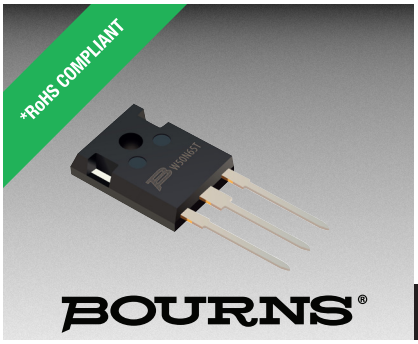


Features

- 650 V, 50 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Trench-Gate Field-Stop technology
- Optimized for conduction
- RoHS compliant*

Applications

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

BIDW50N65T Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDW50N65T 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. In addition, this structure provides a lower thermal resistance $R_{(th)}$.

Additional Information

Click these links for more information:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

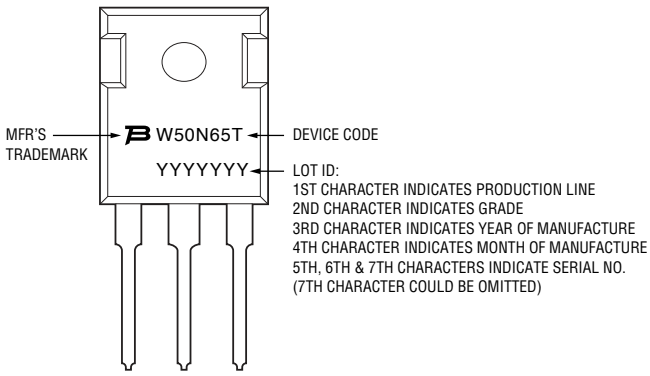
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Continuous Collector Current (T_C = 25 °C), limited by T_{jmax}	I_C	100	A
Continuous Collector Current (T_C = 100 °C), limited by T_{jmax}	I_C	50	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	150	A
Gate-Emitter Voltage	V_{GE}	±20	V
Continuous Forward Current (T_C = 100 °C), limited by T_{jmax}	I_F	50	A
Short-circuit Withstand Time (V_{CE} = 300 V, V_{GE} = 15 V)	T_{SC}	10	μs
Total Power Dissipation	P_{total}	416	W
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Junction Temperature	T_j	-55 to +150	°C

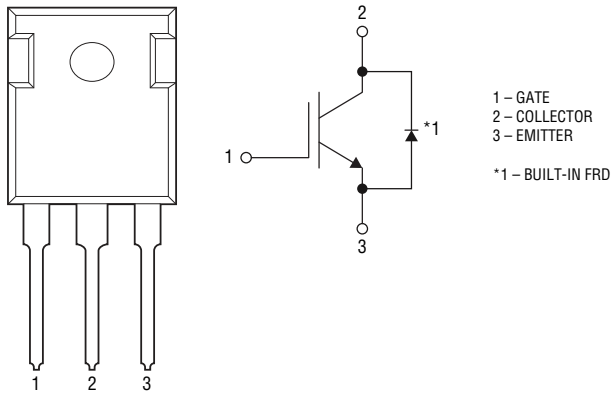
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)\_IGBT}$	0.3	°C/W
Diode Thermal Resistance Junction - Case	$R_{th(j-c)\_Diode}$	0.65	°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.
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.

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 = 50 A T_C= 25 °C	—	1.65	2.2	V
		V_{GE} = 15 V, I_C = 50 A T_C= 125 °C	—	1.9	—	
Diode Forward On-Voltage	V_F	I_F = 50 A, T_C = 25 °C	—	1.7	2.5	V
		I_F = 50 A, T_C = 125 °C	—	1.3	—	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	4.0	5.0	7.0	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	—	2723	—	pF
Output Capacitance	C_{oes}		—	230	—	
Reverse Transfer Capacitance	C_{res}		—	55	—	
Total Gate Charge	Q_g	V_{CE} = 400 V, V_{GE} = 15 V I_C = 50.0 A	—	123	—	nC
Gate-Emitter Charge	Q_{ge}		—	31	—	
Gate-Collector Charge	Q_{gc}		—	48	—	

