

Features

- 600 V, 30 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Advanced trench-gate field-stop technology
- Low switching loss
- Fast switching
- RoHS compliant*

Applications

- Switch-Mode Power Supplies (SMPS)
- Uninterruptible Power Sources (UPS)
- Power Factor Correction (PFC)
- Induction heating

BOURNS®

BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDNW30N60H3 IGBT device combines technology from a MOS gate and a bipolar transistor, resulting in an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics while resulting in a lower Collector-Emitter Saturation Voltage ($V_{CE(sat)}$) and fewer switching losses.

Additional Information

Click these links for more information:



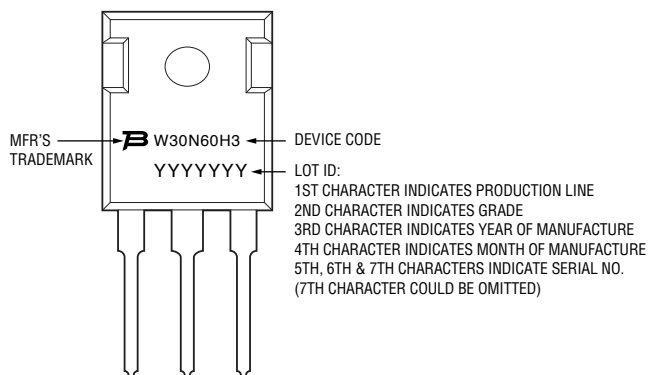
Maximum Electrical Ratings ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current ($T_C = 25\text{ }^\circ\text{C}$), limited by T_{jmax}	I_C	60	A
Continuous Collector Current ($T_C = 100\text{ }^\circ\text{C}$), limited by T_{jmax}	I_C	30	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	120	A
Gate-Emitter Voltage	V_{GE}	± 20	V
Continuous Forward Current ($T_C = 100\text{ }^\circ\text{C}$), limited by T_{jmax}	I_F	12	A
Total Power Dissipation	P_{total}	230	W
Storage Temperature	T_{STG}	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_j	-55 to +150	$^\circ\text{C}$

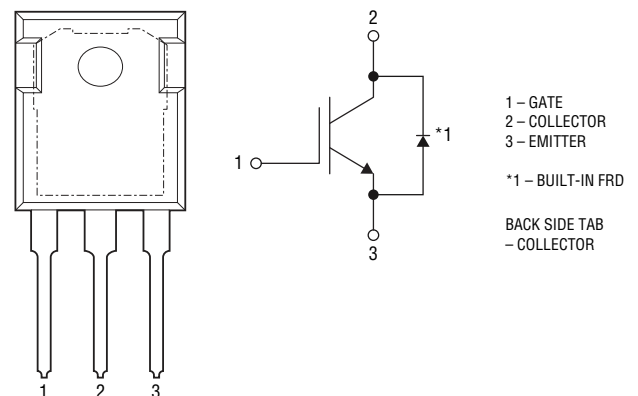
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)}_{IGBT}$	0.54	$^\circ\text{C/W}$
Diode Thermal Resistance Junction - Case	$R_{th(j-c)}_{Diode}$	1.5	$^\circ\text{C/W}$

Typical Part Marking



Internal Circuit



*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
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Static Electrical Characteristics ($T_C = 25\text{ }^\circ\text{C}$, Unless Otherwise Specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	600	—	—	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $T_C = 25\text{ }^\circ\text{C}$	—	1.65	2.0	V
		$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $T_C = 125\text{ }^\circ\text{C}$	—	1.9	—	
Diode Forward On-Voltage	V_F	$I_F = 12\text{ A}, T_C = 25\text{ }^\circ\text{C}$	—	1.8	—	V
		$I_F = 12\text{ A}, T_C = 125\text{ }^\circ\text{C}$	—	1.4	—	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4.0	5.0	6.5	V
Collector Cut-off Current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$	—	—	200	μA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$	—	—	± 400	nA

