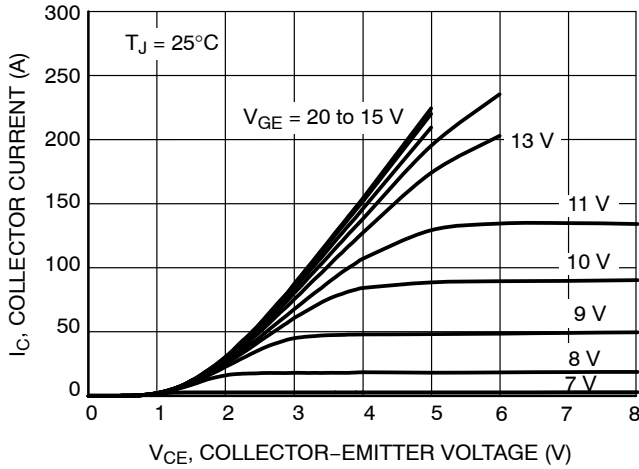


Figure 1. Output Characteristics

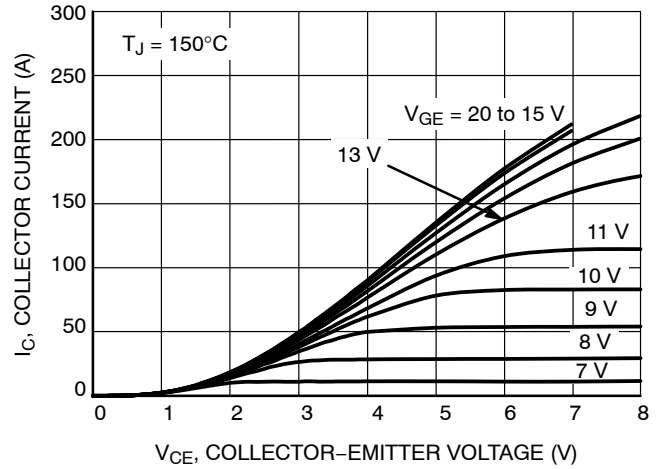


Figure 2. Output Characteristics

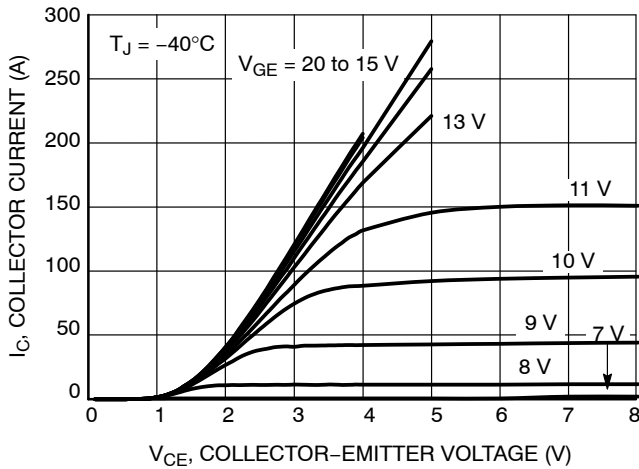


Figure 3. Output Characteristics

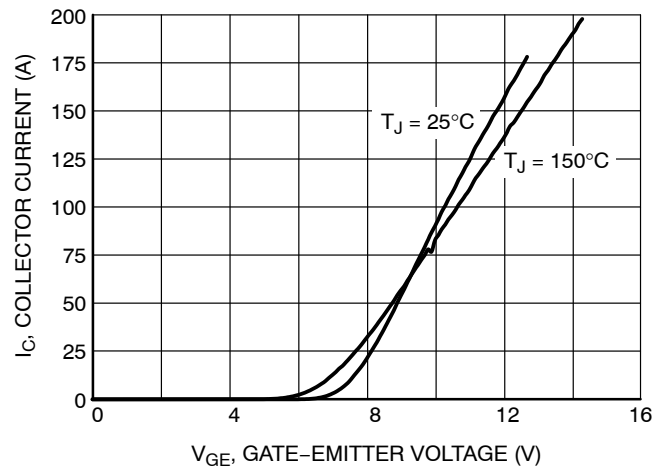


