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NGTB40N120IHLWG

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
- Optimized for Low Case Temperature in IH Cooker Application
- Low Gate Charge
- These are Pb−Free Devices

Typical Applications

- Inductive Heating
- Consumer Appliances
- Soft Switching

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	 80 40	A
Pulsed collector current, T_{pulse} limited by T_{Jmax}	I_{CM}	320	A
Diode forward current @ T_C = 25°C @ T_C = 100°C	I_F	 80 40	A
Diode pulsed current, T_{pulse} limited by T_{Jmax}	I_{FM}	320	A
Gate−emitter voltage	V_{GE}	±20	V
Power Dissipation @ T_C = 25°C @ T_C = 100°C	P_D	 260 104	W
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.

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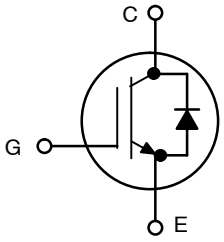
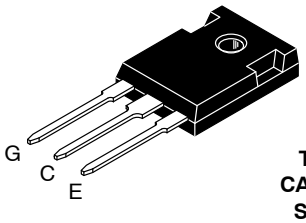
40 A, 1200 V
V_{CEsat} = 1.90 V
E_{off} = 1.40 mJ





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
NGTB40N120IHLWG	TO−247 (Pb−Free)	30 Units / Rail

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction−to−case, for IGBT	$R_{\theta JC}$	0.48	°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 = 40 A V_{GE} = 15 V, I_C = 40 A, T_J = 150°C	V_{CEsat}	− −	1.90 2.1	2.35 −	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 400 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}	−	−	200	nA
DYNAMIC CHARACTERISTIC						
Input capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	−	10400	−	pF
Output capacitance		C_{oes}	−	245	−	
Reverse transfer capacitance		C_{res}	−	185	−	
Gate charge total	V_{CE} = 600 V, I_C = 40 A, V_{GE} = 15 V	Q_g		420		nC
Gate to emitter charge		Q_{ge}		95		
Gate to collector charge		Q_{gc}		178		
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn−off delay time	T_J = 25°C V_{CC} = 600 V, I_C = 40 A R_g = 10 Ω V_{GE} = 0 V/ 15V	$t_{d(off)}$		360		ns
Fall time		t_f		130		
Turn−off switching loss		E_{off}		1.40		mJ
Turn−off delay time	T_J = 125°C V_{CC} = 600 V, I_C = 40 A R_g = 10 Ω V_{GE} = 0 V/ 15V	$t_{d(off)}$		380		ns
Fall time		t_f		185		
Turn−off switching loss		E_{off}		2.6		mJ
DIODE CHARACTERISTIC						
Forward voltage	V_{GE} = 0 V, I_F = 40 A V_{GE} = 0 V, I_F = 40 A, T_J = 150°C	V_F		1.6 1.8	1.8	V

