

Features

- 600 V, 30 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- 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

BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

General Information

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

Additional Information

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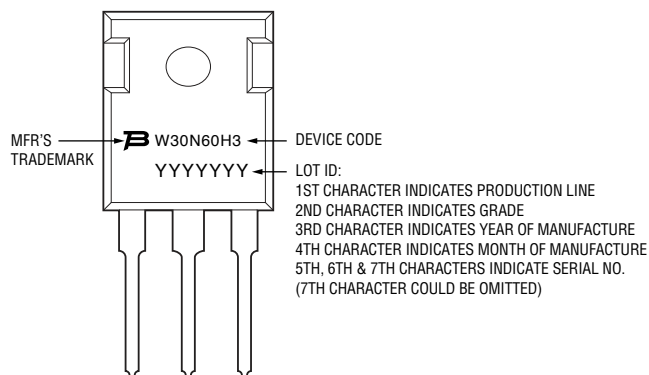
Maximum Electrical Ratings ($T_C = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current ($T_C = 25^\circ\text{C}$), limited by T_{jmax}	I_C	60	A
Continuous Collector Current ($T_C = 100^\circ\text{C}$), 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 ($T_C = 100^\circ\text{C}$), 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	$^\circ\text{C}$

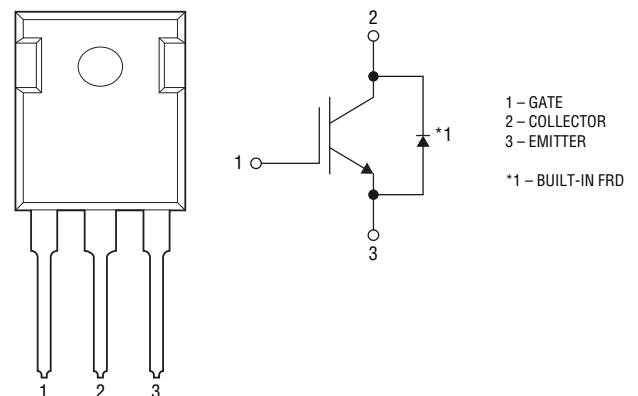
Thermal Resistance

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



WARNING Cancer and Reproductive Harm
www.P65Warnings.ca.gov

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

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BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

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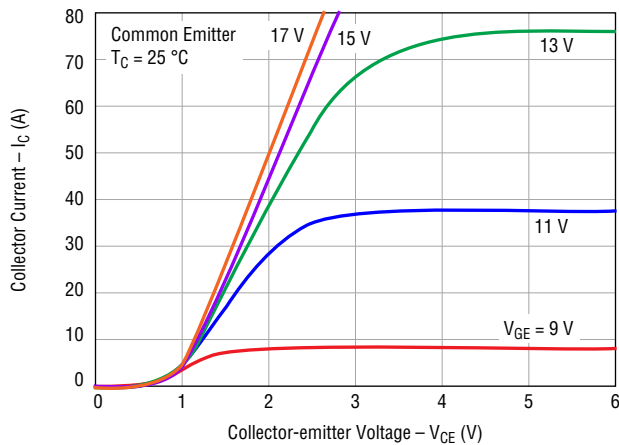
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Diode Switching Characteristics ($T_C = 25^\circ\text{C}$, unless otherwise specified)

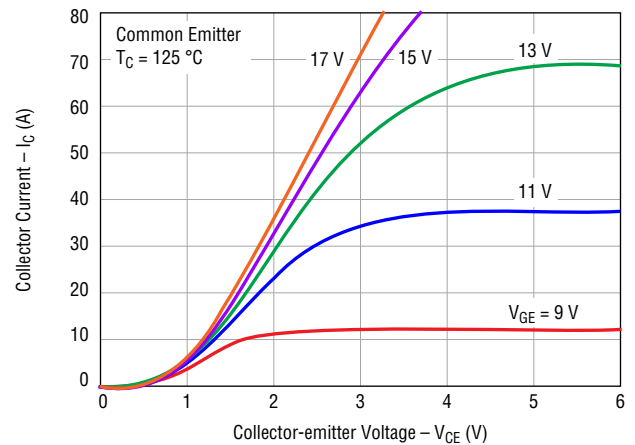
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	$di_F/dt = 200 \text{ A}/\mu\text{s}$ $I_F = 12.0 \text{ A}$	—	28	—	ns
Reverse Recovery Charge	Q_{rr}		—	55	—	nC