Figure 4. Typical Transfer Characteristics

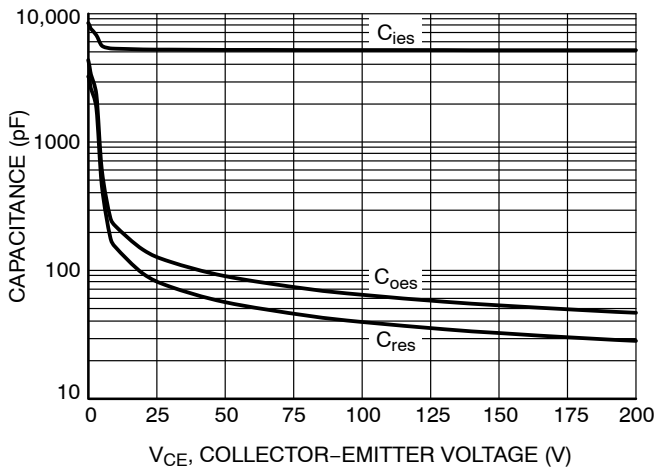


Figure 5. Typical Capacitance

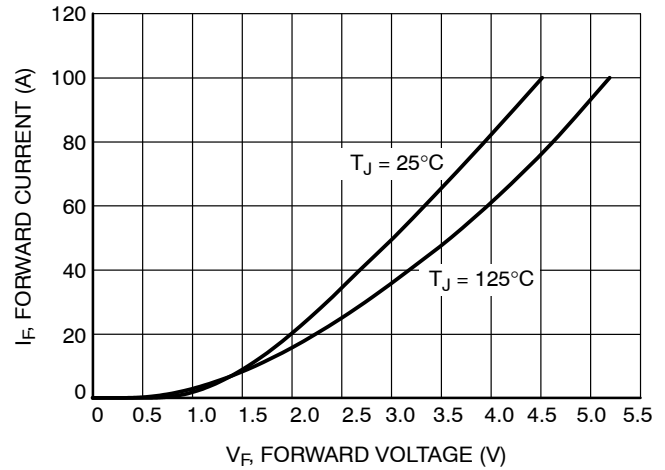


Figure 6. Diode Forward Characteristics

NGTB25N120FLWG

TYPICAL CHARACTERISTICS

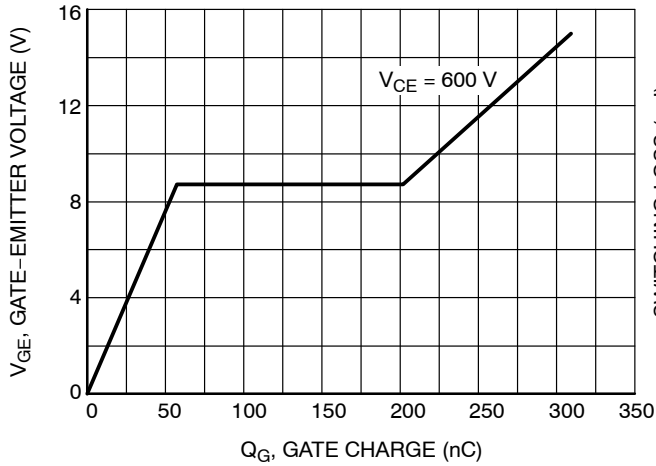


