

NGTB30N60SWG

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 half bridge resonant 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 Fieldstop Technology
- Low Switching Loss Reduces System Power Dissipation
- Low Gate Charge
- Soft, Fast Free Wheeling Diode
- These are Pb-Free Devices

Typical Applications

- Inverter Welding
- UPS Systems

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	600	V
Collector current @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	I_C	60 30	A
Pulsed collector current, T_{pulse} limited by $T_{J\text{max}}$	I_{CM}	120	A
Diode forward current @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	I_F	60 30	A
Diode pulsed current, T_{pulse} limited by $T_{J\text{max}}$	I_{FM}	120	A
Gate-emitter voltage	V_{GE}	± 20	V
Power Dissipation @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	P_D	189 76	W
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	T_{SLD}	260	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



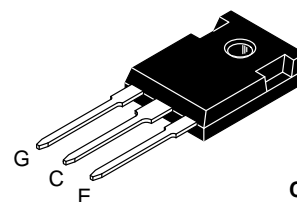
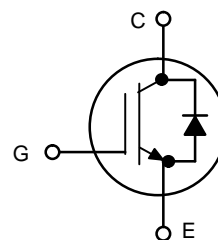
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30 A, 600 V

$V_{CEsat} = 1.9 \text{ V}$

$E_{off} = 0.54 \text{ mJ}$



**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
NGTB30N60SWG	TO-247 (Pb-Free)	30 Units / Rail

NGTB30N60SWG

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case, for IGBT	$R_{\theta JC}$	0.66	°C/W
Thermal resistance junction-to-case, for Diode	$R_{\theta JC}$	2.73	°C/W
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	°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	$V_{GE} = 0\text{ V}, I_C = 500\text{ }\mu\text{A}$	$V_{(BR)CES}$	600	–	–	V
Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 30\text{ A}, T_J = 150^\circ\text{C}$	V_{CEsat}	– –	1.9 2.6	2.2 –	V
Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 150\text{ }\mu\text{A}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$ $V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}, T_J = 150^\circ\text{C}$	I_{CES}	– –	– –	0.2 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}	–	2040	–	pF
Output capacitance		C_{oes}	–	70	–	
Reverse transfer capacitance		C_{res}	–	50	–	
Gate charge total	$V_{CE} = 480\text{ V}, I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	Q_g		90		nC
Gate to emitter charge		Q_{ge}		19		
Gate to collector charge		Q_{gc}		45		

SWITCHING CHARACTERISTIC, INDUCTIVE LOAD

Turn-on delay time	$T_J = 25^\circ\text{C}$ $V_{CC} = 400\text{ V}, I_C = 30\text{ A}$ $R_g = 10\text{ }\Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$	$t_{d(on)}$		57		ns
Rise time		t_r		32		
Turn-off delay time		$t_{d(off)}$		109		
Fall time		t_f		91		
Turn-on switching loss		E_{on}		0.75		mJ
Turn-off switching loss		E_{off}		0.54		mJ
Turn-on delay time	$T_J = 150^\circ\text{C}$ $V_{CC} = 400\text{ V}, I_C = 30\text{ A}$ $R_g = 10\text{ }\Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$	$t_{d(on)}$		56		ns
Rise time		t_r		34		
Turn-off delay time		$t_{d(off)}$		113		
Fall time		t_f		172		
Turn-on switching loss		E_{on}		0.91		mJ
Turn-off switching loss		E_{off}		0.87		mJ

DIODE CHARACTERISTIC

Forward voltage	$V_{GE} = 0\text{ V}, I_F = 30\text{ A}$ $V_{GE} = 0\text{ V}, I_F = 30\text{ A}, T_J = 150^\circ\text{C}$	V_F		2.3 2.5	2.5	V
Reverse recovery time	$T_J = 25^\circ\text{C}$ $I_F = 30\text{ A}, V_R = 400\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	t_{rr}		200		ns
Reverse recovery charge		Q_{rr}		1000		nc
Reverse recovery current		I_{rrm}		9		A

