

Features

- 650 V, 40 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Novel trench-gate field-stop technology
- Optimized for conduction
- High-speed switching
- Maximum operating $T_j = 175\text{ }^\circ\text{C}$
- RoHS compliant*

Applications

- Switched-Mode Power Supplies (SMPS)
- Uninterruptible Power Sources (UPS)
- Power Factor Correction (PFC)
- Inverters
- Welding converters
- Photovoltaic

BOURNS®

BIDW40N65H5 Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDW40N65H5 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:



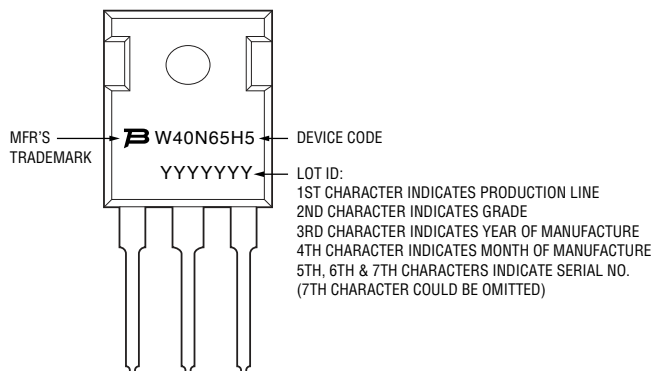
Maximum Electrical Ratings ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Continuous Collector Current ($T_C = 25\text{ }^\circ\text{C}$), limited by T_{jmax}	I_C	80	A
Continuous Collector Current ($T_C = 100\text{ }^\circ\text{C}$), limited by T_{jmax}	I_C	40	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	120	A
Gate-Emitter Voltage	V_{GE}	± 20	V
Gate-Emitter Voltage ($t_p \leq 10\text{ }\mu\text{s}$, $D < 1\%$)	V_{GE}	± 30	V
Continuous Forward Current ($T_C = 100\text{ }^\circ\text{C}$), limited by T_{jmax}	I_F	20	A
Total Power Dissipation	P_{total}	300	W
Storage Temperature	T_{STG}	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_j	-40 to +175	$^\circ\text{C}$

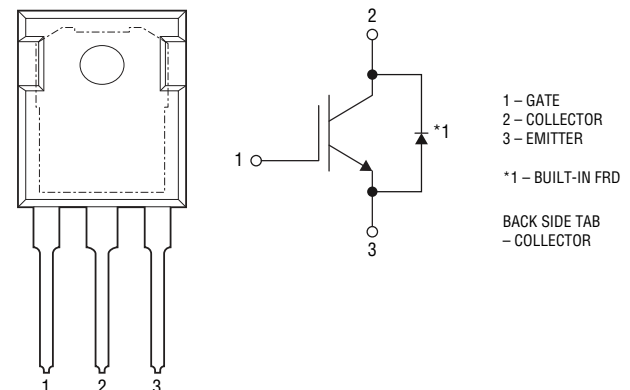
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)}_{IGBT}$	0.5	$^\circ\text{C/W}$
Diode Thermal Resistance Junction - Case	$R_{th(j-c)}_{Diode}$	1.4	$^\circ\text{C/W}$

Typical Part Marking



Internal Circuit



*RoHS Directive 2015/863, Mar 31, 2015 and Annex. Specifications are subject to change without notice. Users should verify actual device performance in their specific applications. The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

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Static Electrical Characteristics (T_C = 25 °C, Unless Otherwise Specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter Breakdown Voltage	BV _{CES}	V _{GE} = 0 V, I _C = 250 μA	650	—	—	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} = 15 V, I _C = 40 A, T _C = 25 °C	—	1.65	2.1	V
		V _{GE} = 15 V, I _C = 40 A, T _C = 150 °C	—	1.85	—	
Diode Forward On-Voltage	V _F	I _F = 20 A, T _C = 25 °C	—	1.5	2	V
		I _F = 20 A, T _C = 150 °C	—	1.4	—	V
Gate Threshold Voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 250 μA	3.2	4.5	5.8	V
Collector Cut-off Current	I _{CES}	V _{GE} = 0 V, V _{CE} = 650 V	—	—	200	μA
Gate-Emitter Leakage Current	I _{GES}	V _{CE} = 0 V, V _{GE} = ± 20 V	—	—	±400	nA