Figure 7. Typical Gate Charge

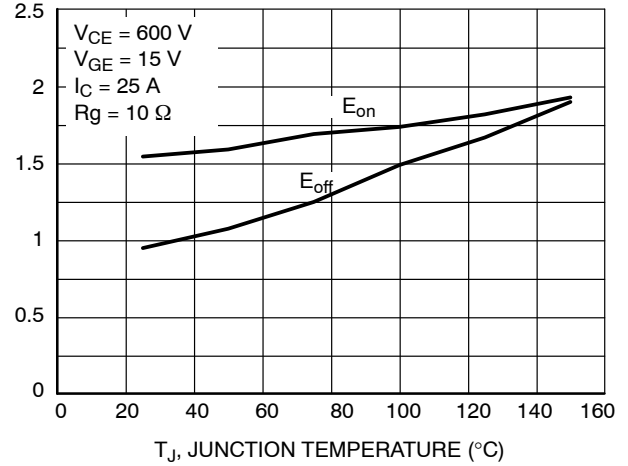


Figure 8. Energy Loss vs. Temperature

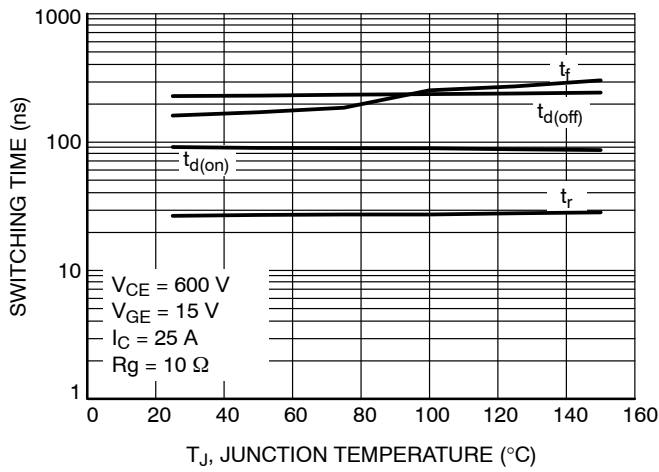


Figure 9. Switching Time vs. Temperature

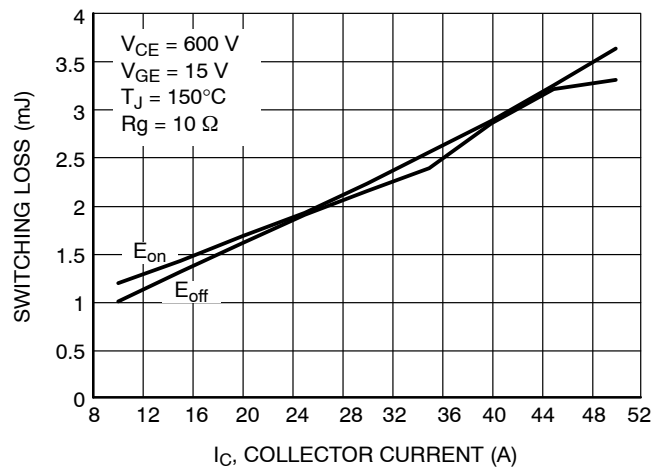


Figure 10. Energy Loss vs. I_C