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NGTB30N60SWG

TYPICAL CHARACTERISTICS

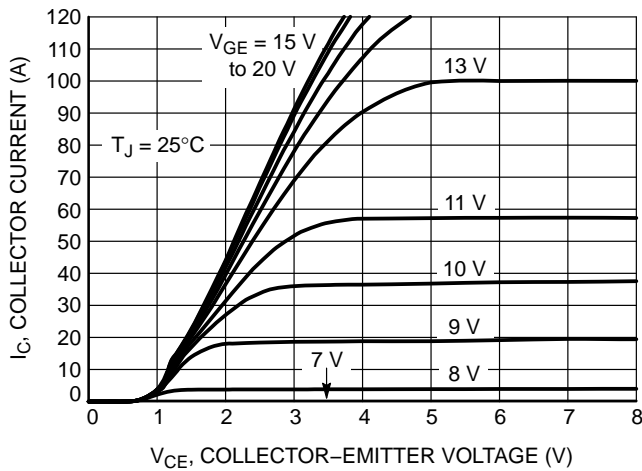


Figure 1. Output Characteristics

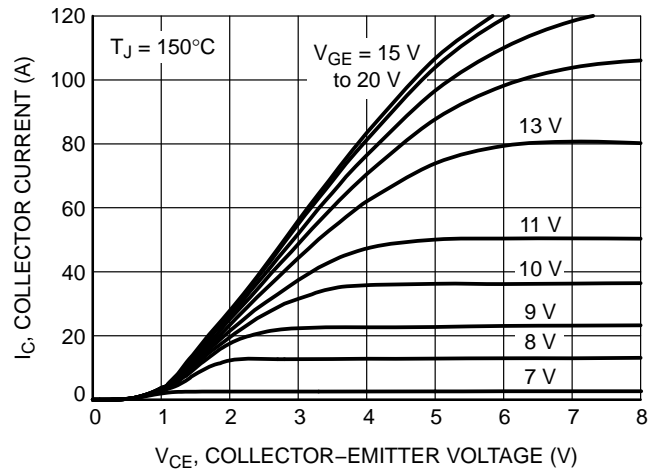


Figure 2. Output Characteristics

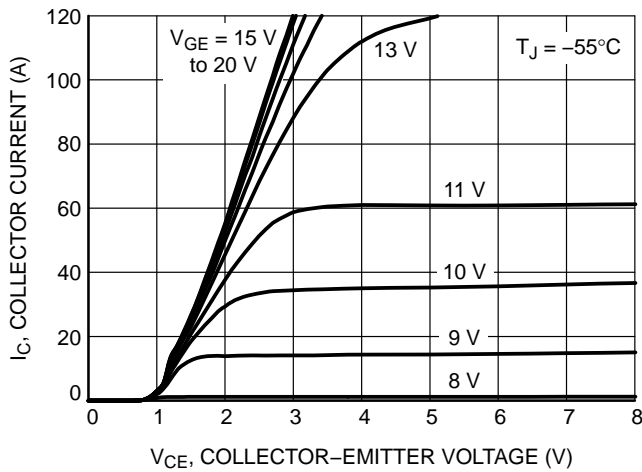


Figure 3. Output Characteristics

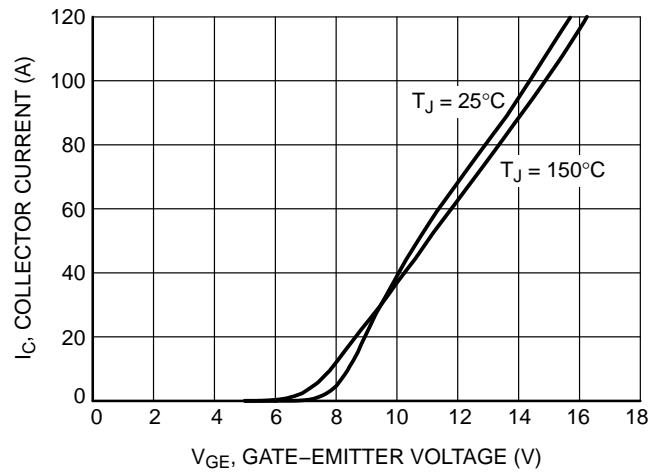