Dynamic Electrical Characteristics (T_C = 25 °C, Unless Otherwise Specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Input Capacitance	C _{ies}	V _{CE} = 30 V, V _{GE} = 0 V, f = 1 MHz	—	3150	—	pF
Output Capacitance	C _{oes}		—	63	—	
Reverse Transfer Capacitance	C _{res}		—	11	—	
Total Gate Charge	Q _g	V _{CE} = 400 V, V _{GE} = 15 V, I _C = 40.0 A	—	111	—	nC
Gate-Emitter Charge	Q _{ge}		—	29	—	
Gate-Collector Charge	Q _{gc}		—	25	—	

IGBT Switching Characteristics (Inductive Load, T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	t _{d(on)}	V _{CE} = 400 V, V _{GE} = 15 V, I _C = 40.0 A, R _G = 10 Ω	—	28	—	ns
Current Rise Time	t _r		—	80	—	ns
Turn-off Delay Time	t _{d(off)}		—	116	—	ns
Current Fall Time	t _f		—	98	—	ns
Turn-on Switching Energy	E _{on}		—	1.9	—	mJ
Turn-off Switching Energy	E _{off}		—	0.52	—	mJ
Total Switching Energy	E _{ts}		—	2.4	—	mJ

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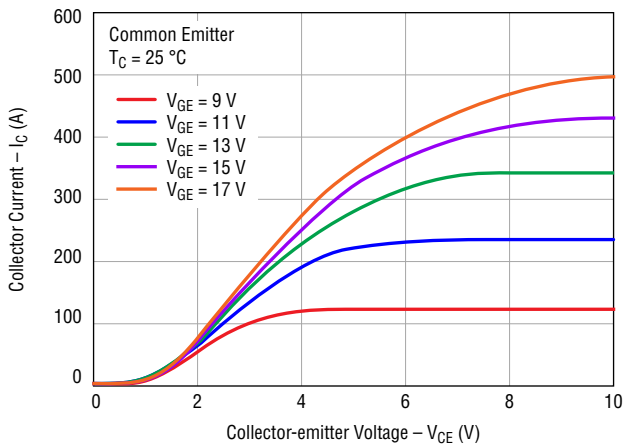


Diode Switching Characteristics ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise specified)

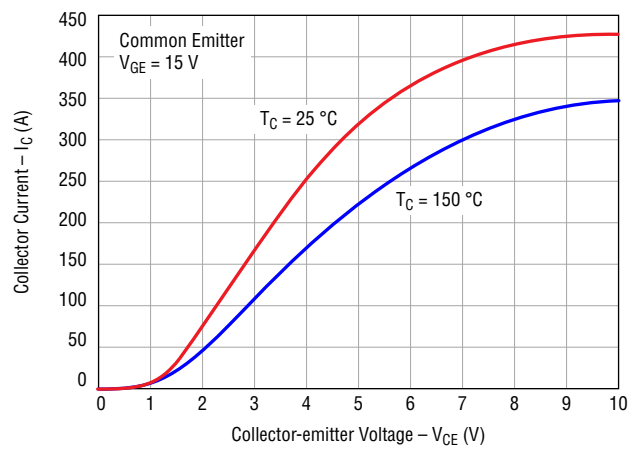
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	$di_F/dt = 200\text{ A}/\mu\text{s}$, $I_F = 20.0\text{ A}$	—	165	—	ns
Reverse Recovery Charge	Q_{rr}		—	223	—	nC