Electrical Characteristic Performance

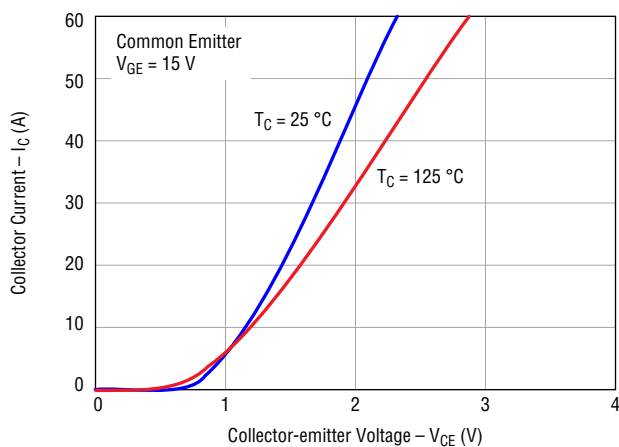
Typical Output Characteristics



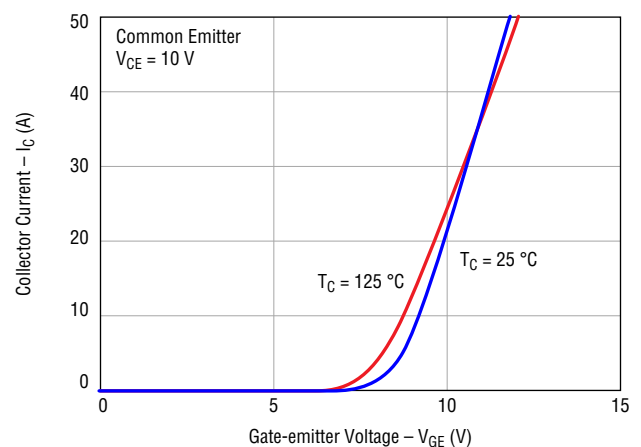
Typical Output Characteristics



Typical Saturation Voltage Characteristics



Typical Transfer Characteristics



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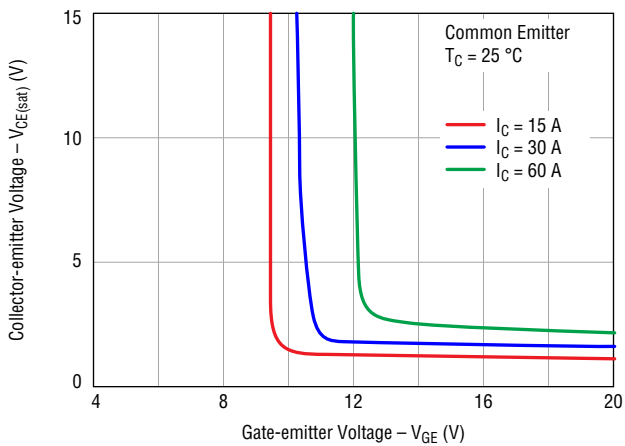
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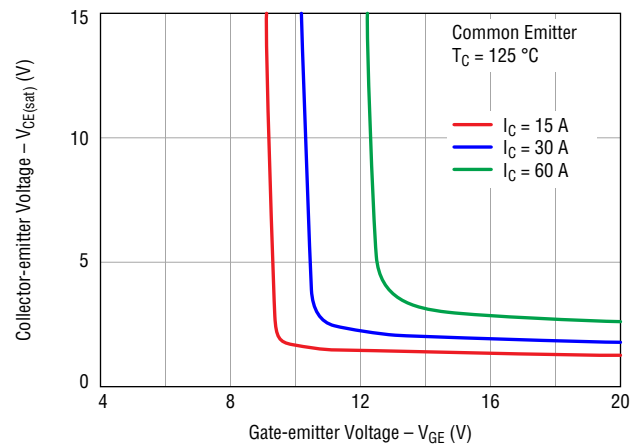
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Electrical Characteristic Performance (continued)