Figure 4. Typical Transfer Characteristics

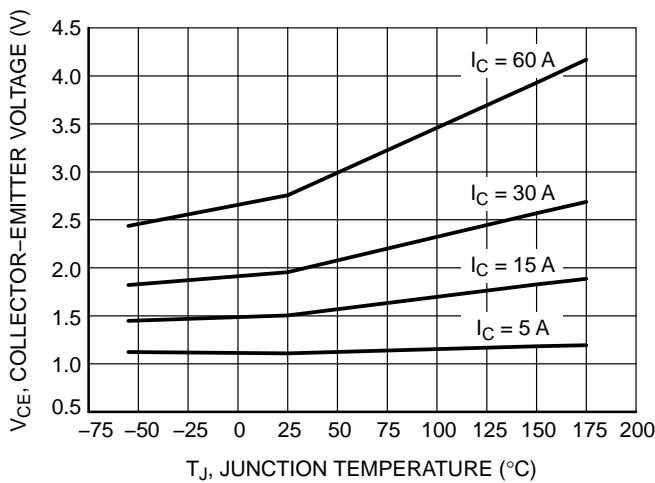


Figure 5. $V_{CE(sat)}$ vs. T_J

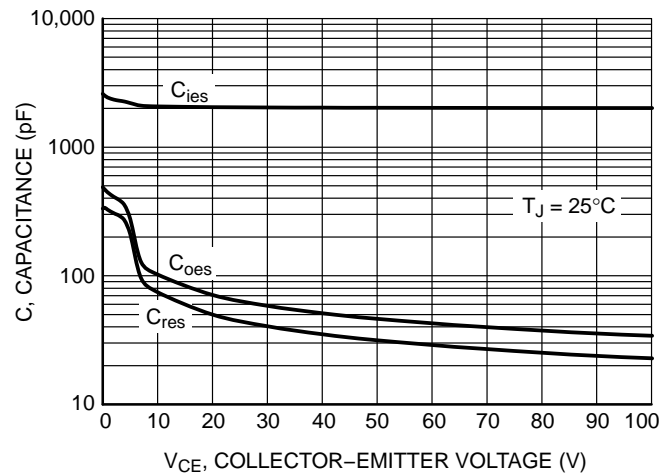


Figure 6. Typical Capacitance

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TYPICAL CHARACTERISTICS

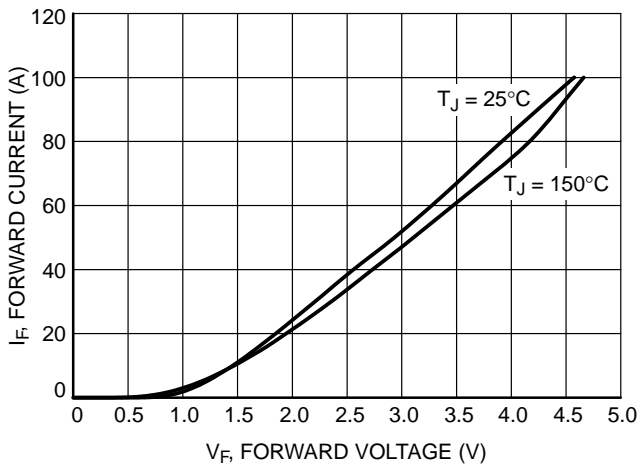


Figure 7. Diode Forward Characteristics

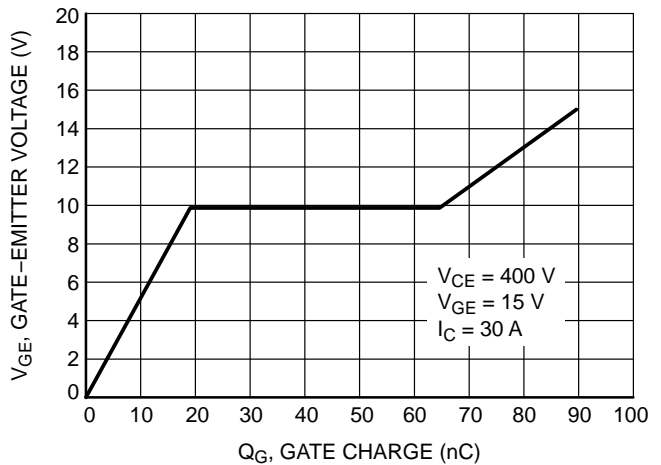