Electrical Characteristic Performance

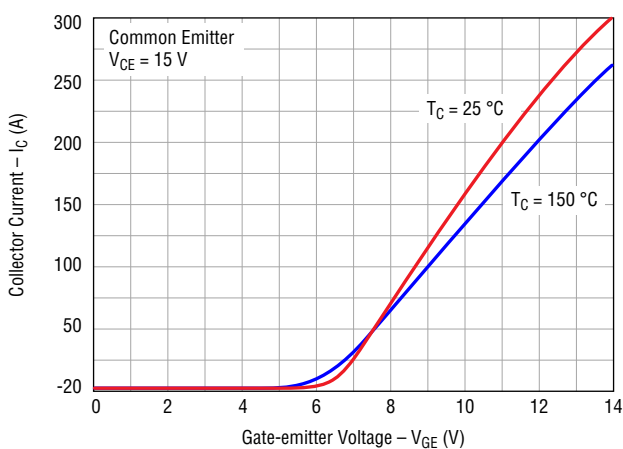
Typical Output Characteristics



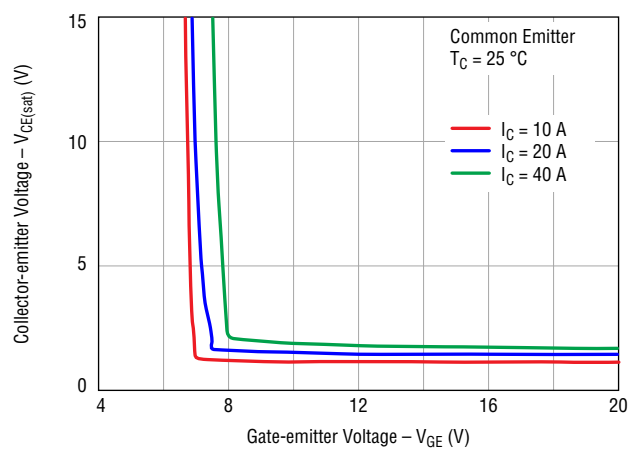
Typical Saturation Voltage Characteristics



Typical Transfer Characteristics



Typical Saturation Voltage vs V_{GE} @ $T_C = 25\text{ }^\circ\text{C}$



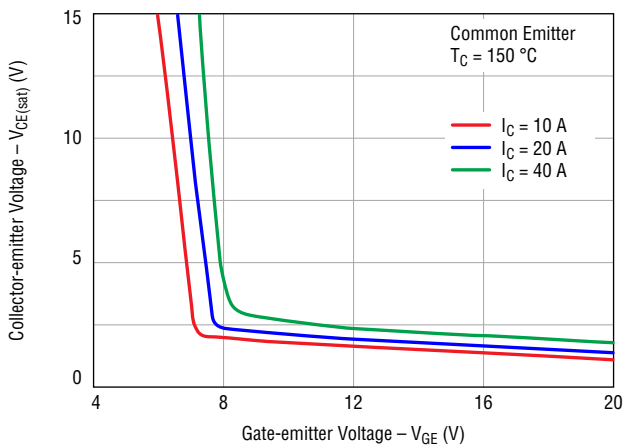
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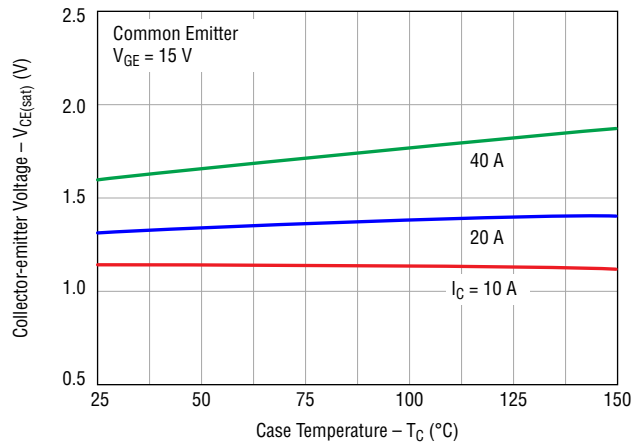
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Electrical Characteristic Performance (continued)