Dynamic Electrical Characteristics ($T_C = 25\text{ }^\circ\text{C}$, Unless Otherwise Specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{ies}	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$	—	1780	—	pF
Output Capacitance	C_{oes}		—	100	—	
Reverse Transfer Capacitance	C_{res}		—	32	—	
Total Gate Charge	Q_g	$V_{CE} = 400\text{ V}, V_{GE} = 15\text{ V}$ $I_C = 30.0\text{ A}$	—	76	—	nC
Gate-Emitter Charge	Q_{ge}		—	20	—	
Gate-Collector Charge	Q_{gc}		—	38	—	

IGBT Switching Characteristics (Inductive Load, $T_C = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter ($T_C = 25\text{ }^\circ\text{C}$)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 15\text{ V}$ $I_C = 30.0\text{ A}, R_G = 10\text{ }\Omega$	—	30	—	ns
Current Rise Time	t_r		—	105	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	67	—	ns
Current Fall Time	t_f		—	100	—	ns
Turn-on Switching Energy	E_{on}		—	1.85	—	mJ
Turn-off Switching Energy	E_{off}		—	0.45	—	mJ
Total Switching Energy	E_{ts}		—	2.3	—	mJ

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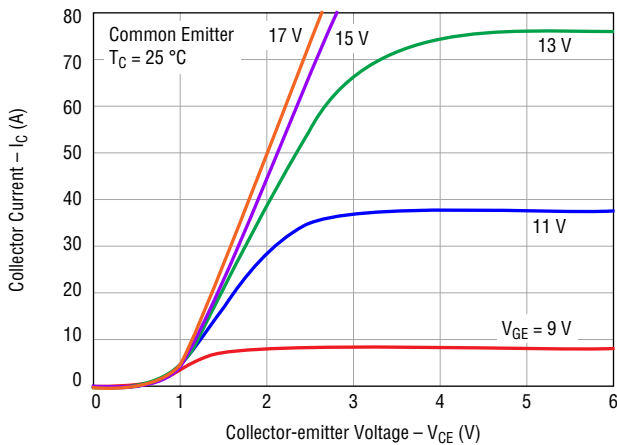


Diode Switching Characteristics ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise specified)

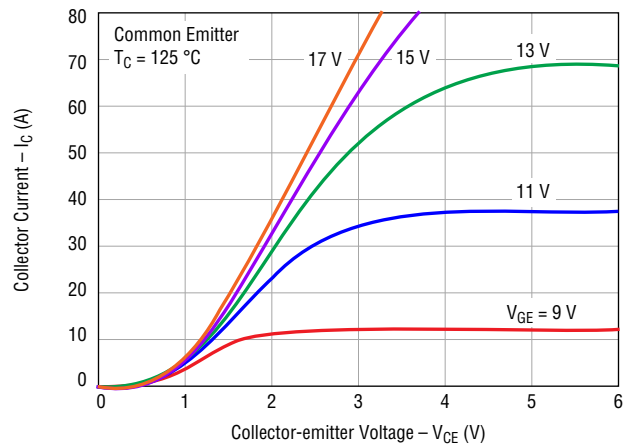
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	$di_F/dt = 200\text{ A}/\mu\text{s}$ $I_F = 12.0\text{ A}$	—	28	—	ns
Reverse Recovery Charge	Q_{rr}		—	55	—	nC