Figure 8. Typical Gate Charge

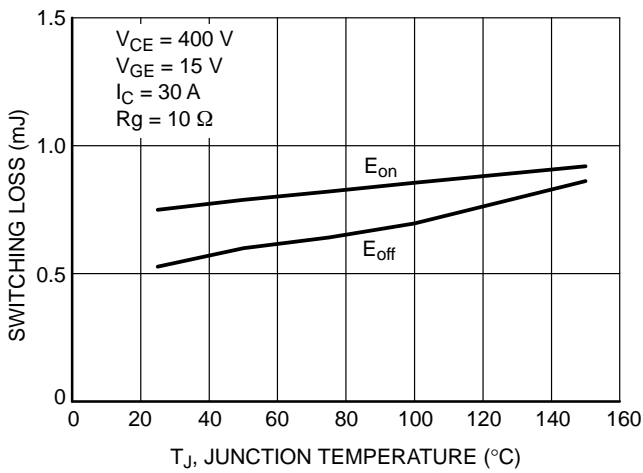


Figure 9. Switching Loss vs. Temperature

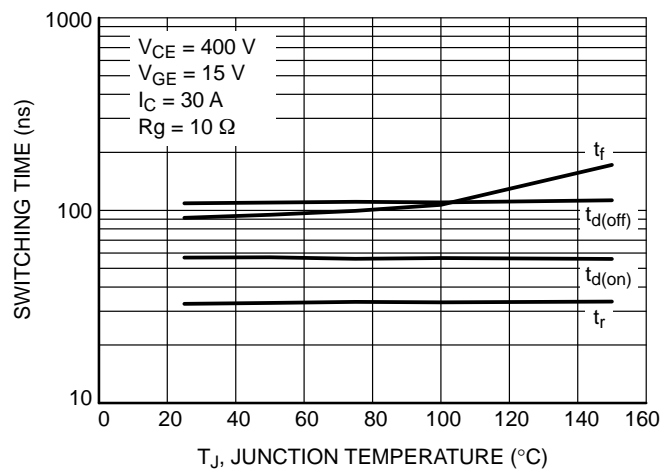


Figure 10. Switching Time vs. Temperature

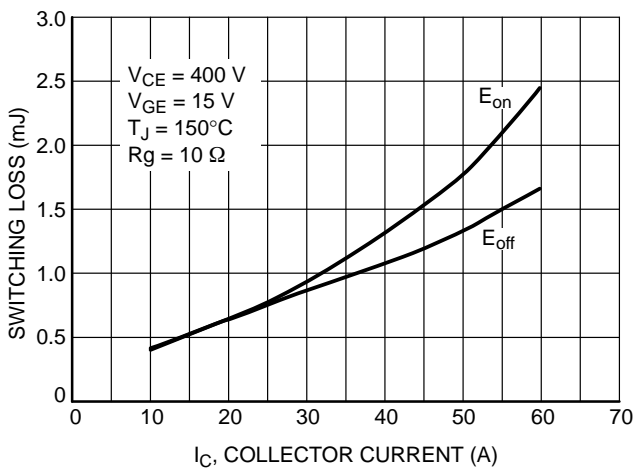


Figure 11. Switching Loss vs. I_C

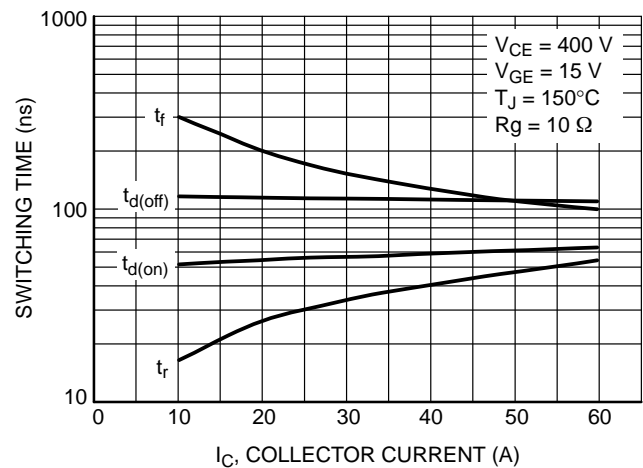


Figure 12. Switching Time vs. I_C