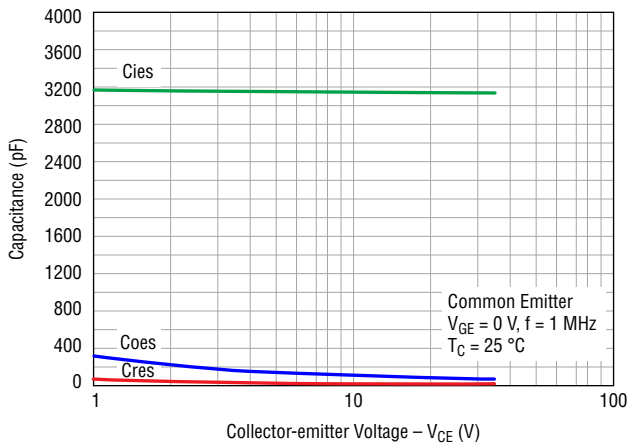
Typical Saturation Voltage vs V_{GE} @ $T_C = 150\text{ }^\circ\text{C}$



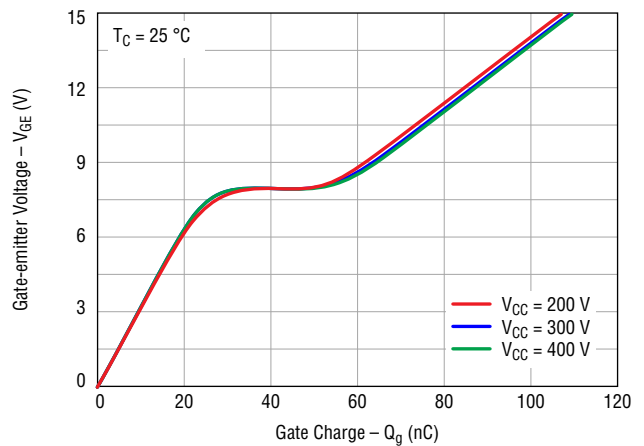
Typical Saturation Voltage vs Case Temperature



Typical Capacitance Characteristics



Typical Gate Charge Characteristics



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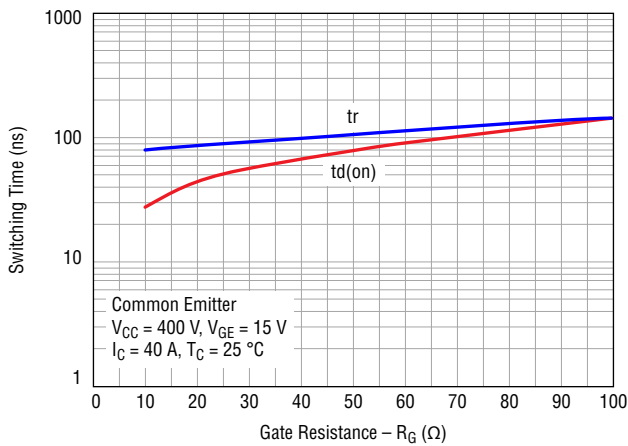
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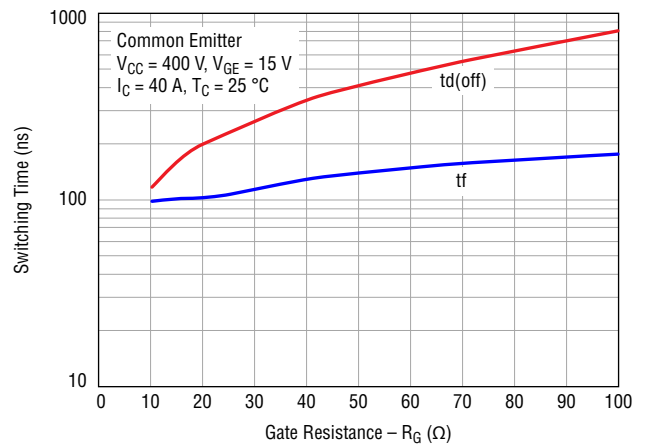


Electrical Characteristic Performance (continued)