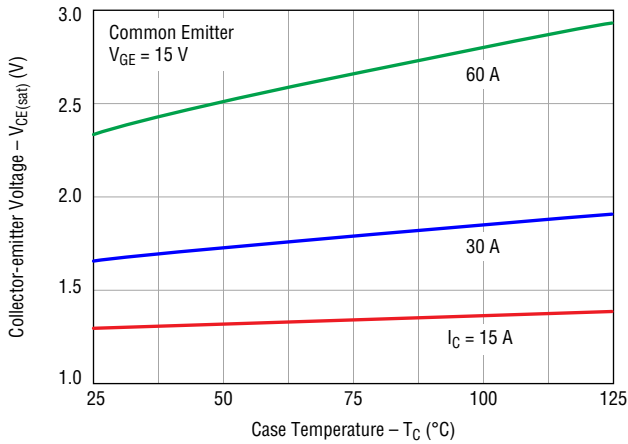
Typical $V_{CE(sat)}$ vs V_{GE} @ $T_C = 25^\circ\text{C}$



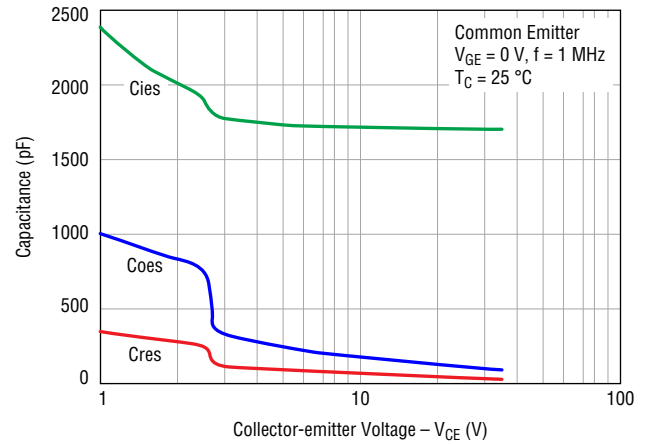
Typical $V_{CE(sat)}$ vs V_{GE} @ $T_C = 125^\circ\text{C}$



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



Typical Capacitance Characteristics



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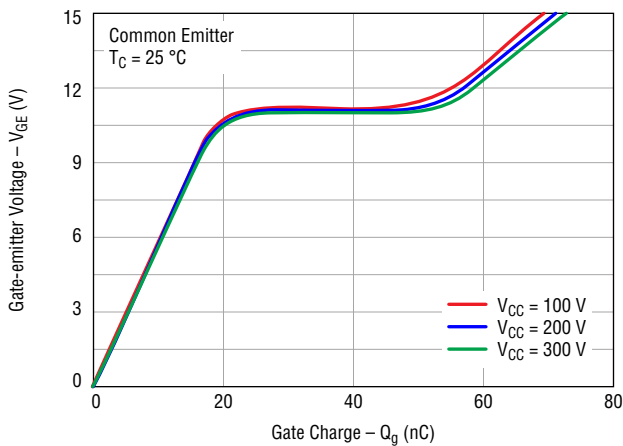
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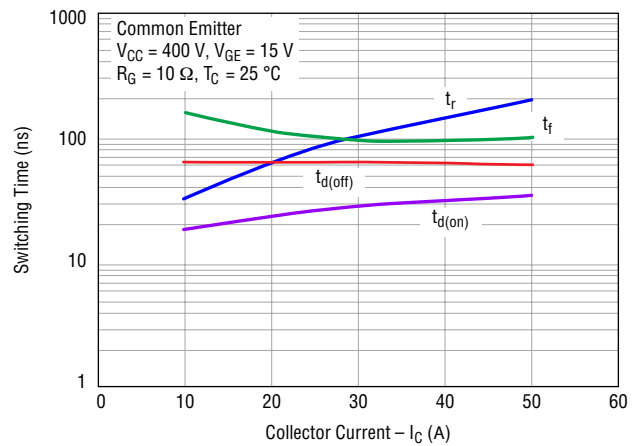
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Electrical Characteristic Performance (continued)