Electrical Characteristic Performance

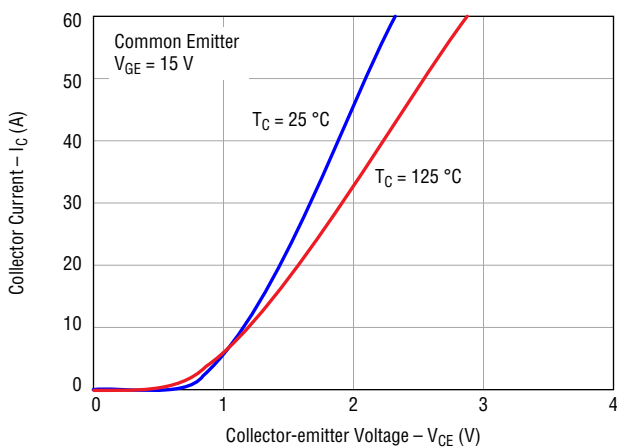
Typical Output Characteristics



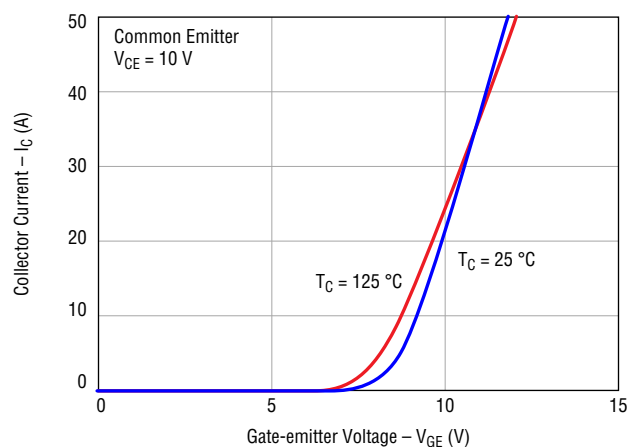
Typical Output Characteristics



Typical Saturation Voltage Characteristics



Typical Transfer Characteristics



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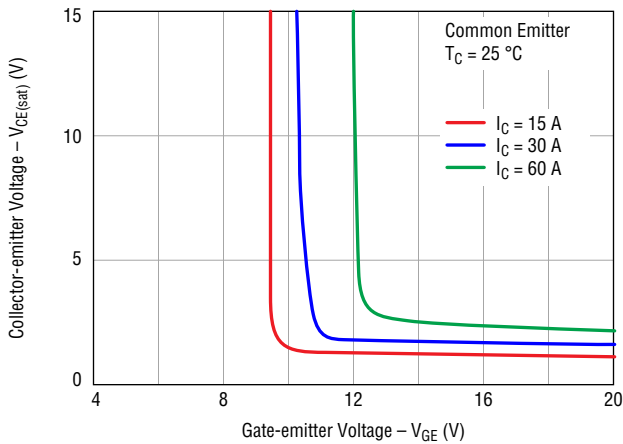
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BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

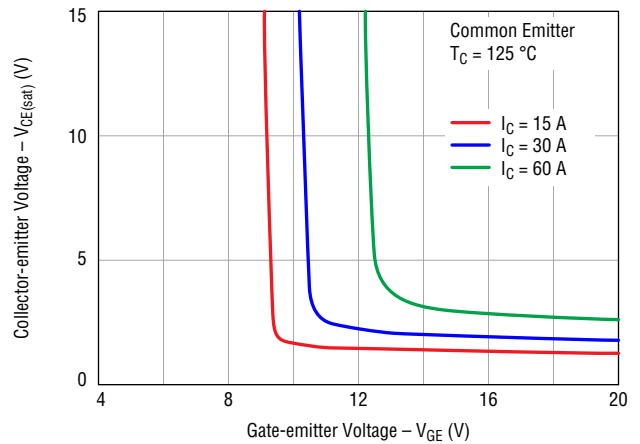


Electrical Characteristic Performance (continued)

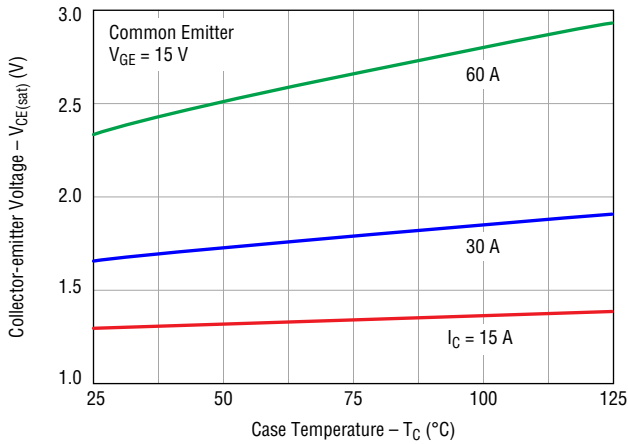
Typical $V_{CE(sat)}$ vs V_{GE} @ $T_C = 25^\circ\text{C}$