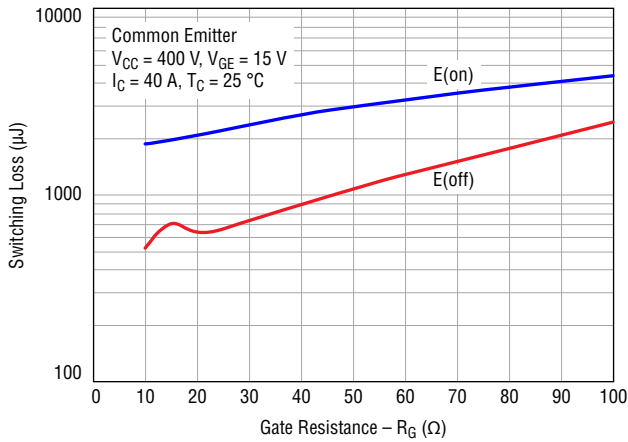
Typical Turn-on Characteristics vs Gate Resistance



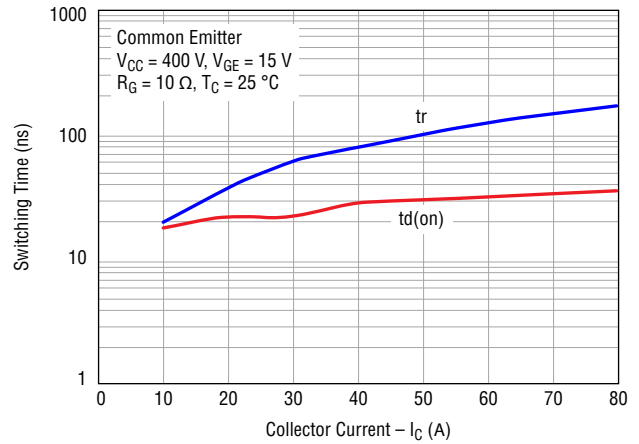
Typical Turn-off Characteristics vs Gate Resistance



Typical Switching Loss vs Gate Resistance



Typical Turn-on Characteristics vs Collector Current



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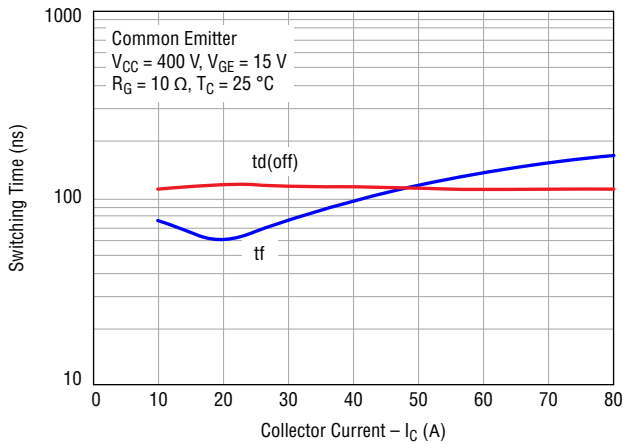
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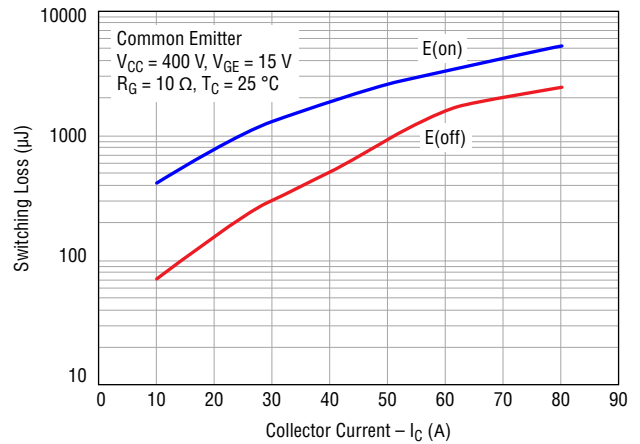


Electrical Characteristic Performance (continued)