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TYPICAL CHARACTERISTICS

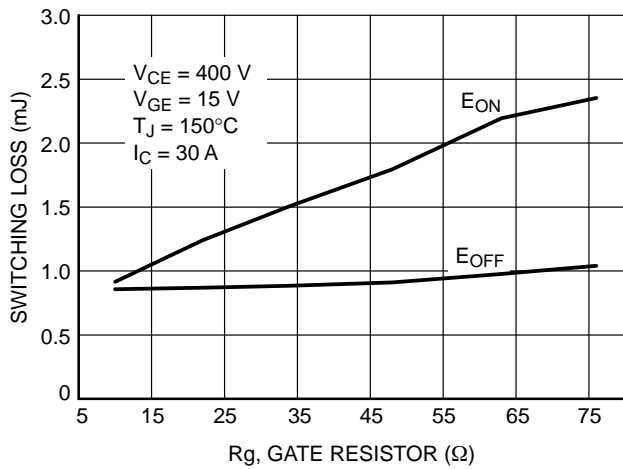


Figure 13. Switching Loss vs. R_g

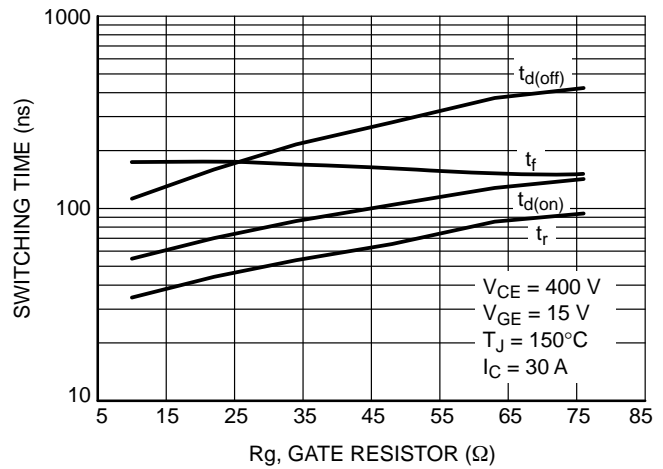


Figure 14. Switching Time vs. R_g

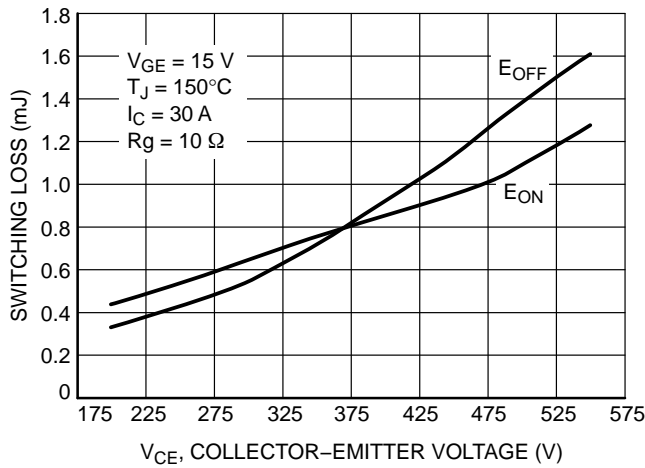


Figure 15. Switching Loss vs. V_{CE}

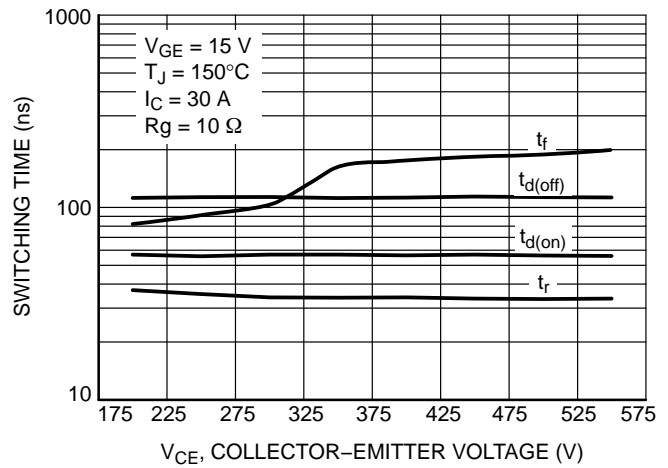


Figure 16. Switching Time vs. V_{CE}