TYPICAL CHARACTERISTICS

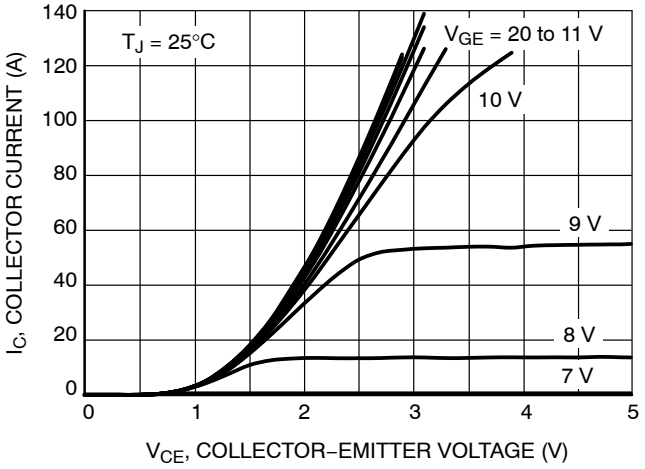


Figure 1. Output Characteristics

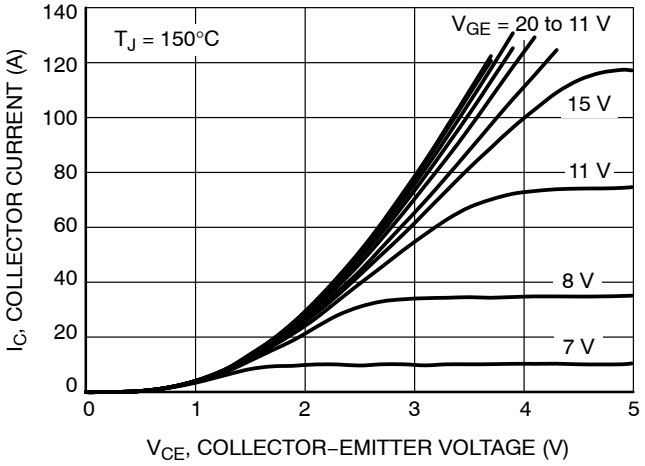


Figure 2. Output Characteristics

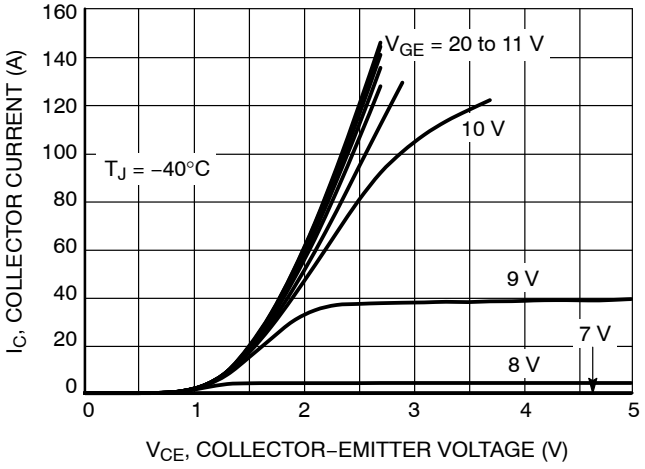


Figure 3. Output Characteristics

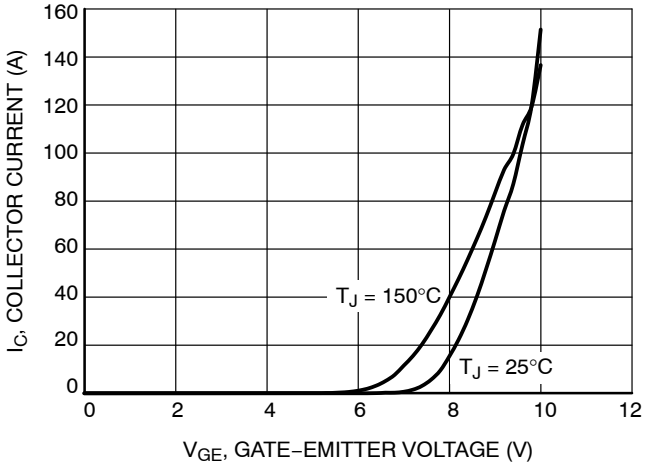


Figure 4. Typical Transfer Characteristics

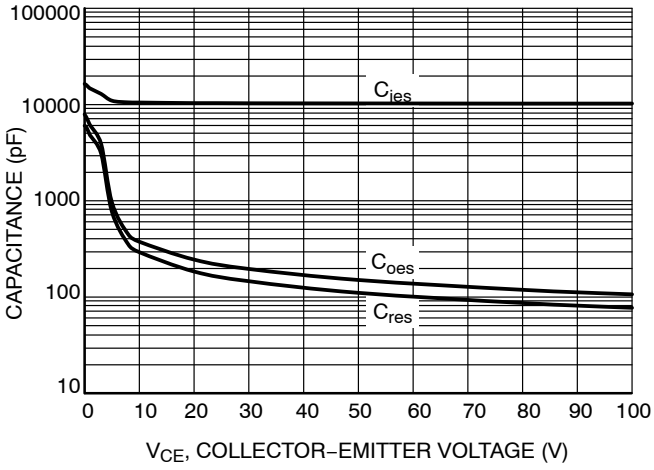


Figure 5. Typical Capacitance

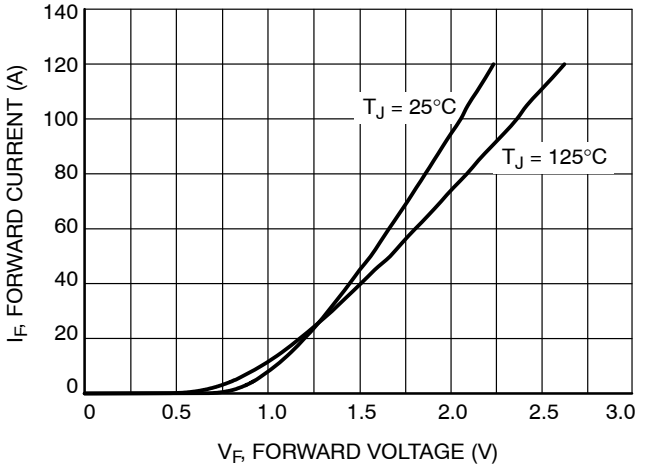