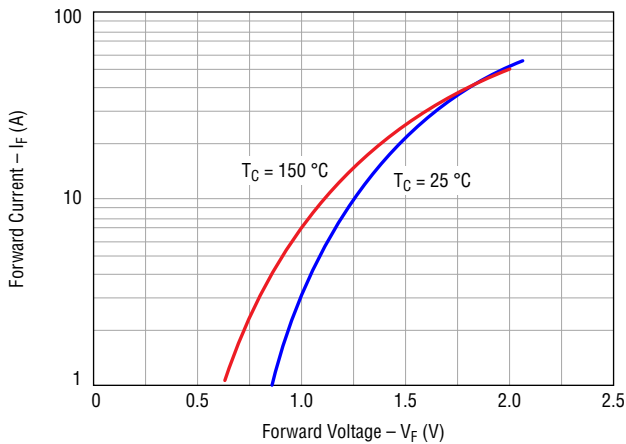
Typical Turn-off Characteristics vs Collector Current



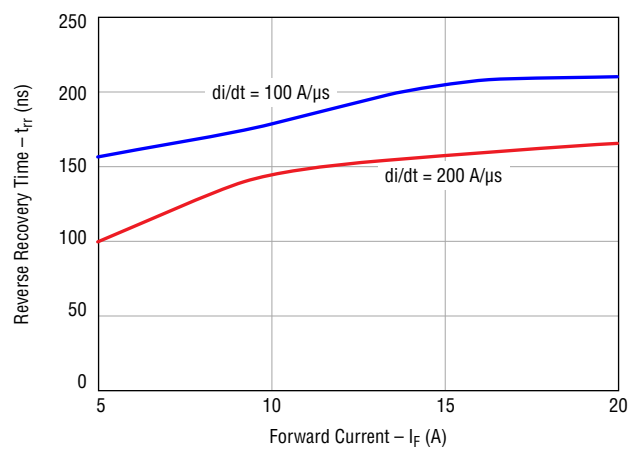
Typical Switching Loss Characteristics vs Collector Current



Typical Forward Characteristics



Typical Reverse Recovery Time vs Forward Current



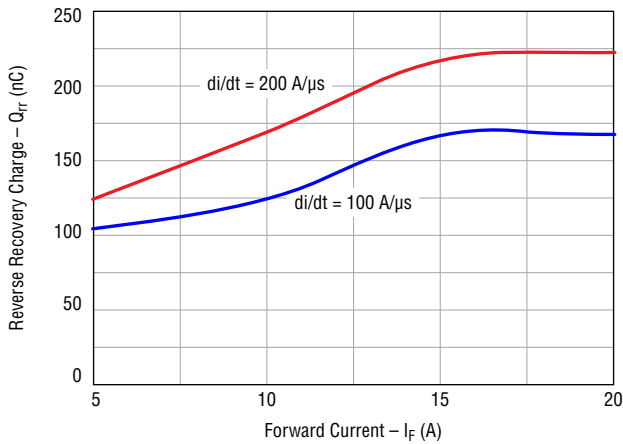
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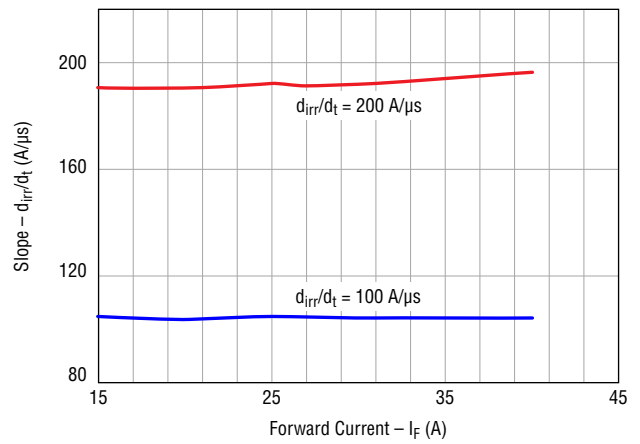
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Electrical Characteristic Performance (continued)