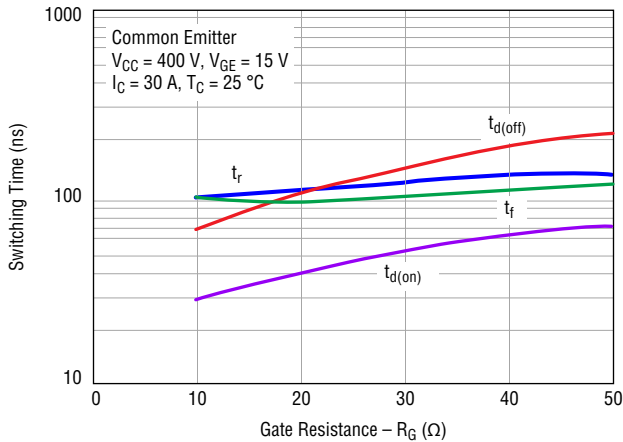
Typical Gate Charge Characteristic



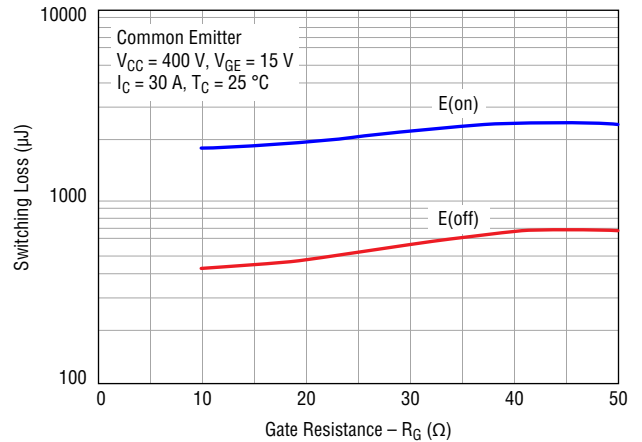
Typical Switching Time Characteristics vs I_C



Typical Switching Time Characteristics vs R_G



Typical Switching Loss vs R_G



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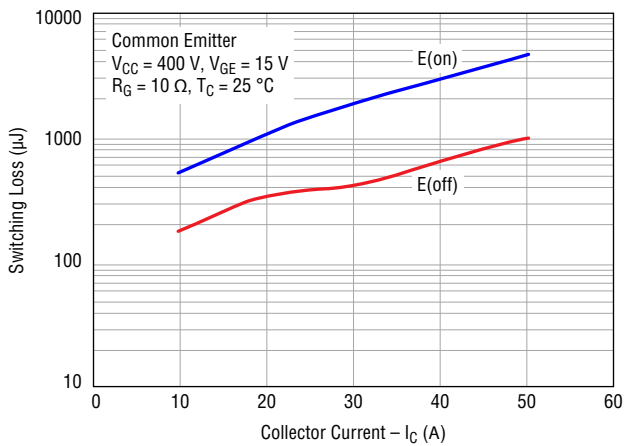
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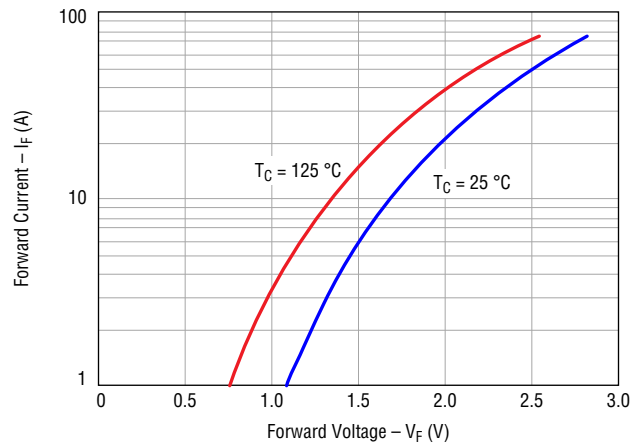
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Electrical Characteristic Performance (continued)