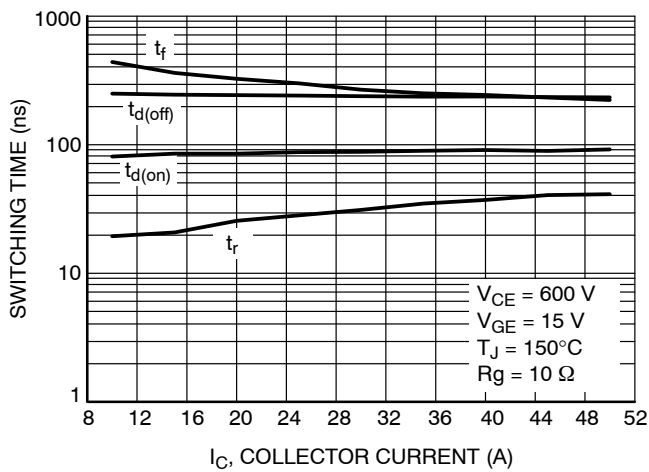


Figure 11. Switching Time vs. I_C

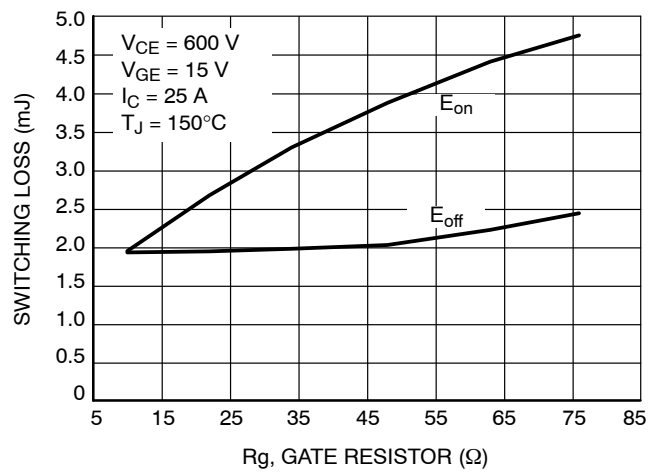


Figure 12. Energy Loss vs. R_g

NGTB25N120FLWG

TYPICAL CHARACTERISTICS

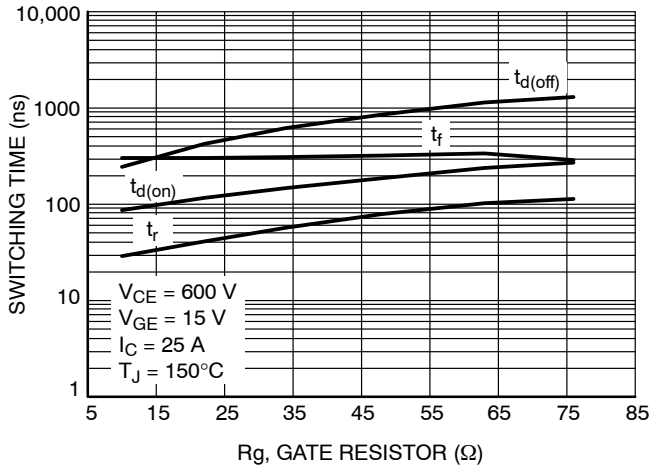


Figure 13. Switching Time vs. R_g