Figure 6. Diode Forward Characteristics

TYPICAL CHARACTERISTICS

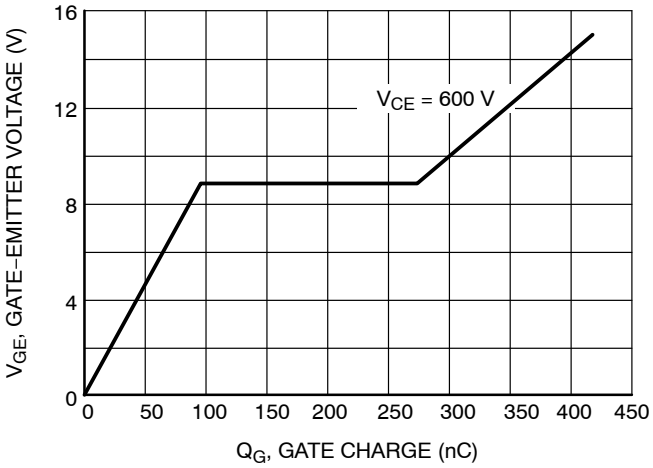


Figure 7. Typical Gate Charge

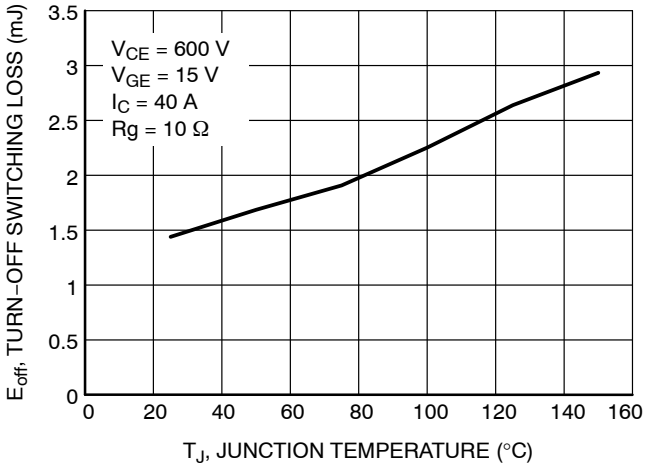


Figure 8. Energy Loss vs. Temperature

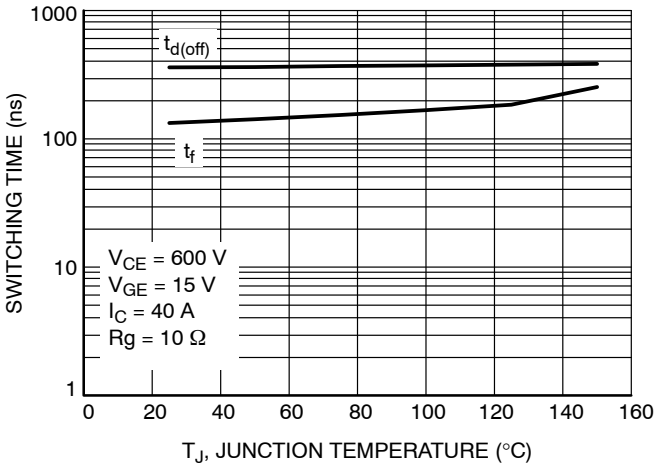


Figure 9. Switching Time vs. Temperature

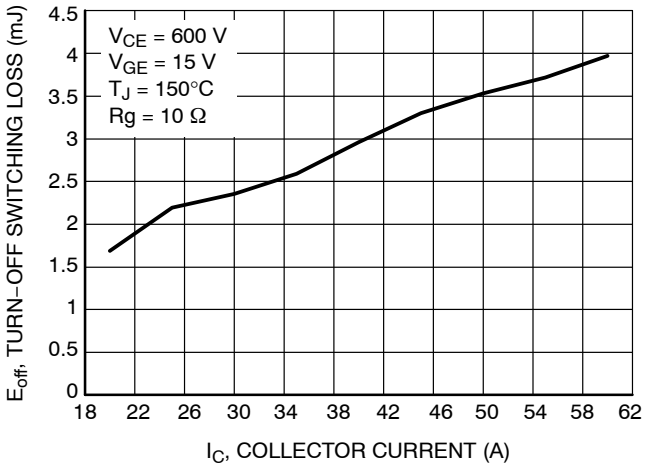


Figure 10. Energy Loss vs. I_C

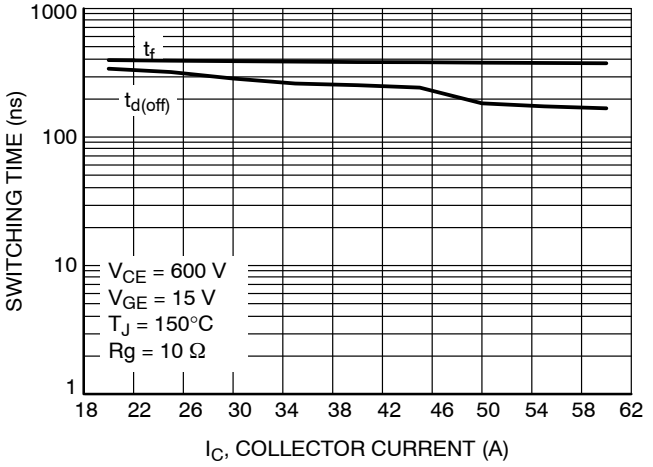


Figure 11. Switching Time vs. I_C

