NGTB25N120LWG

IGBT

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop (FS) 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 resonant or soft switching applications. Incorporated into the device is a rugged 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
- Low Gate Charge
- 5 μs Short−Circuit Capability
- These are Pb−Free Devices

Typical Applications

- Inverter Welding Machines
- Microwave Ovens
- Industrial Switching
- Motor Control Inverter

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−emitter voltage	V_{CES}	1200	V
Collector current @ T_C = 25°C @ T_C = 100°C	I_C	 50 25	A
Pulsed collector current, T_{pulse} limited by T_{Jmax}	I_{CM}	200	A
Diode forward current @ T_C = 25°C @ T_C = 100°C	I_F	 50 25	A
Diode pulsed current, T_{pulse} limited by T_{Jmax}	I_{FM}	200	A
Gate−emitter voltage	V_{GE}	±20	V
Power Dissipation @ T_C = 25°C @ T_C = 100°C	P_D	 192 77	W
Short−Circuit Withstand Time V_{GE} = 15 V, V_{CE} = 600 V, $T_J \le 150$°C	T_{sc}	5	μs
Operating junction temperature range	T_J	−55 to +150	°C
Storage temperature range	T_{stg}	−55 to +150	°C
Lead temperature for soldering, 1/8” from case for 5 seconds	T_{SLD}	260	°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.

ON Semiconductor®

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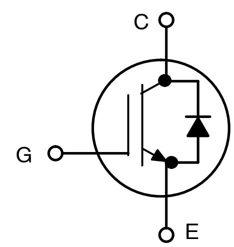
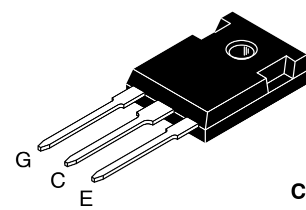
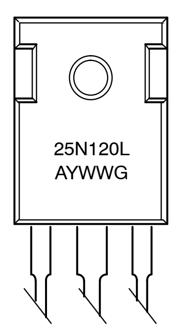
25 A, 1200 V
V_{CEsat} = 1.85 V
E_{off} = 0.8 mJ





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
NGTB25N120LWG	TO−247 (Pb−Free)	30 Units / Rail

August, 2012 − Rev. 4
Publication Order Number:
NGTB25N120L/D

THERMAL CHARACTERISTICS

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

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
STATIC CHARACTERISTIC						
Collector−emitter breakdown voltage, gate−emitter short−circuited	V_{GE} = 0 V, I_C = 500 μA	$V_{(BR)CES}$	1200	–	–	V
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 25 A V_{GE} = 15 V, I_C = 25 A, T_J = 150°C	V_{CEsat}	– –	1.85 2.1	2.3 –	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 250 μA	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector−emitter cut−off current, gate−emitter short−circuited	V_{GE} = 0 V, V_{CE} = 1200 V V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 150°C	I_{CES}	– –	– –	0.5 2.0	mA
Gate leakage current, collector−emitter short−circuited	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	100	nA
DYNAMIC CHARACTERISTIC						
Input capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	–	4700	–	pF
Output capacitance		C_{oes}	–	155	–	
Reverse transfer capacitance		C_{res}	–	100	–	
Gate charge total	V_{CE} = 600 V, I_C = 25 A, V_{GE} = 15 V	Q_g		200		nC
Gate to emitter charge		Q_{ge}		38		
Gate to collector charge		Q_{gc}		100		
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn-on delay time	T_J = 25°C V_{CC} = 600 V, I_C = 25 A R_g = 10 Ω V_{GE} = 0 V/ 15 V	$t_{d(on)}$		89		ns
Rise time		t_r		29		
Turn-off delay time		$t_{d(off)}$		235		
Fall time		t_f		160		
Turn-on switching loss		E_{on}		3.4		mJ
Turn-off switching loss		E_{off}		0.8		
Turn-on delay time	T_J = 125°C V_{CC} = 600 V, I_C = 25 A R_g = 10 Ω V_{GE} = 0 V/ 15 V	$t_{d(on)}$		88		ns
Rise time		t_r		29		
Turn-off delay time		$t_{d(off)}$		250		
Fall time		t_f		225		
Turn-on switching loss		E_{on}		4.4		mJ
Turn-off switching loss		E_{off}		1.9		
DIODE CHARACTERISTIC						
Forward voltage	V_{GE} = 0 V, I_F = 25 A V_{GE} = 0 V, I_F = 25 A, T_J = 150°C	V_F		1.7 1.8	1.8	V