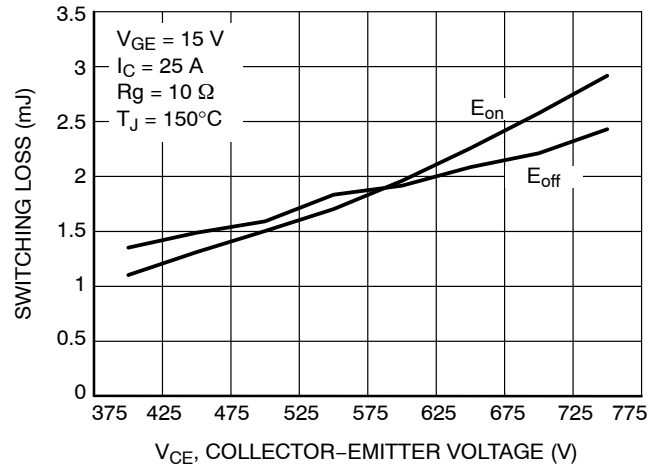


Figure 14. Energy Loss vs. V_{CE}

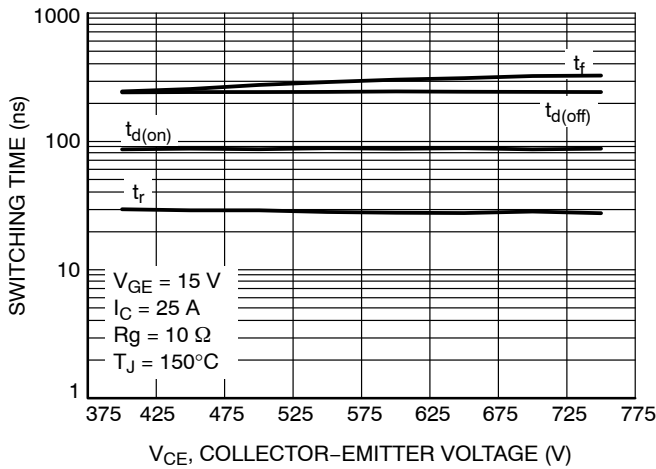


Figure 15. Switching Time vs. V_{CE}

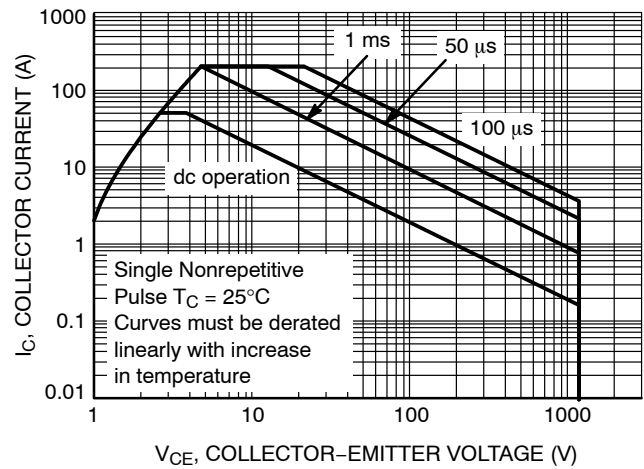


Figure 16. Safe Operating Area

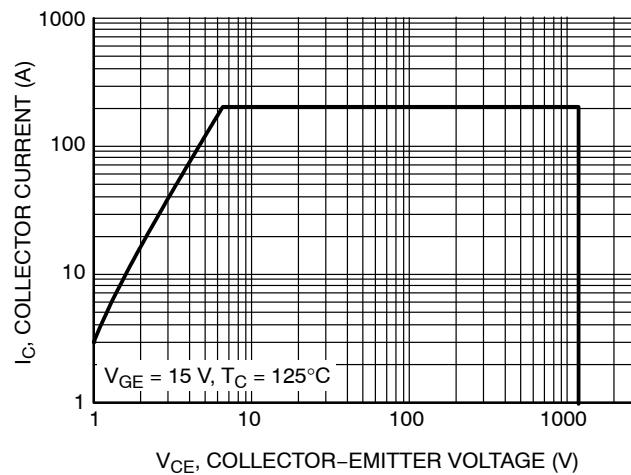