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

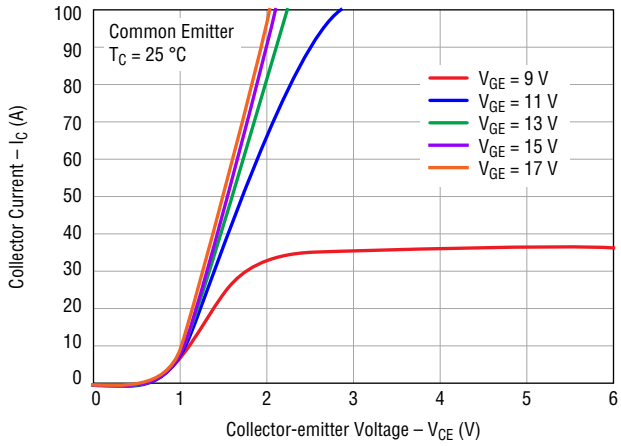
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 50.0 A, R_G = 10 Ω	—	37	—	ns
Current Rise Time	t_r		—	133	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	125	—	ns
Current Fall Time	t_f		—	121	—	ns
Turn-on Switching Energy	E_{on}		—	3.0	—	mJ
Turn-off Switching Energy	E_{off}		—	1.1	—	mJ
Total Switching Energy	E_{ts}		—	4.1	—	mJ

Diode Switching Characteristics (T_C = 25 °C, unless otherwise specified)

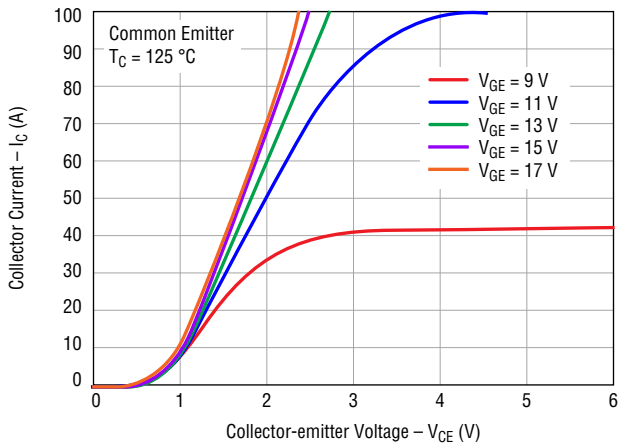
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 50.0 A	—	37.5	—	ns
Reverse Recovery Charge	Q_{rr}		—	78	—	nC