TYPICAL CHARACTERISTICS

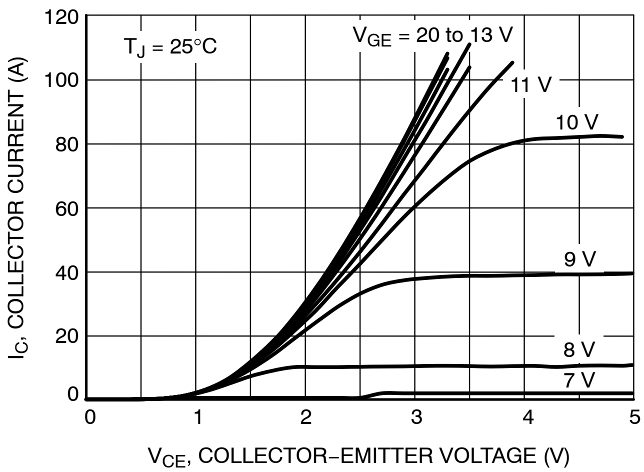


Figure 1. Output Characteristics

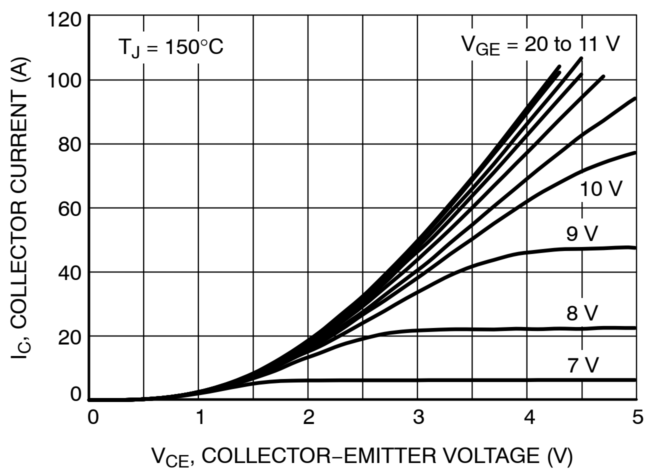


Figure 2. Output Characteristics

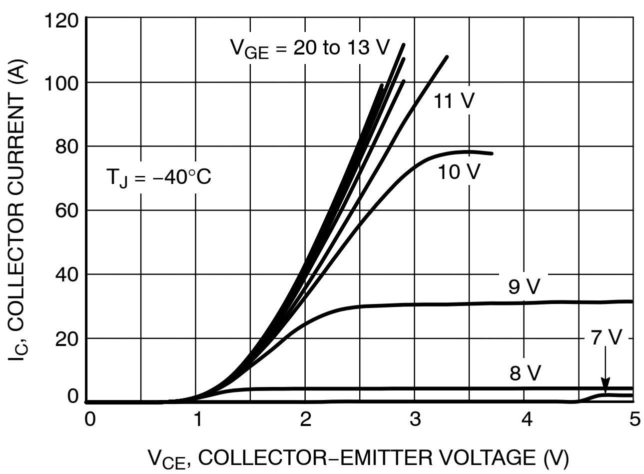


Figure 3. Output Characteristics

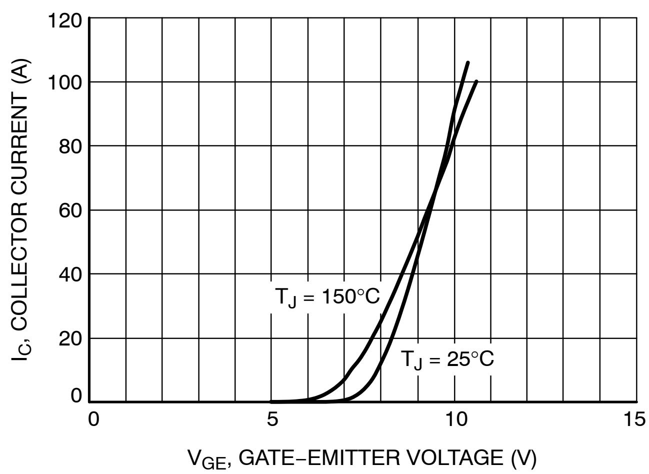


Figure 4. Typical Transfer Characteristics