Figure 17. Reverse Bias Safe Operating Area

NGTB25N120FLWG

TYPICAL CHARACTERISTICS

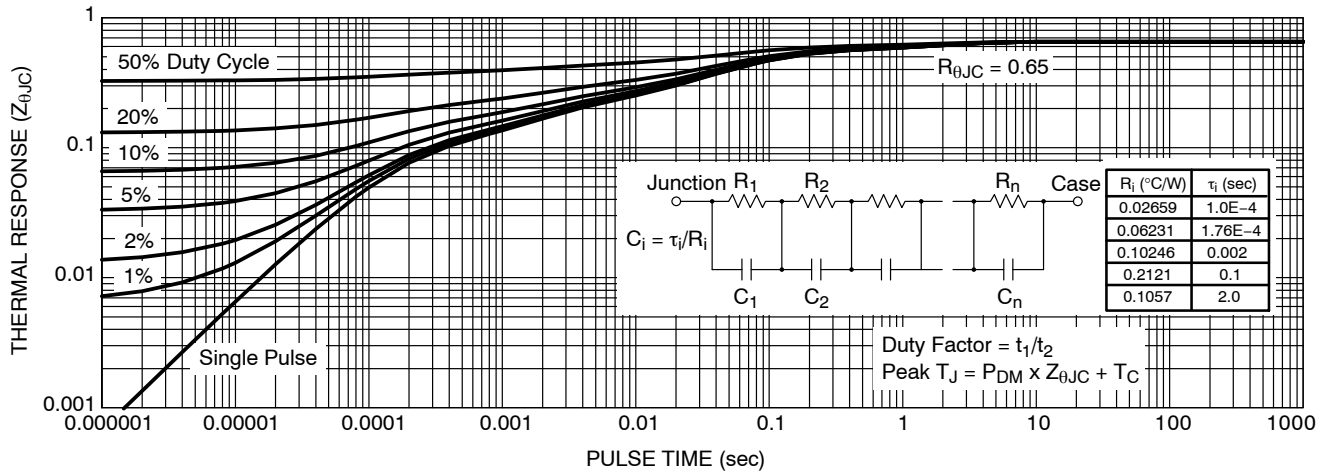


Figure 18. IGBT Transient Thermal Impedance

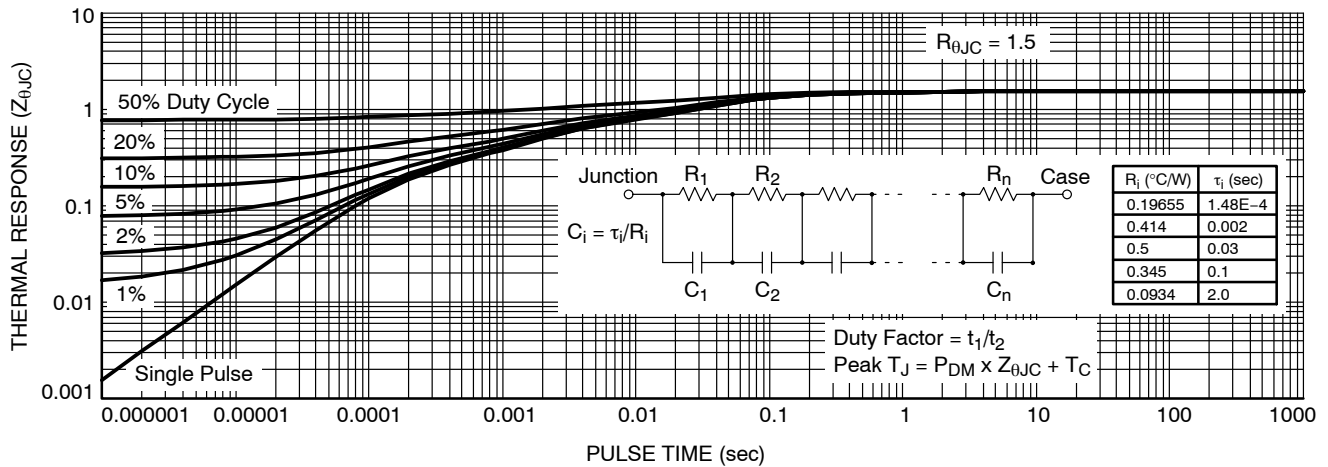


Figure 19. Diode Transient Thermal Impedance