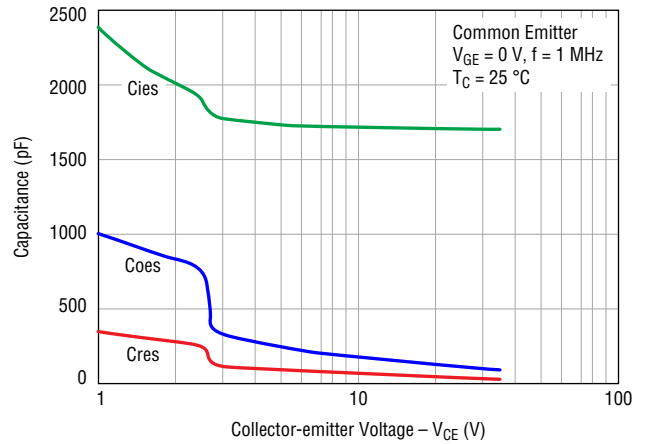
Typical $V_{CE(sat)}$ vs V_{GE} @ $T_C = 125^\circ\text{C}$



Typical $V_{CE(sat)}$ vs Case Temperature



Typical Capacitance Characteristics



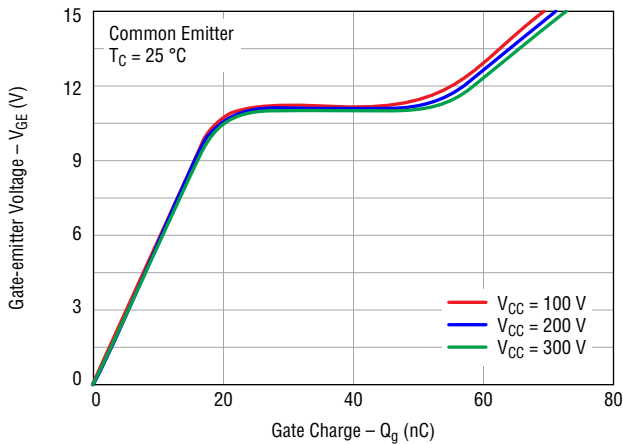
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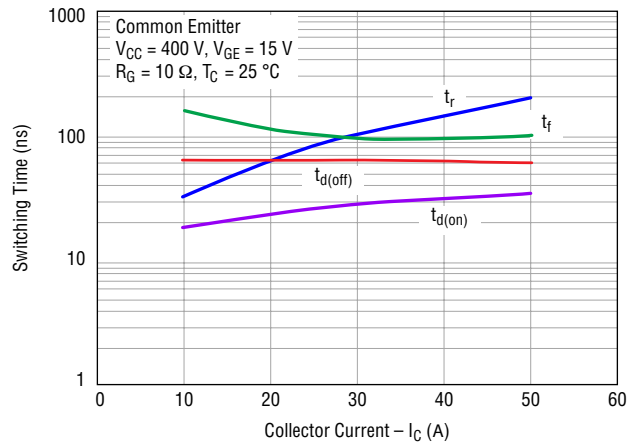
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Electrical Characteristic Performance (continued)