Electrical Characteristic Performance

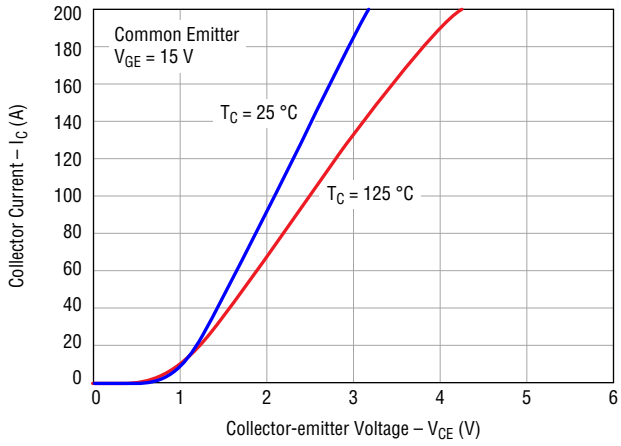
Typical Output Characteristics



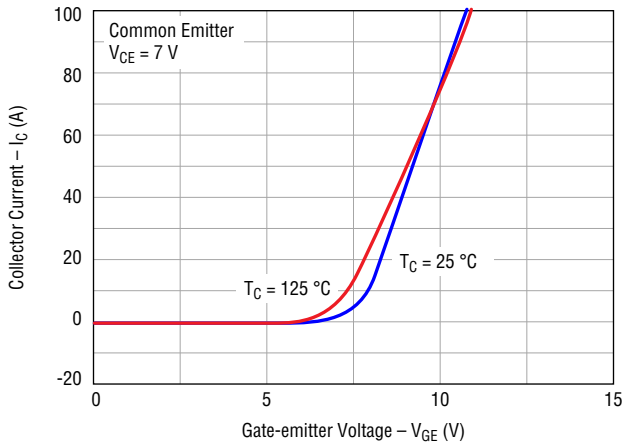
Typical Output Characteristics



Typical Saturation Voltage Characteristics

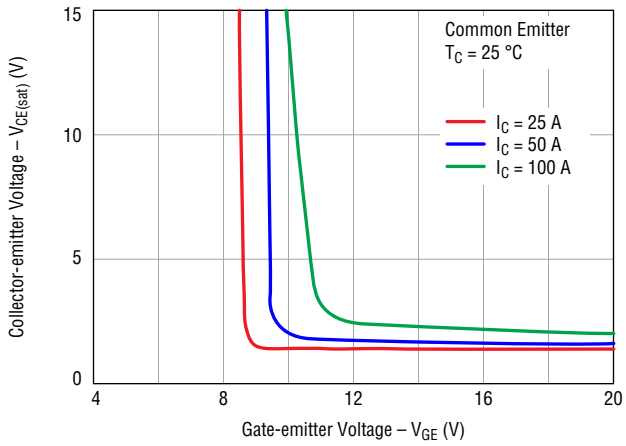


Typical Transfer Characteristics

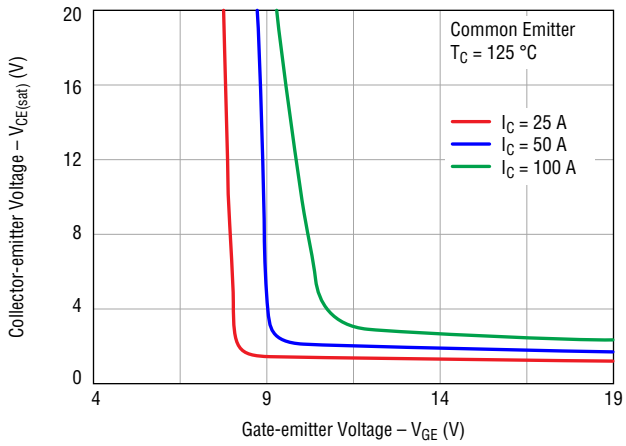


Electrical Characteristic Performance (continued)

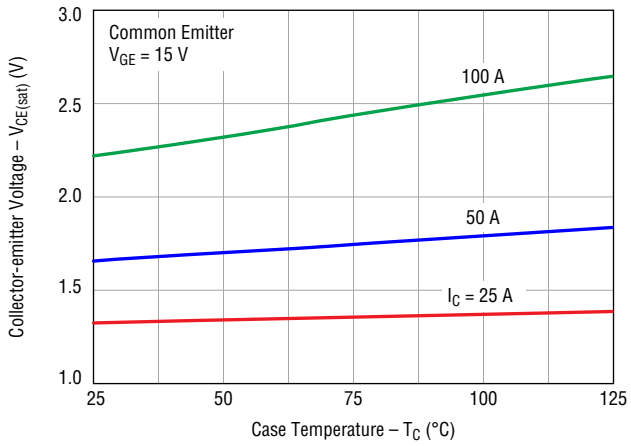
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



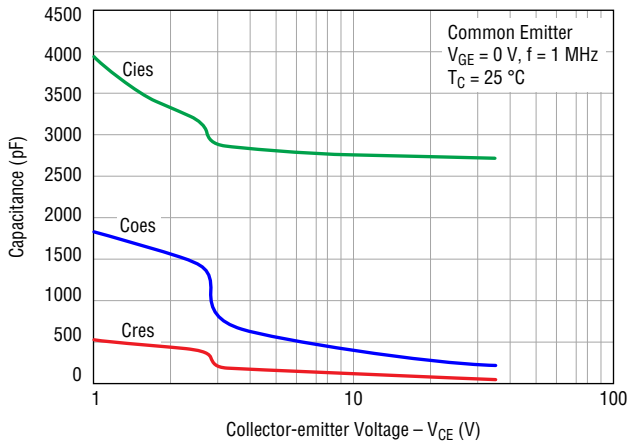
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