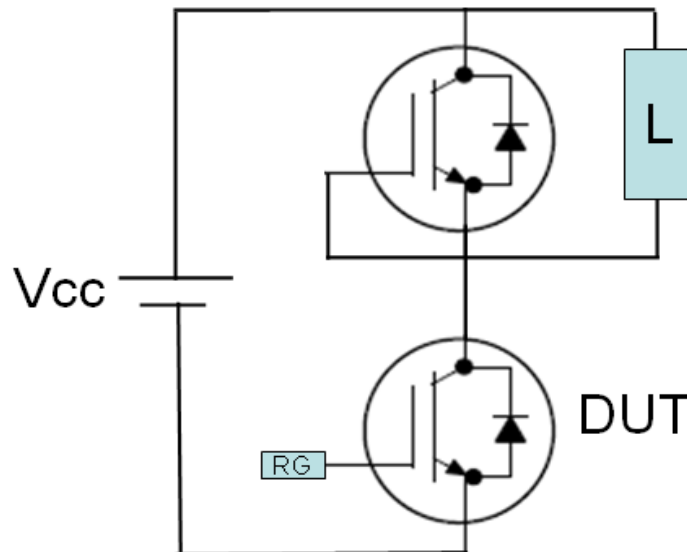


Figure 20. Test Circuit for Switching Characteristics

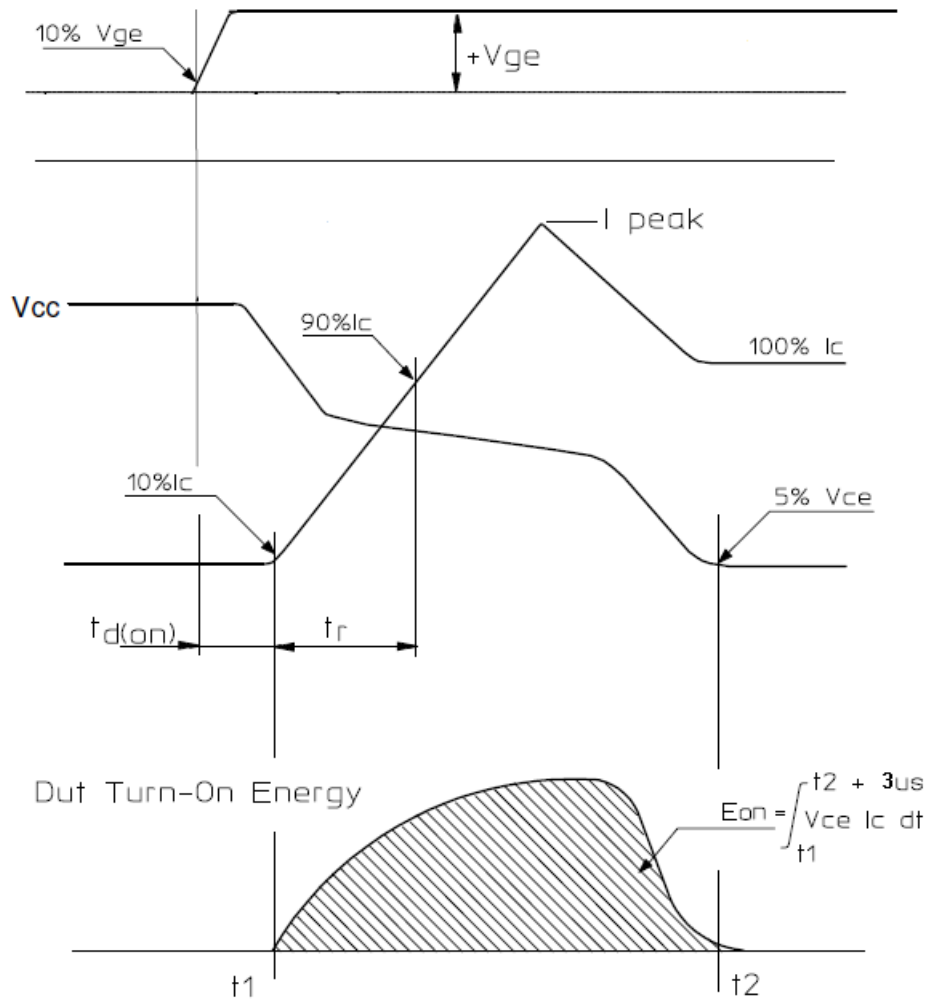


Figure 21. Definition of Turn On Waveform

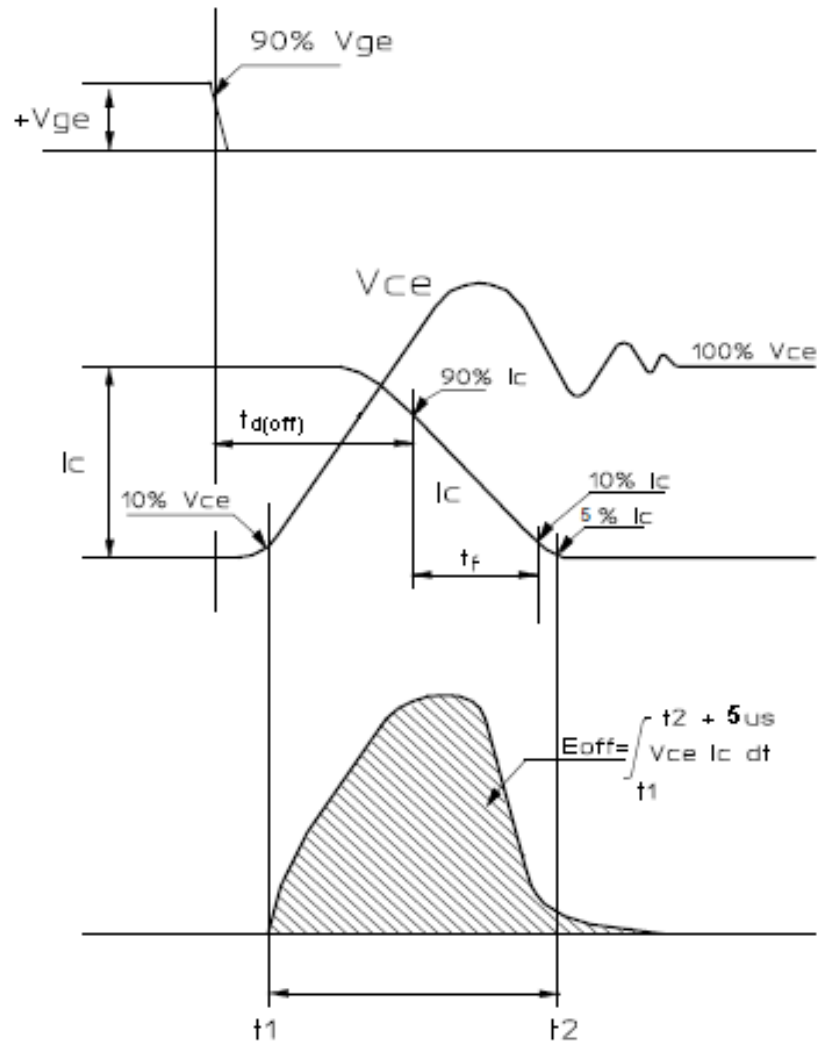
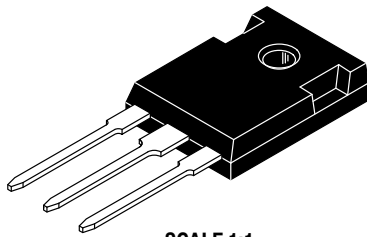