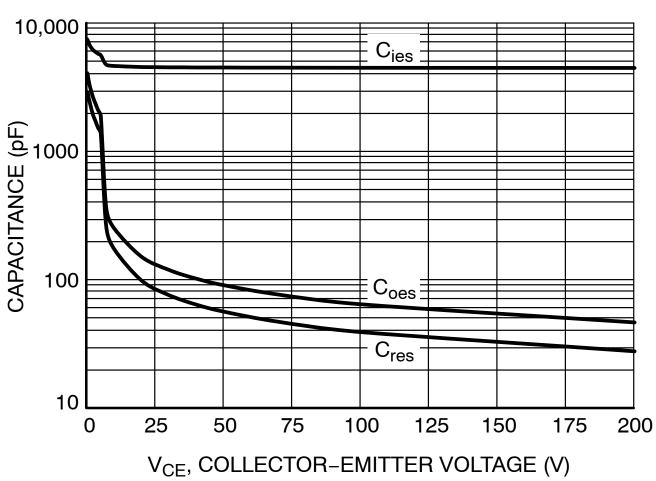


Figure 5. Typical Capacitance

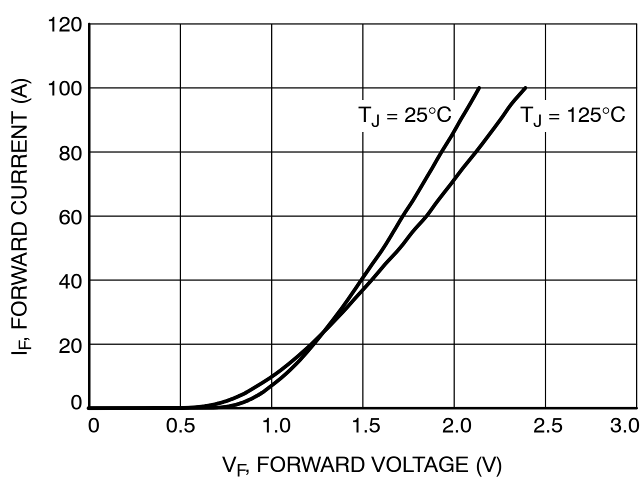


Figure 6. Diode Forward Characteristics

TYPICAL CHARACTERISTICS

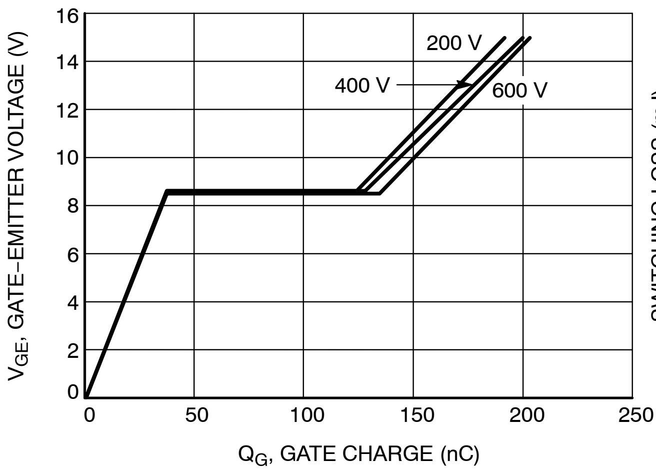


Figure 7. Typical Gate Charge

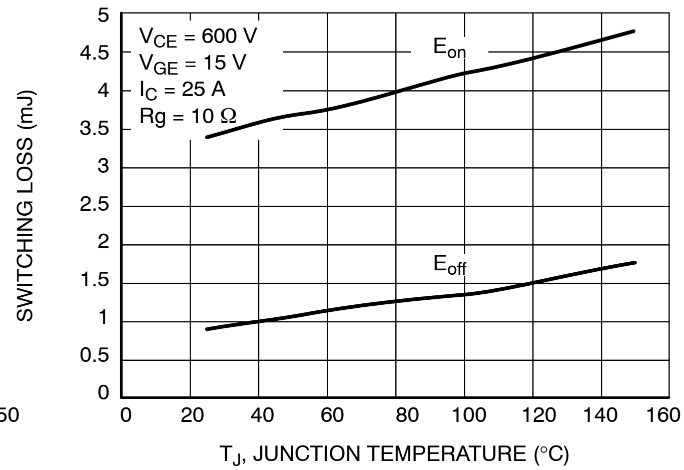