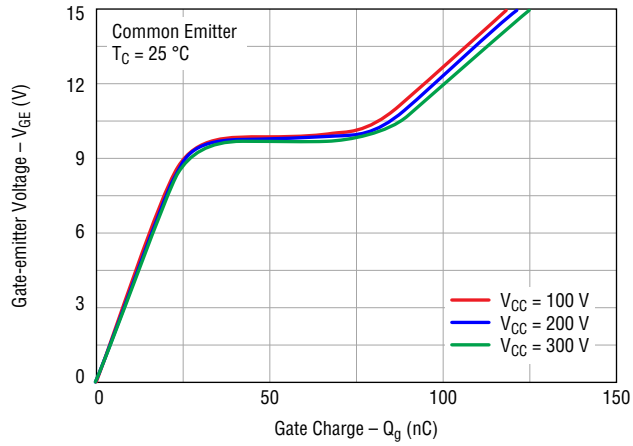


Typical Capacitance Characteristics

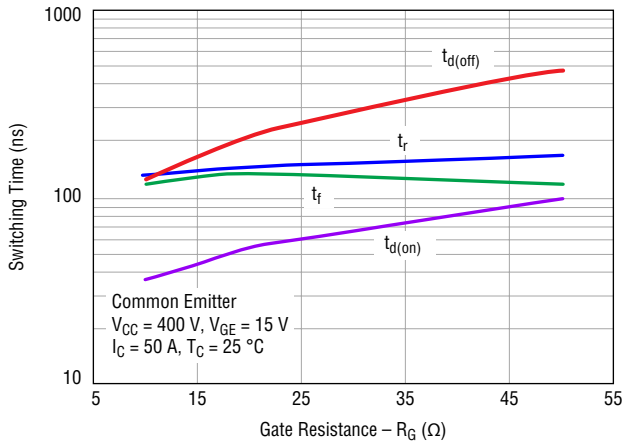


Electrical Characteristic Performance (continued)

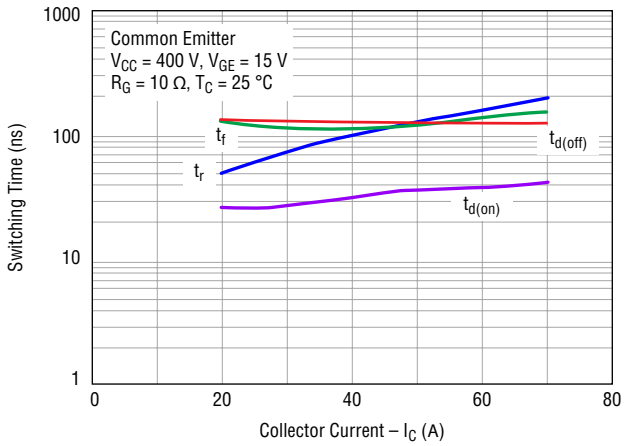
Typical Gate Charge Characteristics



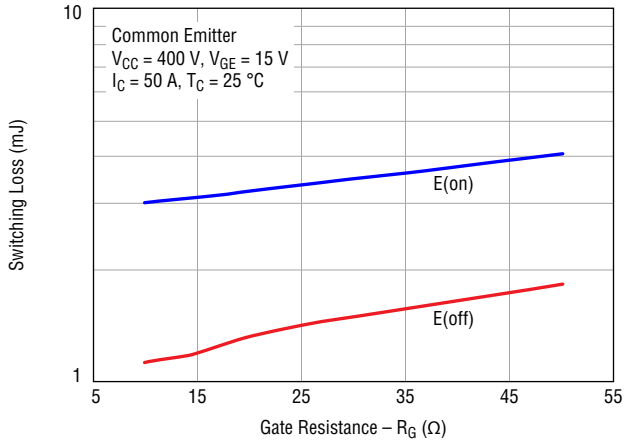
Typical Switching Time Characteristics vs R_G