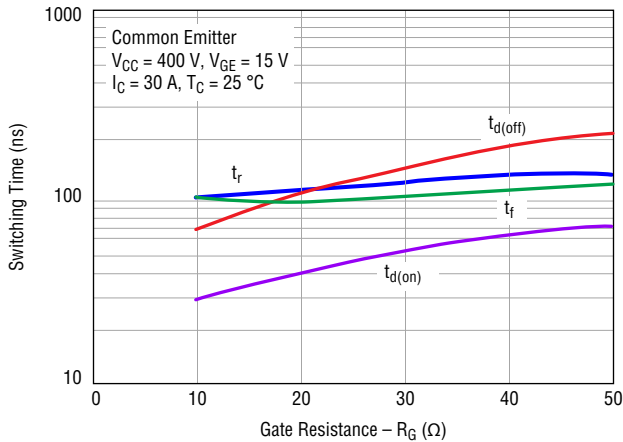
Typical Gate Charge Characteristic



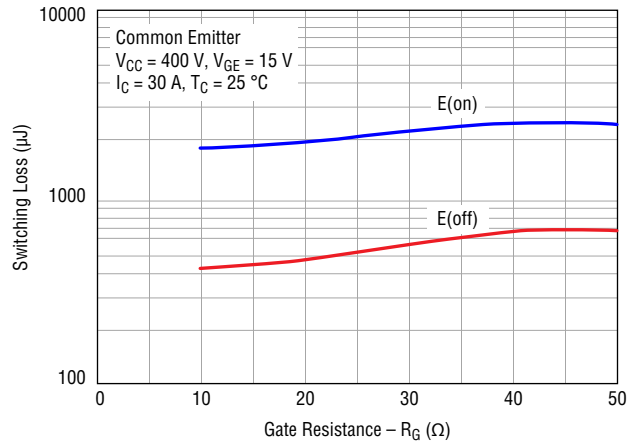
Typical Switching Time Characteristics vs I_C



Typical Switching Time Characteristics vs R_G

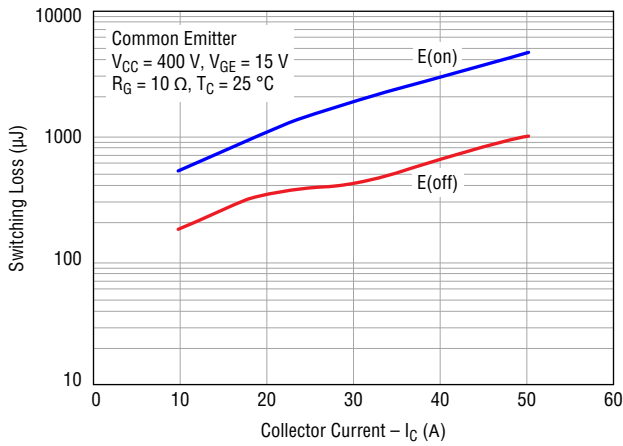


Typical Switching Loss vs R_G

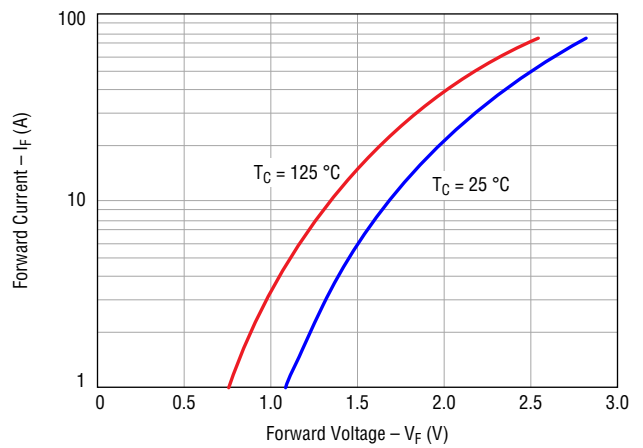


Electrical Characteristic Performance (continued)

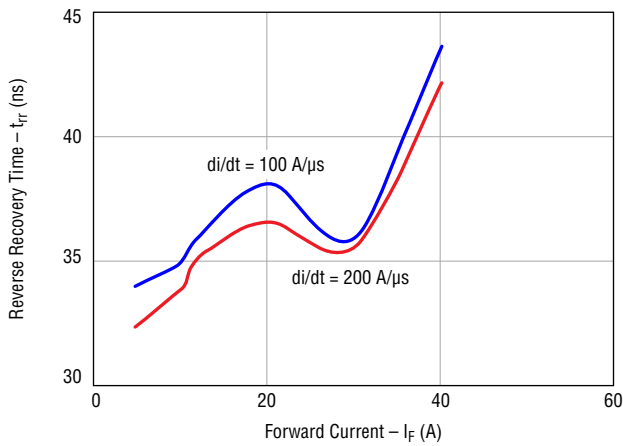
Typical Switching Loss Characteristics vs I_C