Figure 8. Energy Loss vs. Temperature

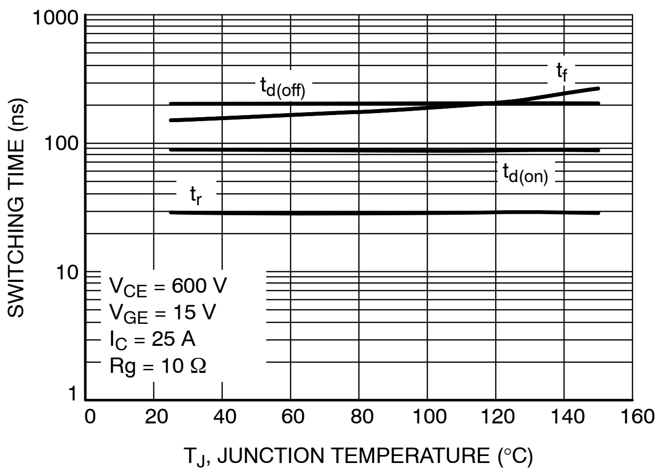


Figure 9. Switching Time vs. Temperature

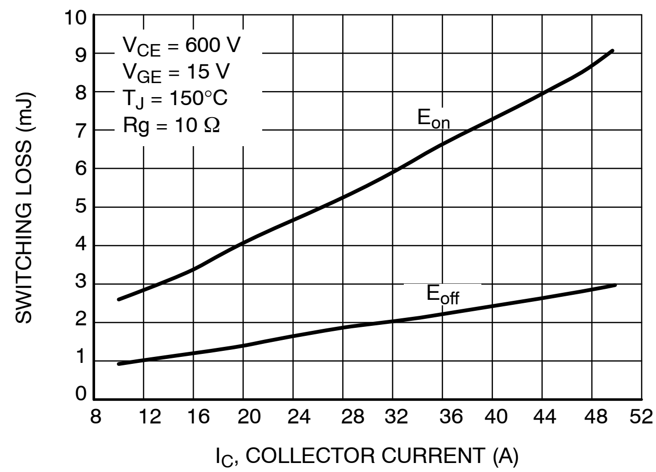


Figure 10. Energy Loss vs. I_C

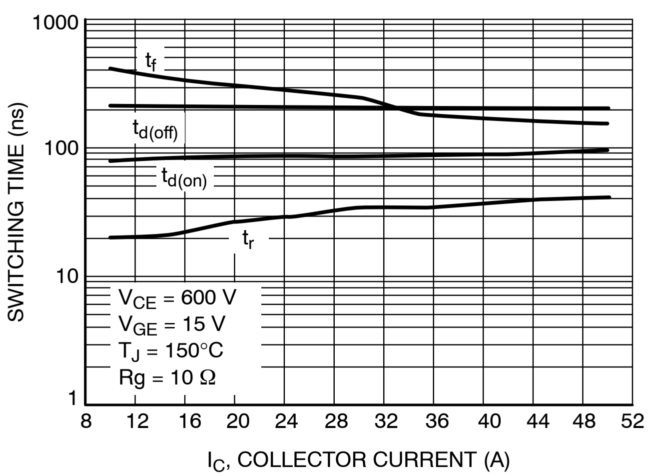


Figure 11. Switching Time vs. I_C

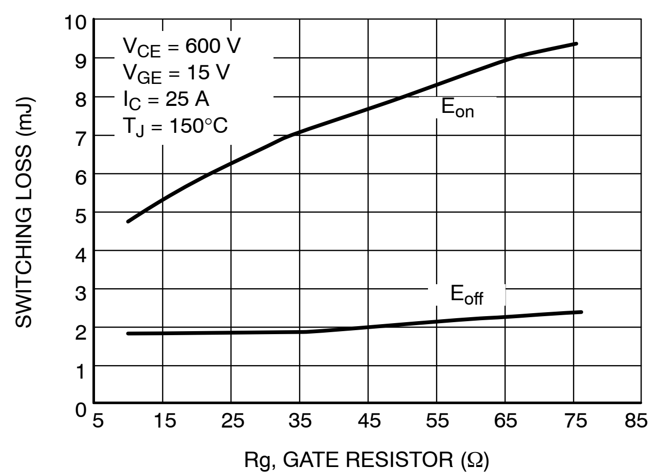


Figure 12. Energy Loss vs. Rg