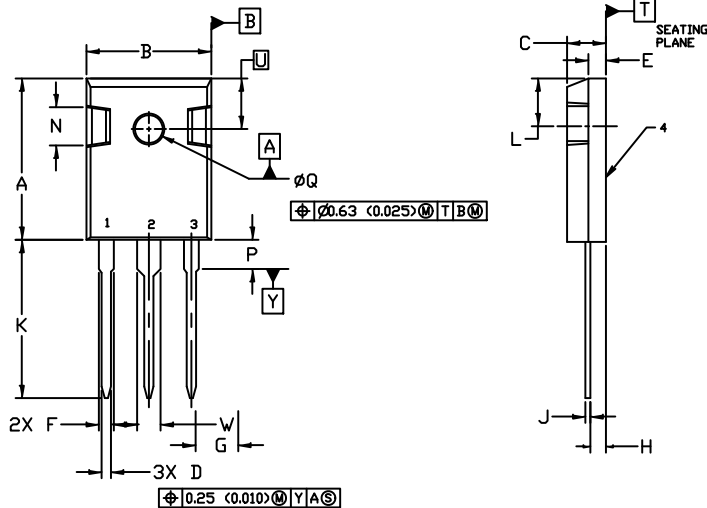
Figure 22. Definition of Turn Off Waveform



TO-247
CASE 340L
ISSUE G

DATE 06 OCT 2021

SCALE 1:1

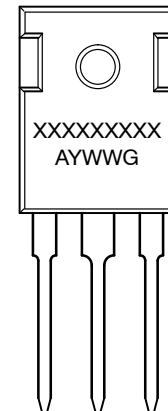


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER

DIM	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	20.32	21.08	0.800	0.830
B	15.75	16.26	0.620	0.640
C	4.70	5.30	0.185	0.209
D	1.00	1.40	0.040	0.055
E	1.90	2.60	0.075	0.102
F	1.65	2.13	0.065	0.084
G	5.45 BSC		0.215 BSC	
H	1.50	2.49	0.059	0.098
J	0.40	0.80	0.016	0.031
K	19.81	20.83	0.780	0.820
L	5.40	6.20	0.212	0.244
N	4.32	5.49	0.170	0.216
P	----	4.50	----	0.177
Q	3.55	3.65	0.140	0.144
U	6.15 BSC		0.242 BSC	
W	2.87	3.12	0.113	0.123

GENERIC
MARKING DIAGRAM*



STYLE 1: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN	STYLE 2: PIN 1. ANODE 2. CATHODE (S) 3. ANODE 2 4. CATHODE (S)	STYLE 3: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR	STYLE 4: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR
STYLE 5: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE	STYLE 6: PIN 1. MAIN TERMINAL 1 2. MAIN TERMINAL 2 3. GATE 4. MAIN TERMINAL 2		

XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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