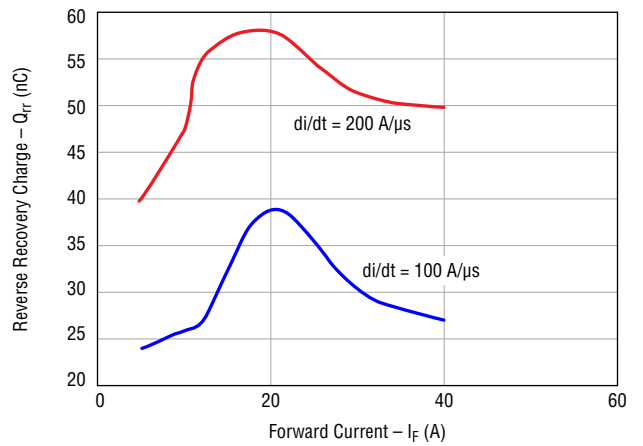
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F



Typical Reverse Recovery Charge vs I_F



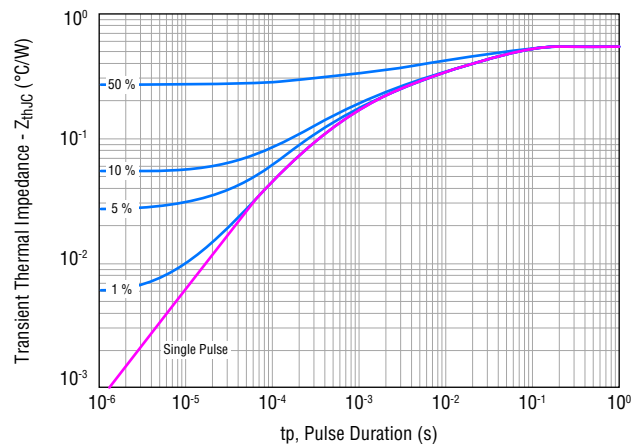
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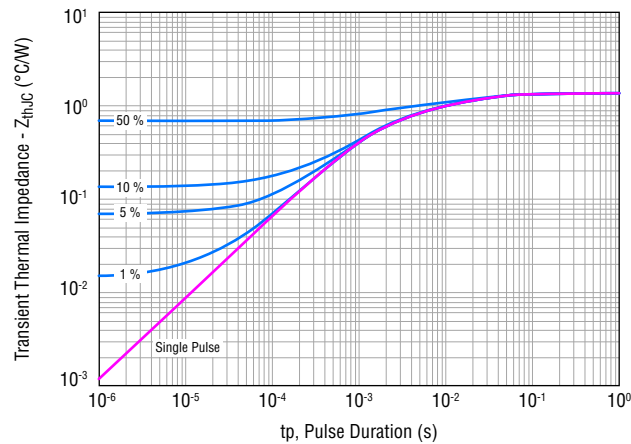
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Electrical Characteristic Performance (continued)

IGBT Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



Diode Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)

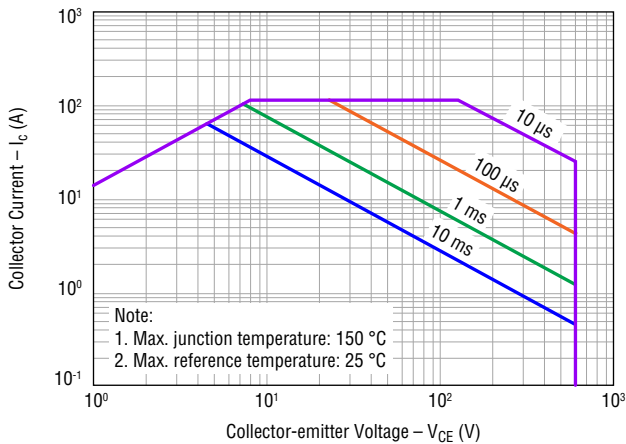


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Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area