TYPICAL CHARACTERISTICS

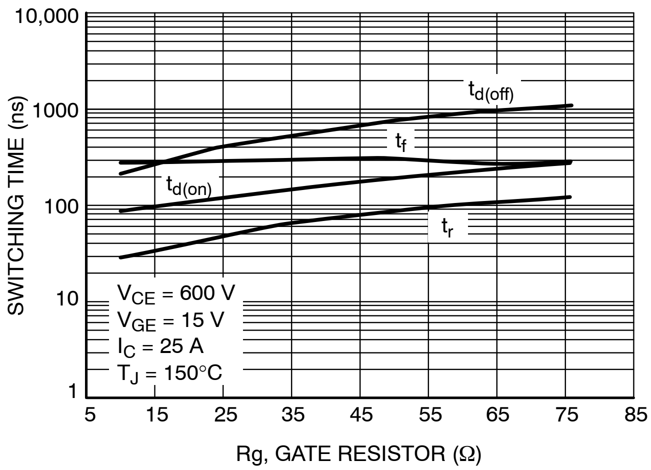


Figure 13. Switching Time vs. Rg

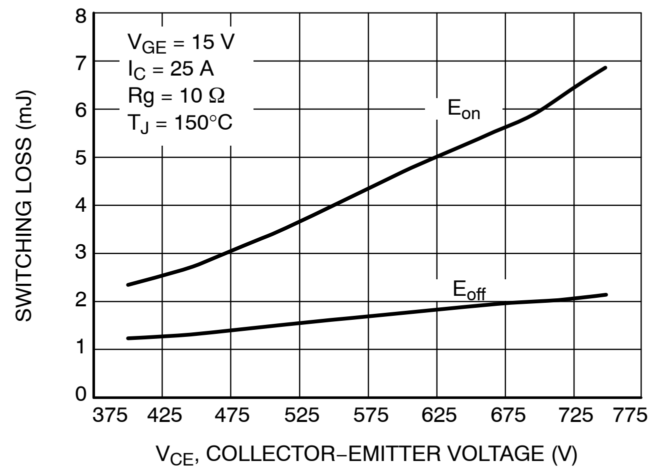


Figure 14. Energy Loss vs. V_{CE}

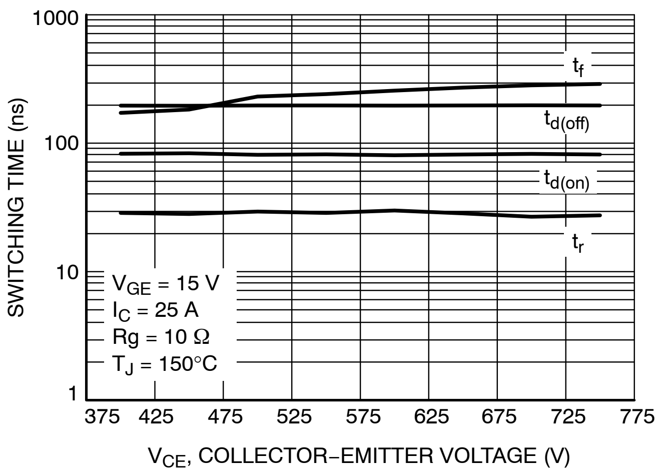


Figure 15. Switching Time vs. V_{CE}

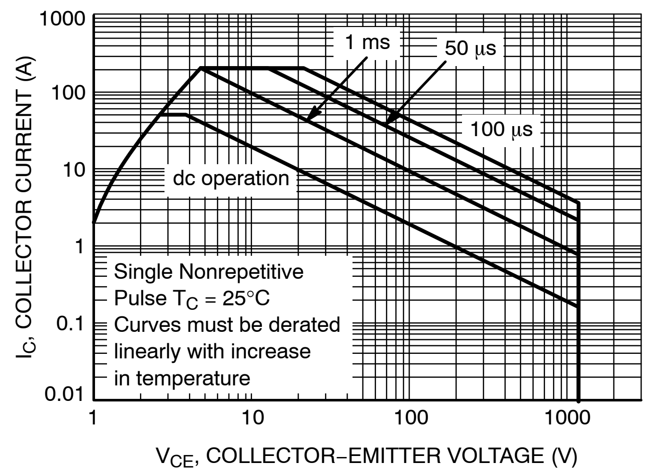


Figure 16. Safe Operating Area