Typical Switching Time Characteristics vs I_C

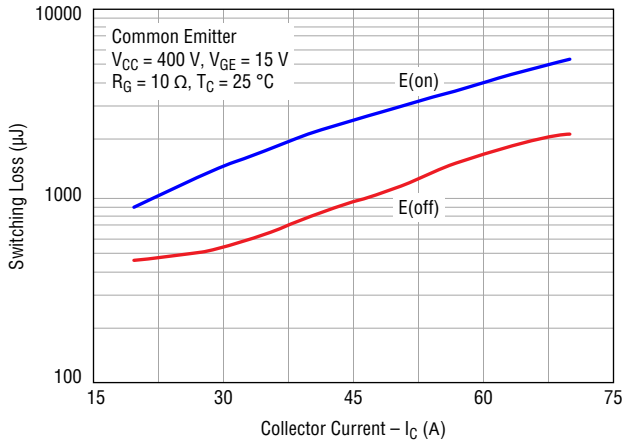


Typical Switching Loss vs R_G

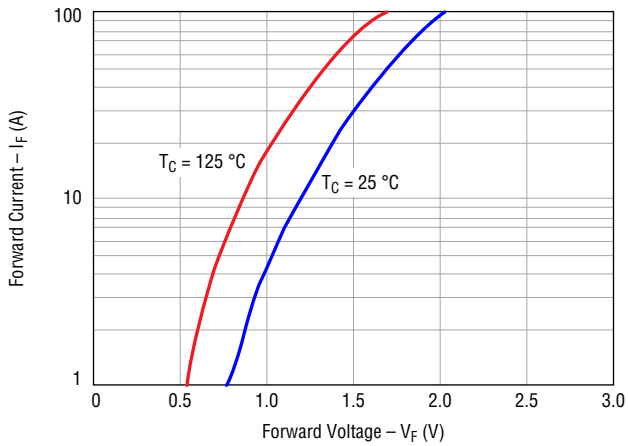


Electrical Characteristic Performance (continued)

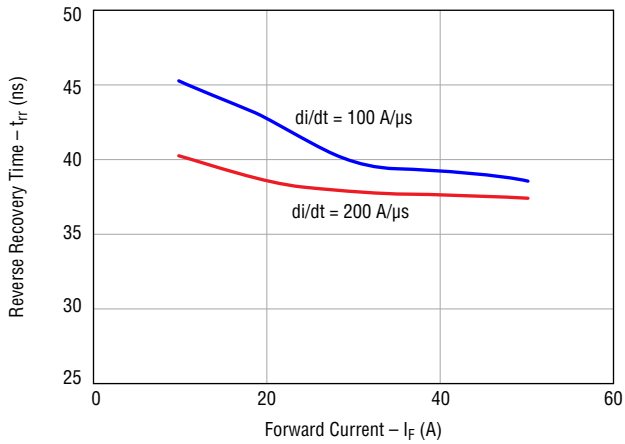
Typical Switching Loss Characteristics vs I_C



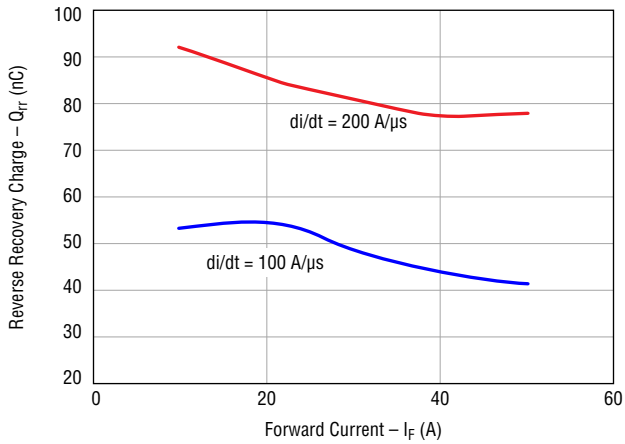
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