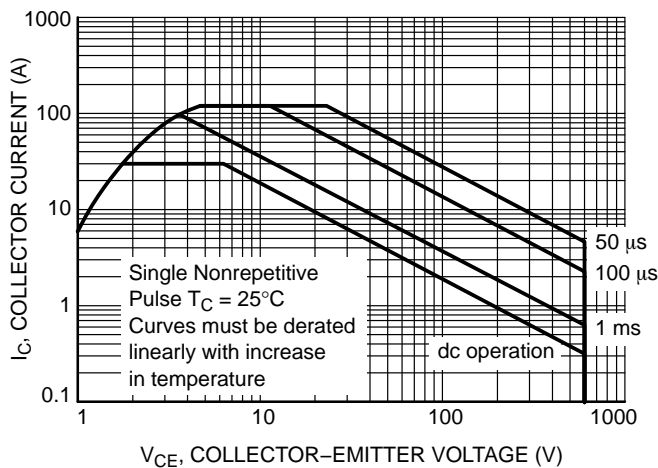


Figure 17. Safe Operating Area

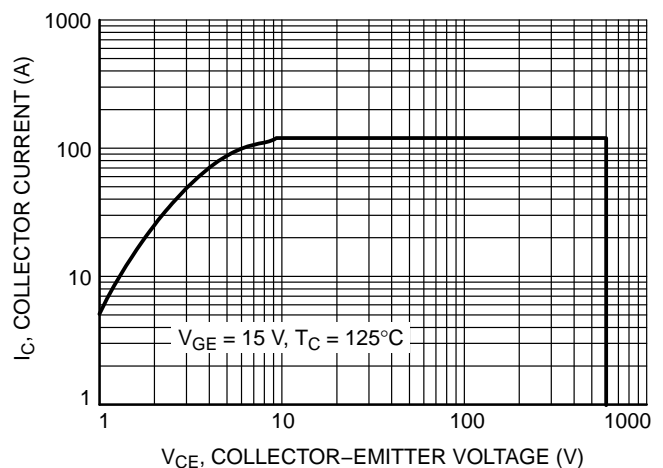


Figure 18. Reverse Bias Safe Operating Area

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TYPICAL CHARACTERISTICS

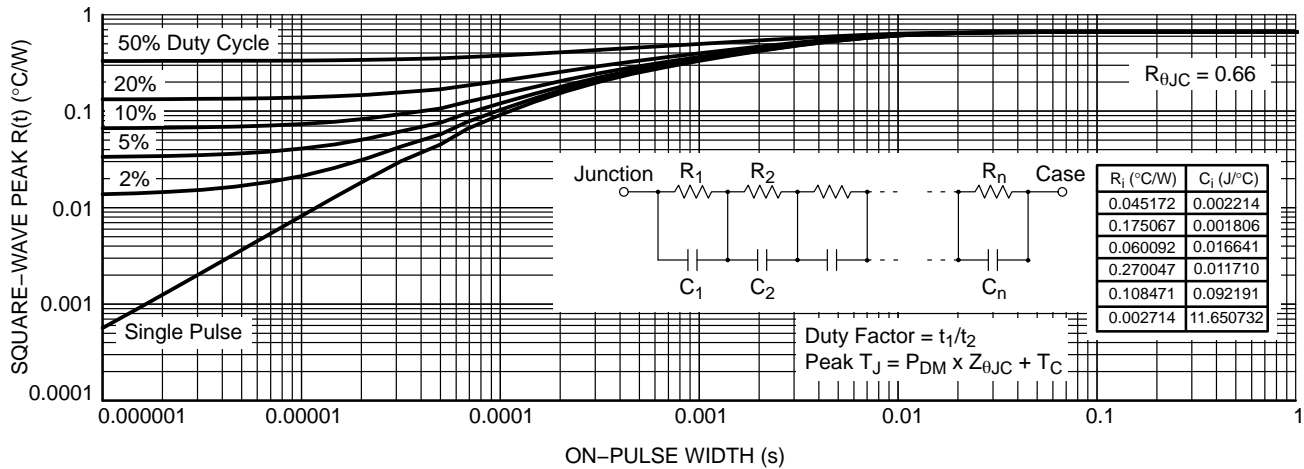


Figure 19. IGBT Die Self-heating Square-wave Duty Cycle Transient Thermal Response