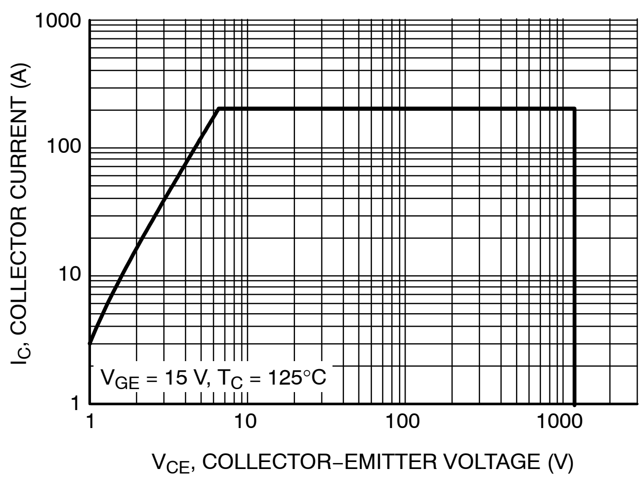


Figure 17. Reverse Bias Safe Operating Area

TYPICAL CHARACTERISTICS

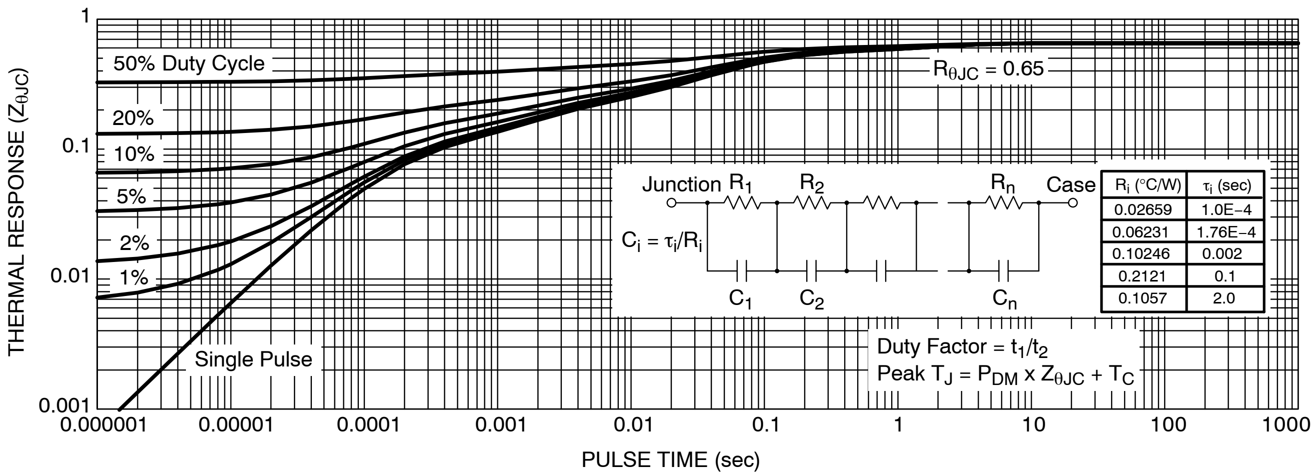


Figure 18. IGBT Transient Thermal Impedance

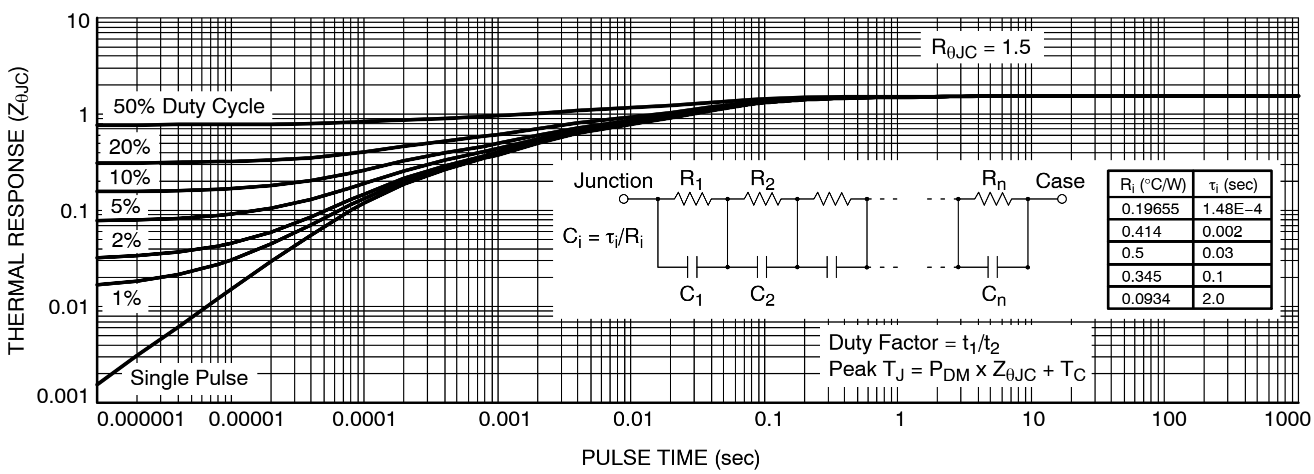


Figure 19. Diode Transient Thermal Impedance

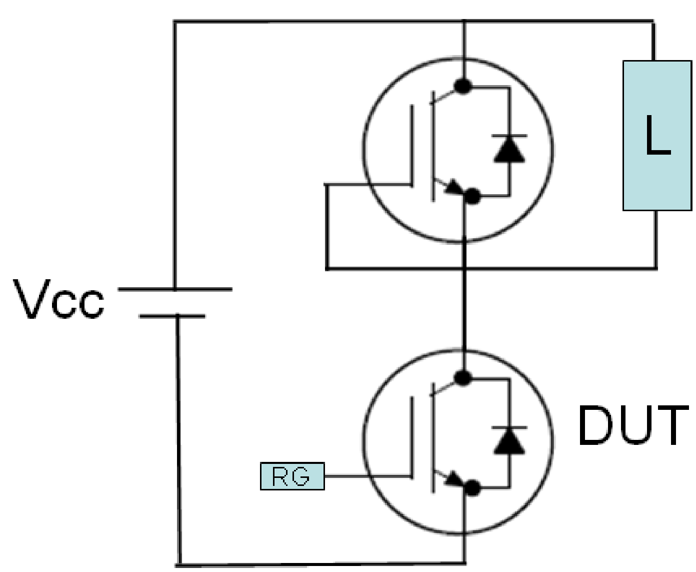