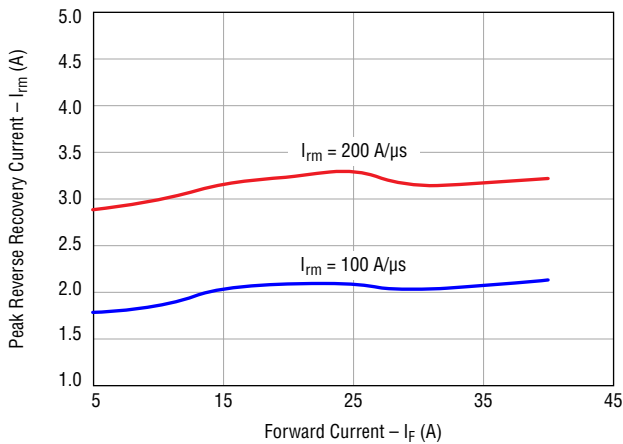
Typical Reverse Recovery Charge vs Forward Current



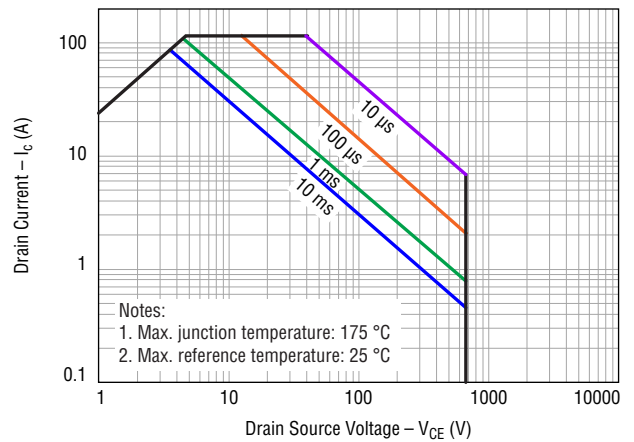
Slope vs Forward Current



Peak Reverse Recovery Current vs Forward Current



Forward Bias Safe Operating Area



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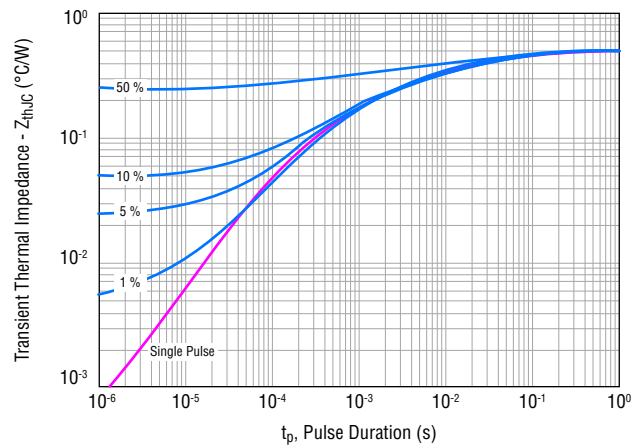
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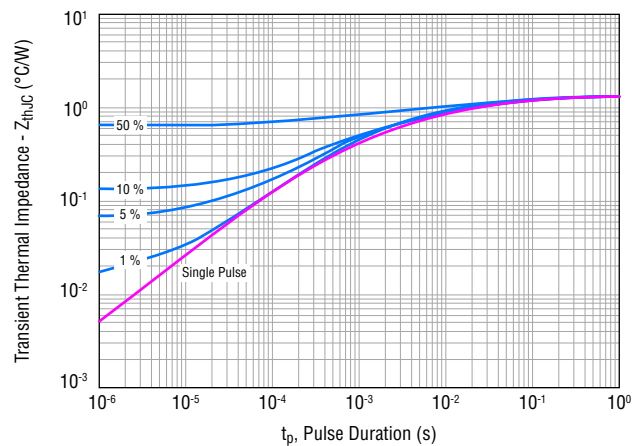


Electrical Characteristic Performance (continued)