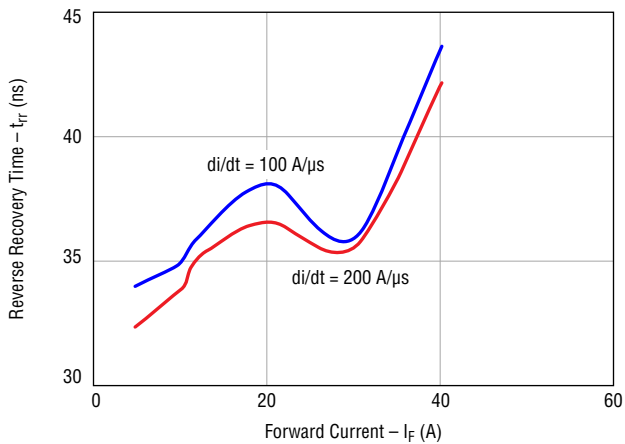
Typical Switching Loss Characteristics vs I_C



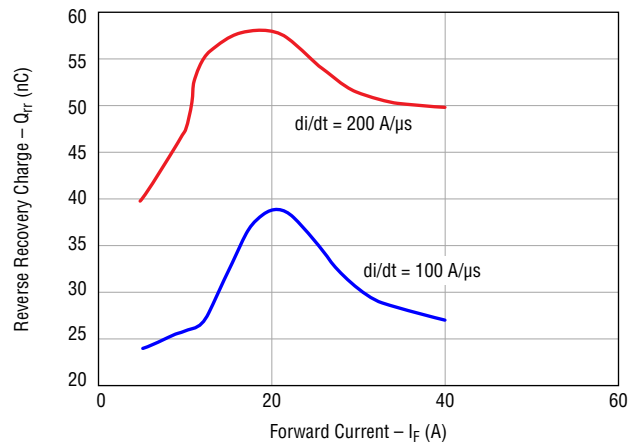
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F



Typical Reverse Recovery Charge vs I_F



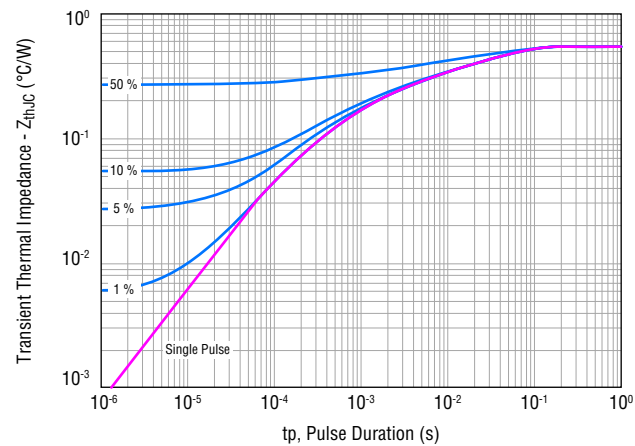
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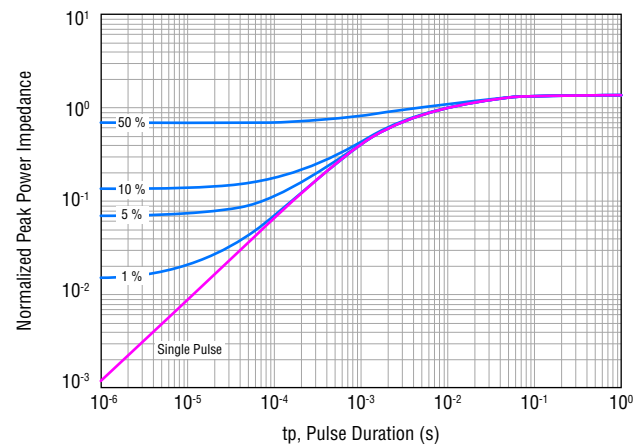
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Electrical Characteristic Performance (continued)