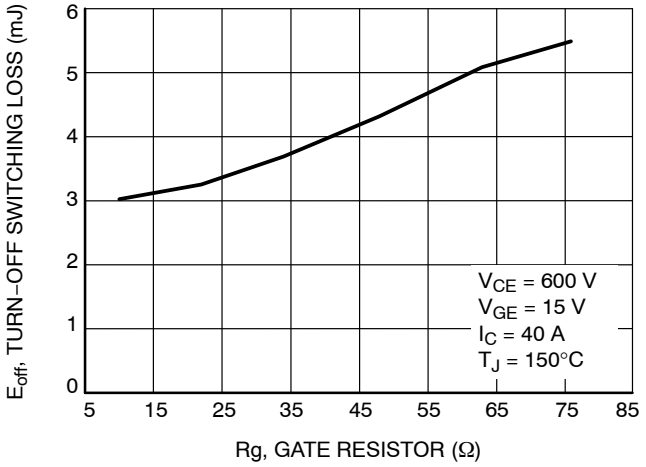


Figure 12. Energy Loss vs. Rg

TYPICAL CHARACTERISTICS

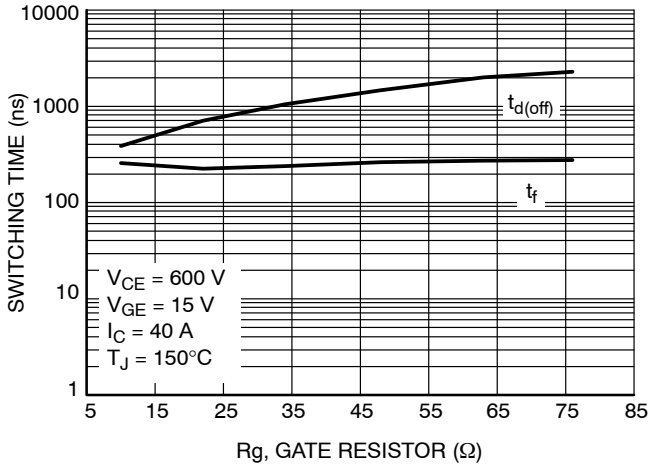


Figure 13. Switching Time vs. Rg

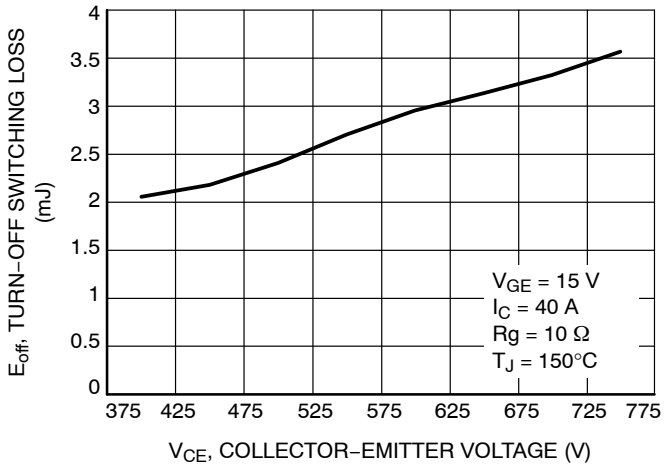


Figure 14. Energy Loss vs. V_{CE}

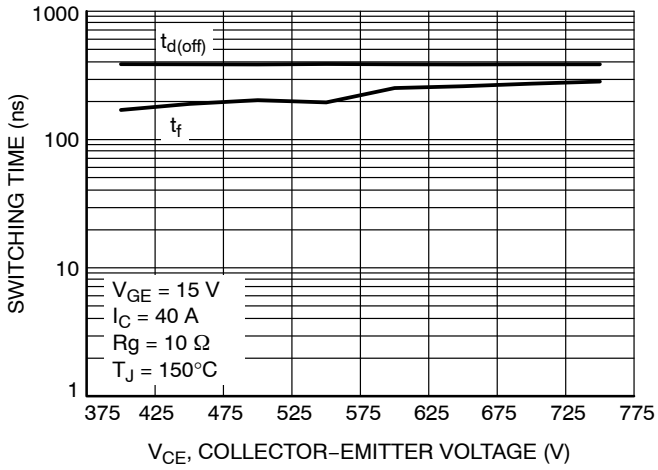


Figure 15. Switching Time vs. V_{CE}

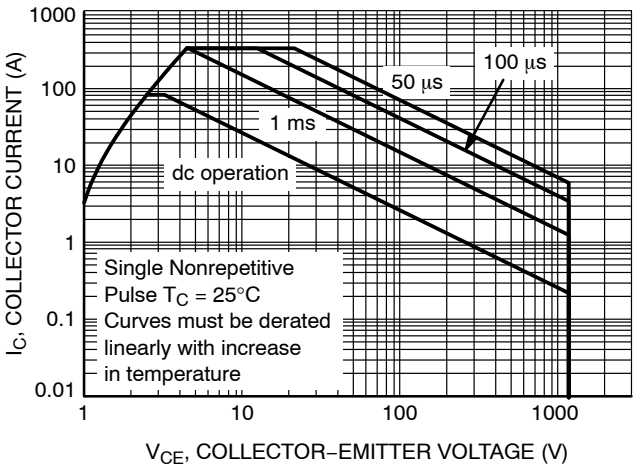


Figure 16. Safe Operating Area

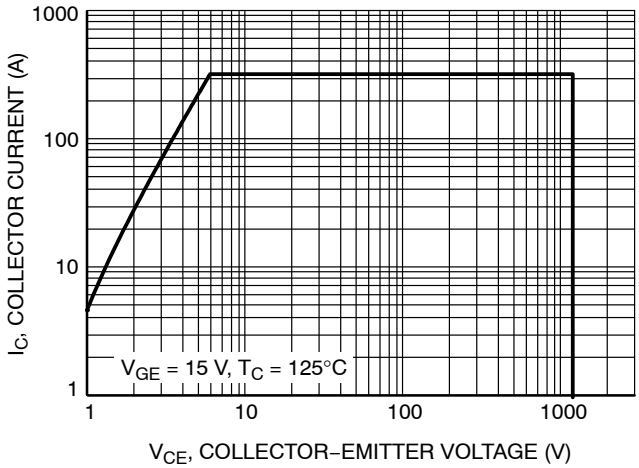