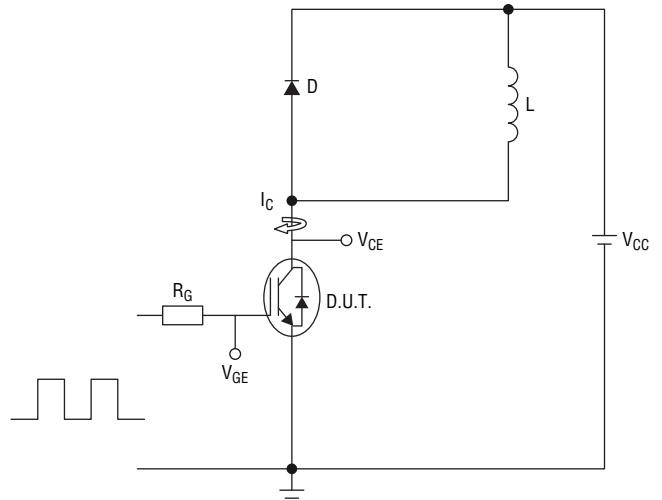


How to Order

B I D N W 30 N 60 H 3

- B = Bourns®
- I = IGBT
- Type
D = Discrete
- Packaging Code
NW = TO-247N-3L
- Current Rating
30 = 30 A
- Device Type
N = N-channel
- Nominal Voltage (divided by 10)
60 = 600 V
- Optimization
H = High Speed
- Version Number

Inductive Load Test Circuit



$L = 1.87 \text{ mH}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = 15 \text{ V}$, $I_C = 30 \text{ A}$, $R_G = 10 \Omega$

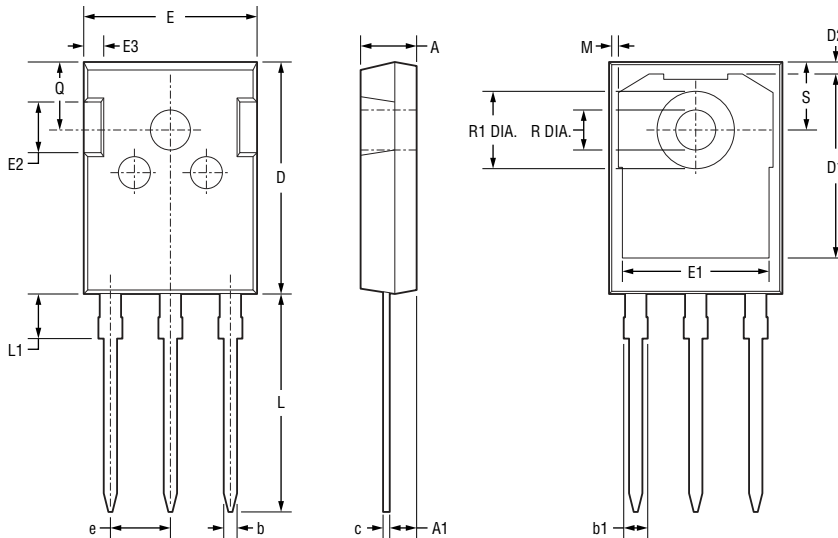
Environmental Characteristics

ESD Class (HBM)2

BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)



Product Dimensions



DIMENSIONS: $\frac{\text{MM}}{\text{(INCHES)}}$

Symbol	Min.	Nom.	Max.
A	4.90 (.193)	5.00 (.197)	5.10 (.201)
A1	2.31 (.091)	2.41 (.095)	2.51 (.099)
b	1.16 (.046)	—	1.26 (.050)
b1	—	—	2.25 (.089)
c	0.59 (.023)	—	0.66 (.026)
D	20.90 (.823)	21.00 (.827)	21.10 (.831)
D1	16.25 (.640)	16.55 (.652)	16.85 (.663)
D2	1.05 (.041)	1.17 (.046)	1.35 (.053)
E	15.70 (.618)	15.80 (.622)	15.90 (.626)
E1	13.10 (.516)	13.30 (.524)	13.50 (.531)
E2	4.40 (.173)	4.50 (.177)	4.60 (.181)
E3	1.50 (.059)	1.60 (.063)	1.70 (.067)
e	5.436 (.214) BSC		
L	19.80 (.780)	19.92 (.784)	20.10 (.791)
L1	—	—	4.30 (.169)
M	0.35 (.014)	—	0.95 (.037)
R	3.40 (.134)	3.50 (.138)	3.60 (.142)
R1	7.00 (.276)	—	7.40 (.291)
Q	5.60 (.220)	—	6.00 (.236)
S	6.05 (.238)	6.15 (.242)	6.25 (.246)

Packaging Specifications

BIDNW30N60H3 30 pieces per tube



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REV. 08/23

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