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



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

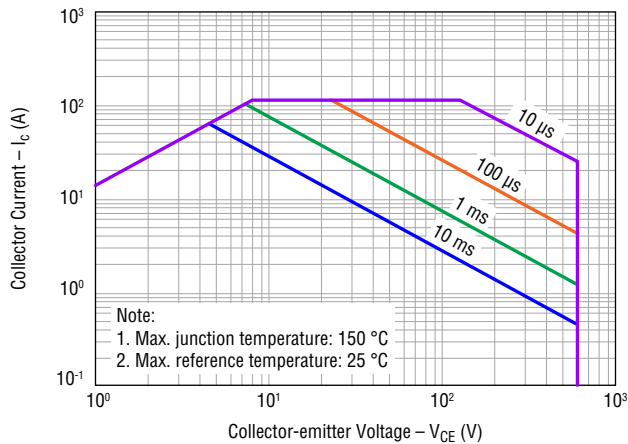


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Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area

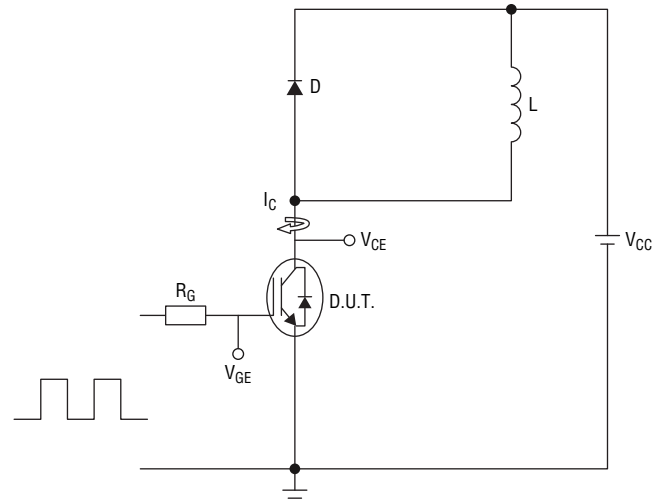


How to Order

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



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

Environmental Characteristics

ESD Class (HBM).....2

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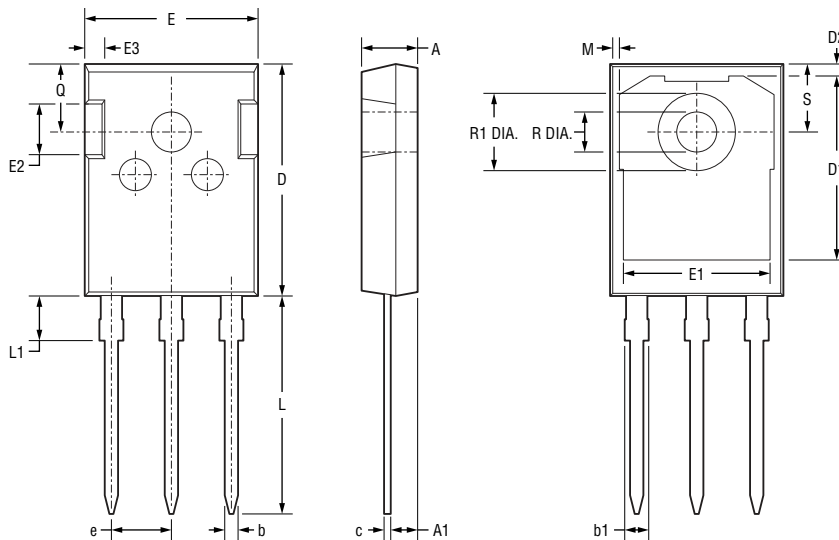
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BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

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Product Dimensions



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

Packaging Specifications

BIDNW30N60H3 30 pieces per tube

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

BOURNS®

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