Figure 17. Reverse Bias Safe Operating Area

TYPICAL CHARACTERISTICS

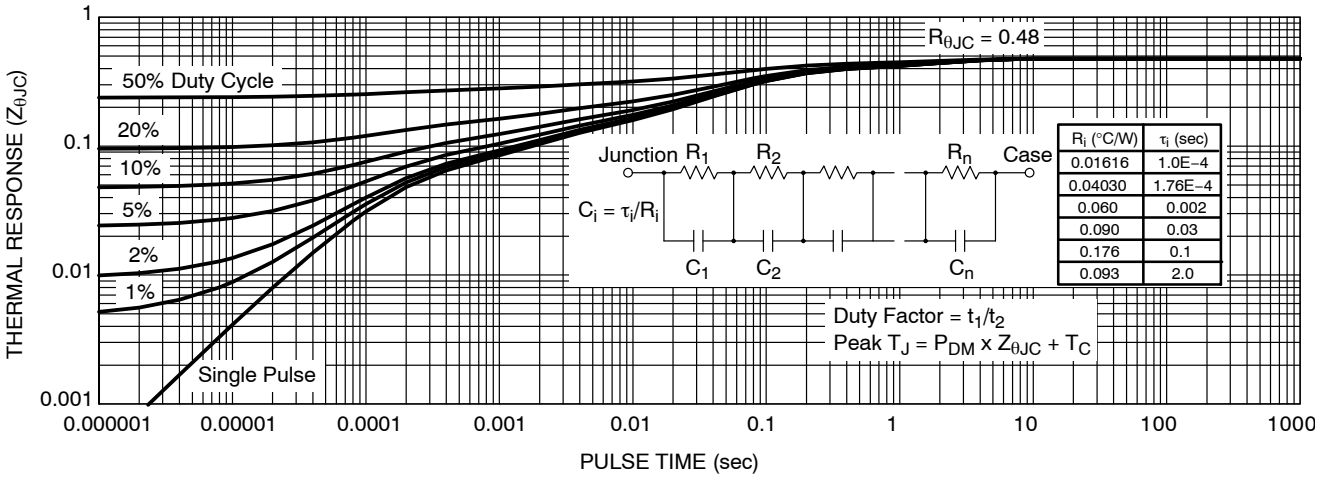


Figure 18. IGBT Transient Thermal Impedance

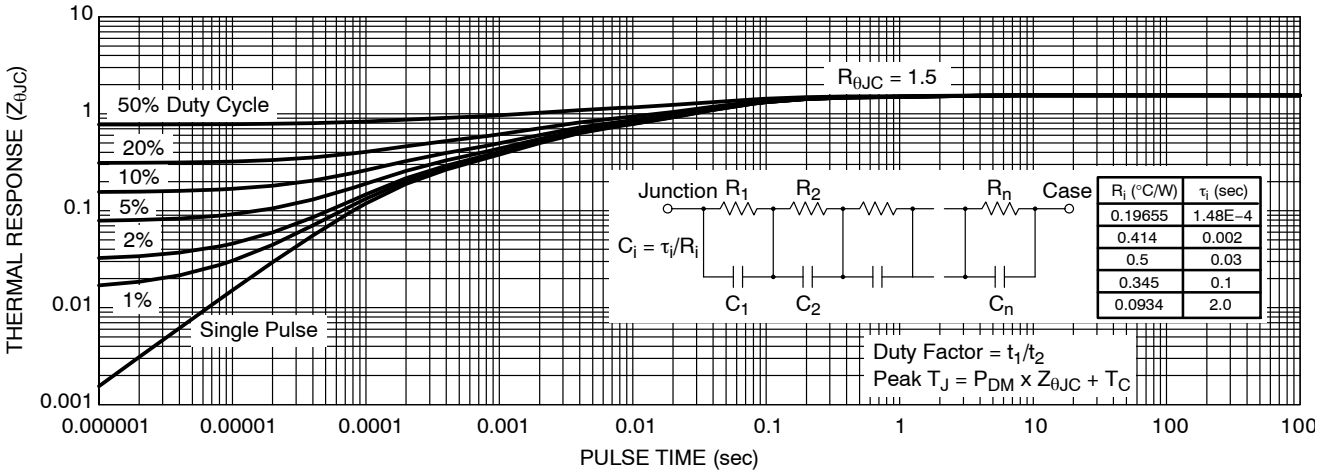


Figure 19. Diode Transient Thermal Impedance

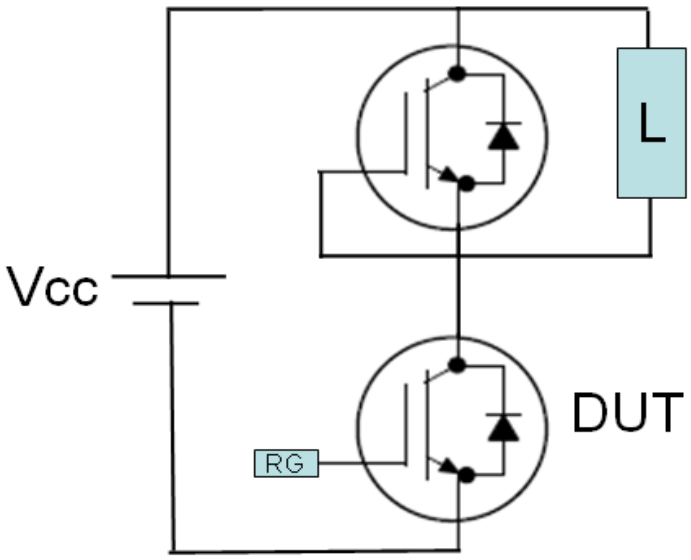


Figure 20. Test Circuit for Switching Characteristics

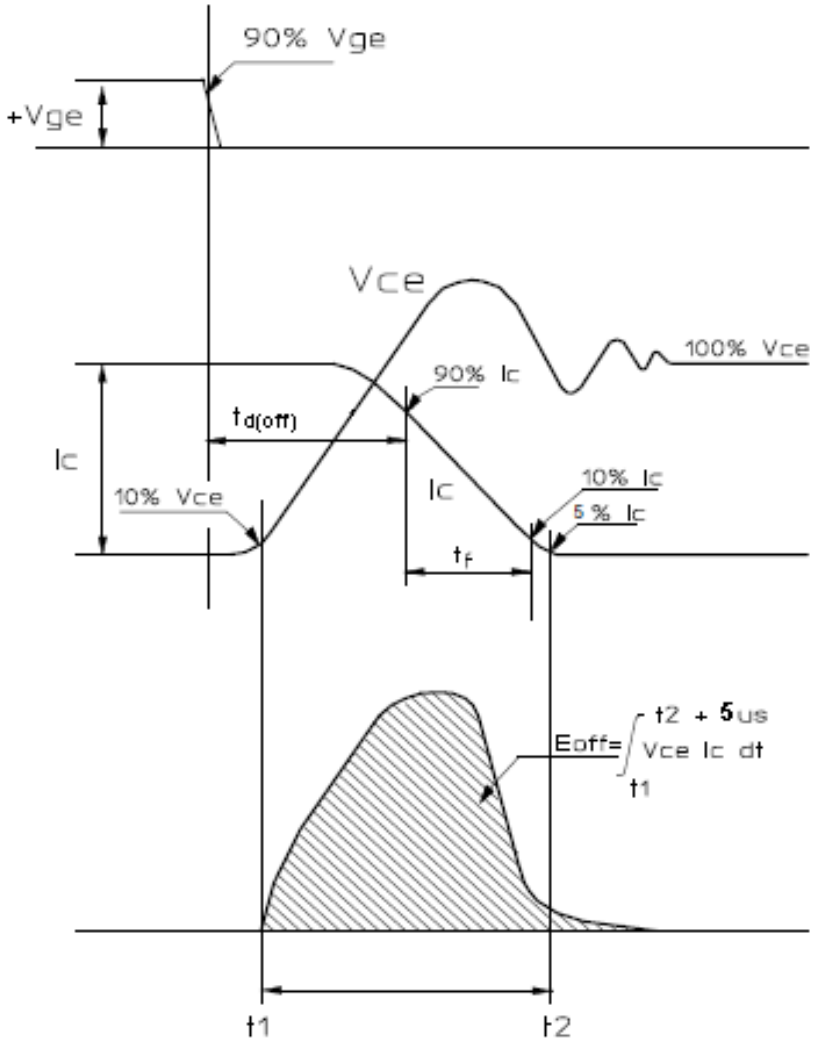


Figure 21. Definition of Turn Off Waveform