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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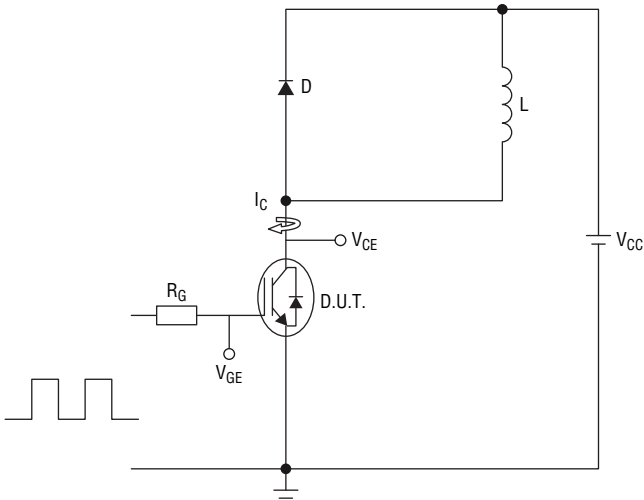
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BIDW40N65H5 Insulated Gate Bipolar Transistor (IGBT)



Inductive Load Test Circuit



$L = 200 \mu\text{H}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = 15 \text{ V}$, $I_C = 40 \text{ A}$, $R_G = 10 \Omega$

How to Order

B I D W 40 N 65 H5

B = Bourns® _____

I = IGBT _____

Type _____
D = Discrete

Package Code _____
W = TO-247-3L

Current Rating _____
40 = 40 A

Device Type _____
N = N-channel

Nominal Voltage (divided by 10) _____
65 = 650 V

Optimization _____
H = High Speed

Version Number _____
5 = Revision Control

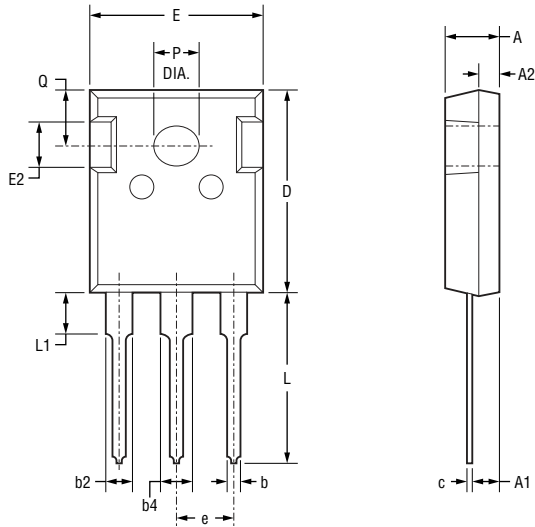
Environmental Characteristics

ESD Class (HBM)2

BIDW40N65H5 Insulated Gate Bipolar Transistor (IGBT)



Product Dimensions



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

Symbol	Min.	Nom.	Max.
A	$\frac{4.80}{(.189)}$	$\frac{5.00}{(.197)}$	$\frac{5.20}{(.205)}$
A1	$\frac{2.21}{(.087)}$	$\frac{2.41}{(.095)}$	$\frac{2.59}{(.102)}$
A2	$\frac{1.85}{(.073)}$	$\frac{2.00}{(.079)}$	$\frac{2.15}{(.085)}$
b	$\frac{1.11}{(.044)}$	—	$\frac{1.36}{(.054)}$
b2	$\frac{1.91}{(.075)}$	—	$\frac{2.25}{(.089)}$
b4	$\frac{2.91}{(.115)}$	—	$\frac{3.25}{(.128)}$
c	$\frac{0.51}{(.020)}$	—	$\frac{0.75}{(.030)}$
D	$\frac{20.80}{(.819)}$	$\frac{21.00}{(.827)}$	$\frac{21.30}{(.839)}$
E	$\frac{15.50}{(.610)}$	$\frac{15.80}{(.622)}$	$\frac{16.10}{(.634)}$
E2	$\frac{4.40}{(.173)}$	$\frac{5.00}{(.197)}$	$\frac{5.20}{(.205)}$
e	$\frac{5.44}{(.214)}$ BSC		
L	$\frac{19.72}{(.776)}$	$\frac{19.92}{(.784)}$	$\frac{20.22}{(.796)}$
L1	—	—	$\frac{4.30}{(.169)}$
P	$\frac{3.40}{(.134)}$	—	$\frac{3.80}{(.150)}$
Q	$\frac{5.60}{(.220)}$	$\frac{5.80}{(.228)}$	$\frac{6.00}{(.236)}$

Packaging Specifications

BIDW40N65H5 30 pieces per tube



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