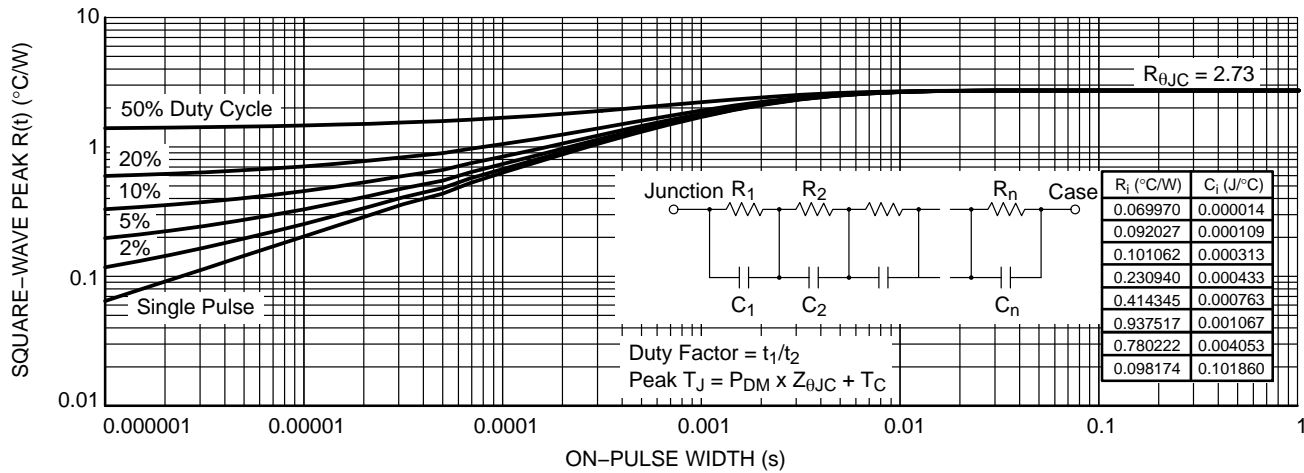
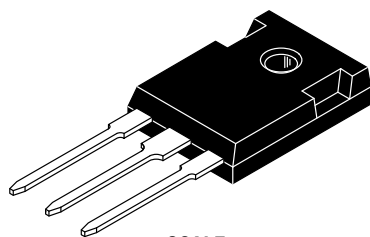
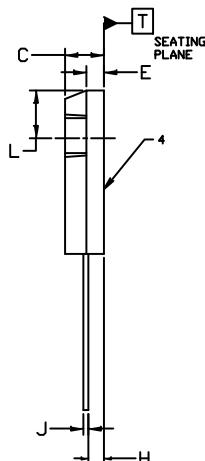
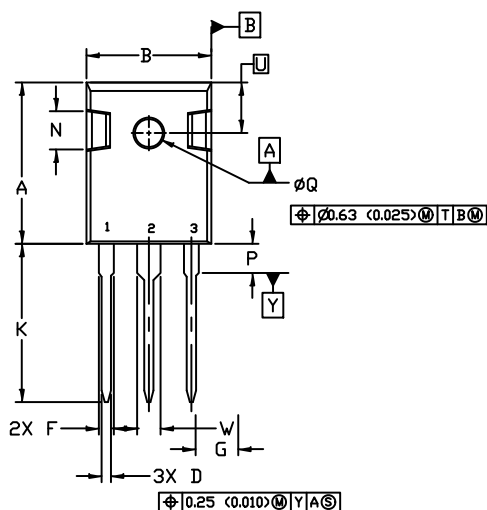


Figure 20. Diode Die Self-heating Square-wave Duty Cycle Transient Thermal Response

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1



TO-247
CASE 340L
ISSUE G

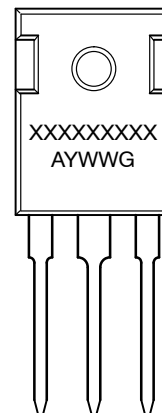
DATE 06 OCT 2021

NOTES:

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

	MILLIMETERS		INCHES	
DIM	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. 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

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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