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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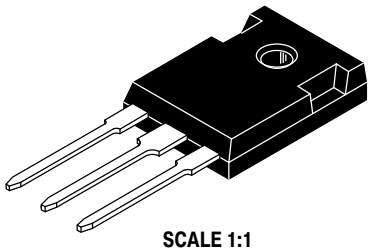
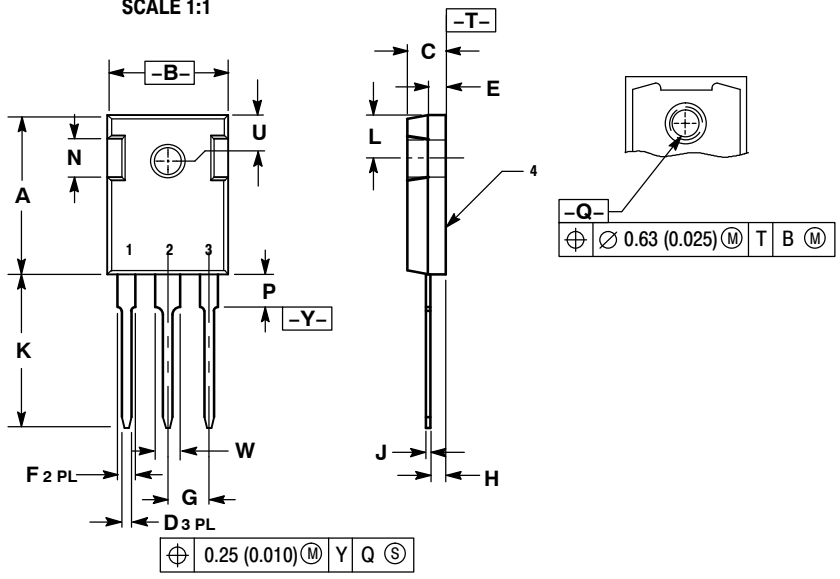
TO−247
CASE 340L−02
ISSUE F

DATE 26 OCT 2011



SCALE 1:1



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

	MILLIMETERS		INCHES	
DIM	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 1:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 2:
PIN 1. ANODE