Figure 20. Test Circuit for Switching Characteristics

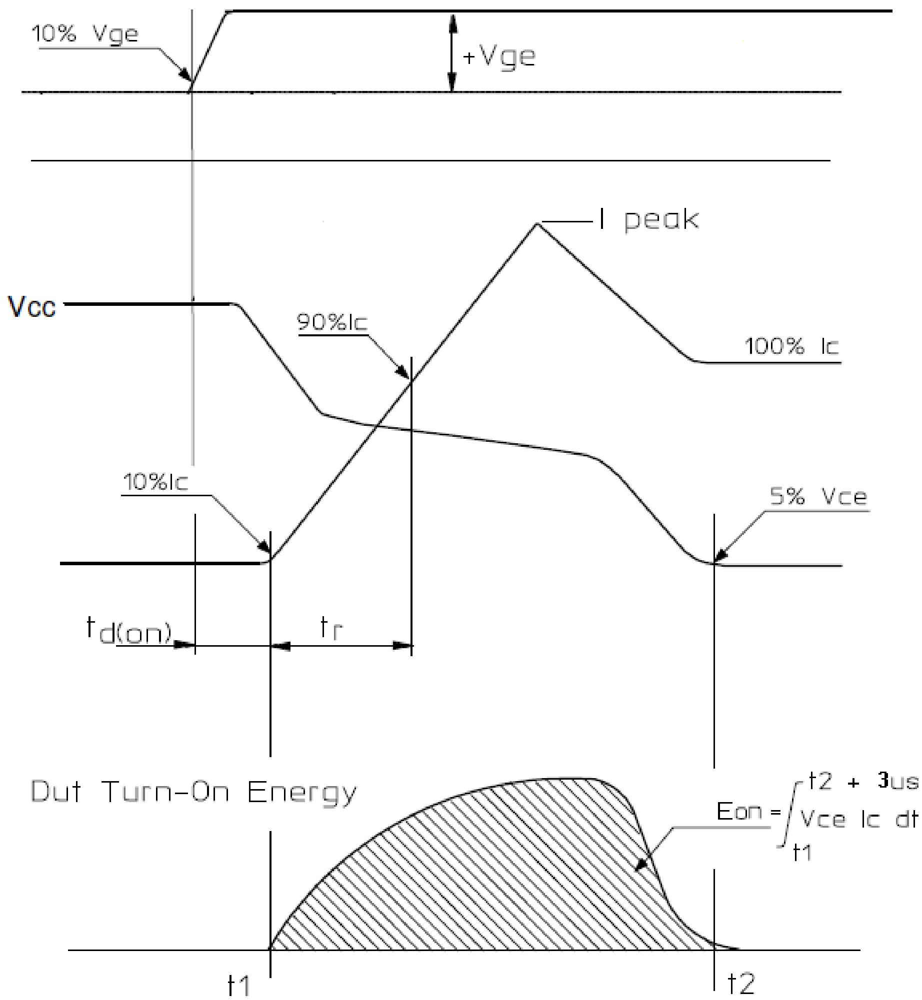


Figure 21. Definition of Turn On Waveform

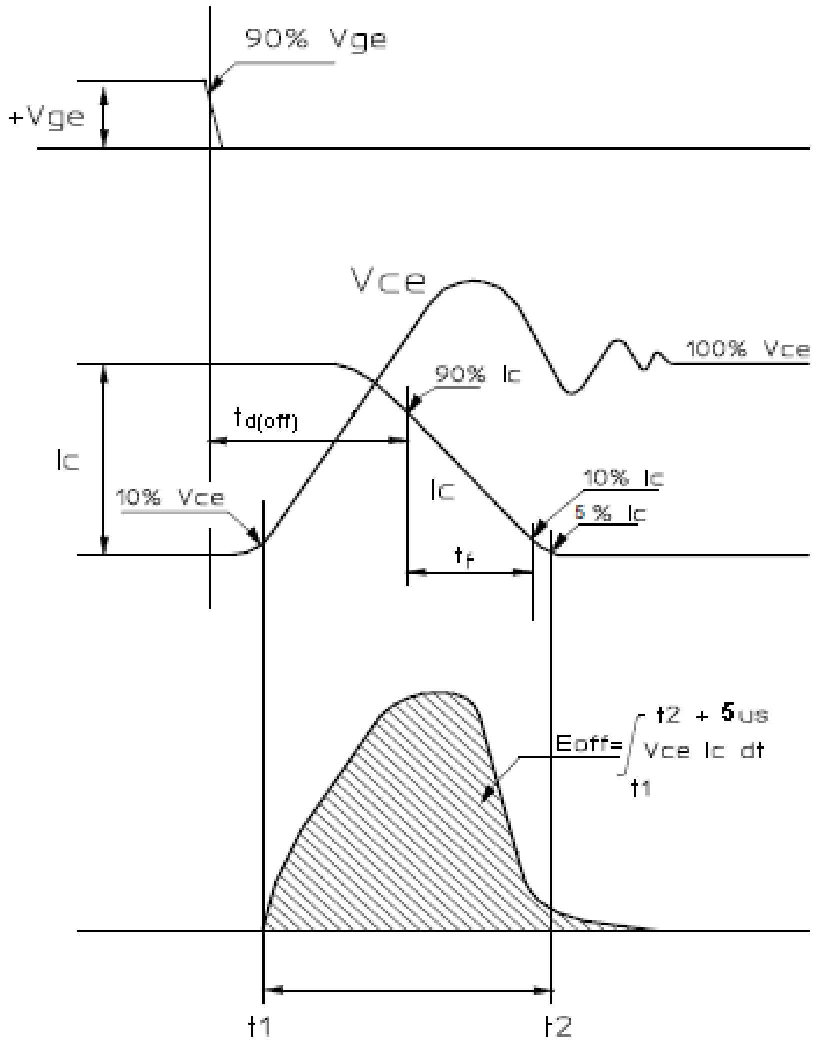
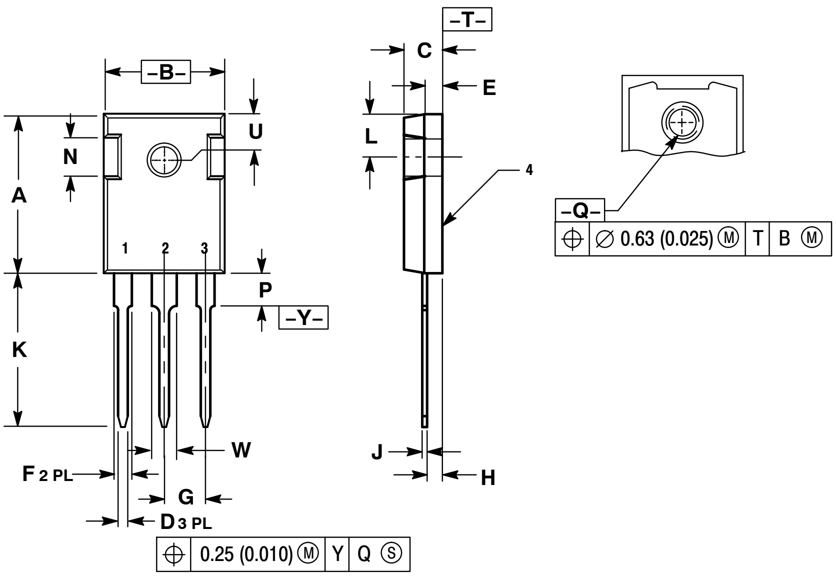


Figure 22. Definition of Turn Off Waveform

PACKAGE DIMENSIONS

TO−247
CASE 340L−02
ISSUE F



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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	20.32	21.08	0.800	8.30
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

STYLE 4:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

PUBLICATION ORDERING INFORMATION

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