2. CATHODE (S)
3. ANODE 2
4. CATHODES (S)

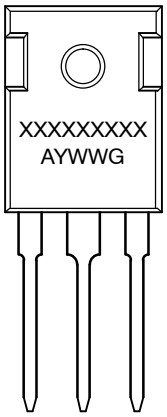
STYLE 3:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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

GENERIC MARKING DIAGRAM*



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.

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STATUS:	ON SEMICONDUCTOR STANDARD	
NEW STANDARD:		
DESCRIPTION:	TO−247	PAGE 1 OF 2

ISSUE	REVISION	DATE
D	CHANGE OF OWNERSHIP FROM MOTOROLA TO ON SEMICONDUCTOR. DIM A WAS 20.80–21.46/0.819–0.845. DIM K WAS 19.81–20.32/0.780–0.800. UPDATED STYLE 1, ADDED STYLES 2, 3, & 4. REQ. BY L. HAYES.	25 AUG 2000
E	DIM E MINIMUM WAS 2.20/0.087. DIM K MINIMUM WAS 20.06/0.790. ADDED GENERIC MARKING DIAGRAM. REQ. BY S. ALLEN.	26 FEB 2010
F	ADDED STYLES 5 AND 6. REQ. BY J. PEREZ.	26 OCT 2011

PUBLICATION ORDERING INFORMATION

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