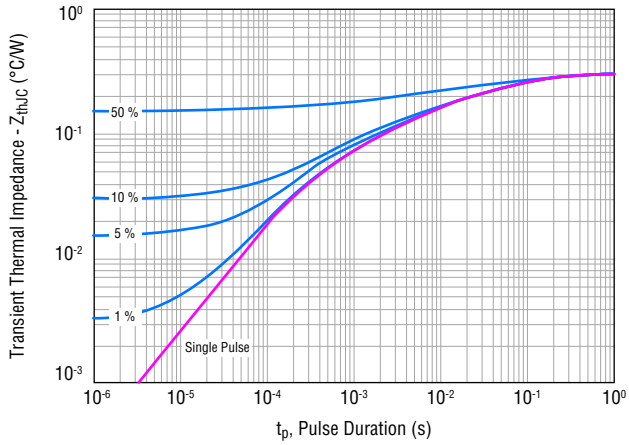


Typical Reverse Recovery Charge vs I_F

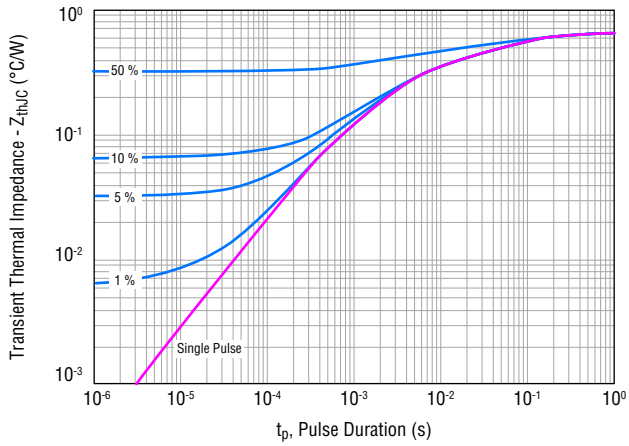


Electrical Characteristic Performance (continued)

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

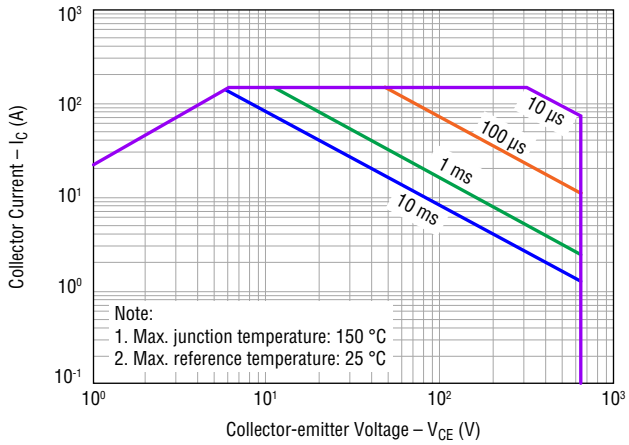


Diode Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area

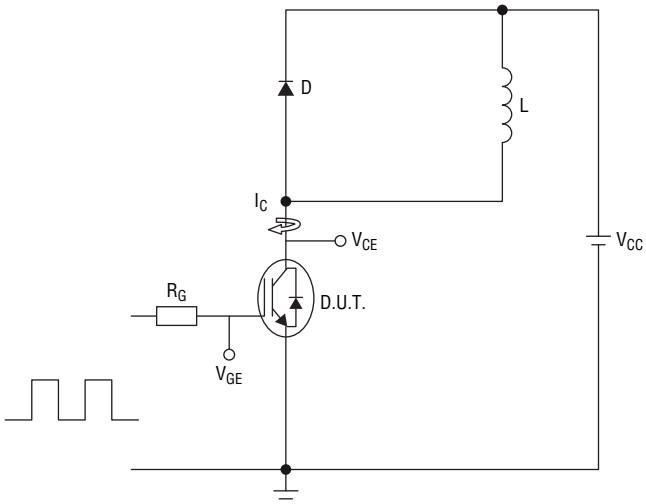


How to Order

B I D W 50 N 65 T

- B = Bourns®
- I = IGBT
- Type
  - D = Discrete
- Package Code
  - W = TO-247-3L
- Current Rating
  - 50 = 50 A
- Device Type
  - N = N-channel
- Nominal Voltage (divided by 10)
  - 65 = 650 V
- Optimization
  - T = Medium Speed

Inductive Load Test Circuit

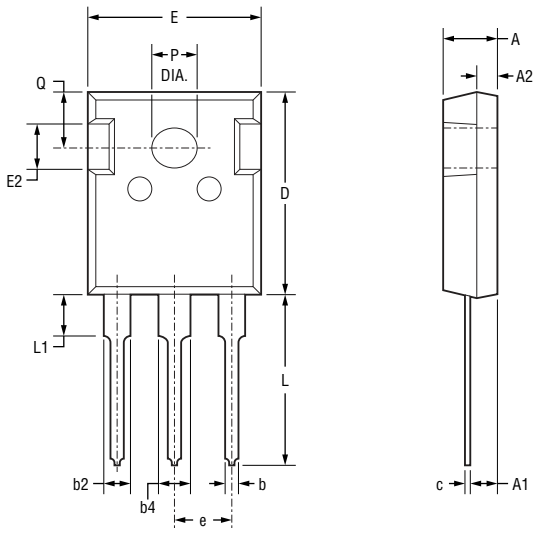


L = 1.12 mH, V_{CE} = 400 V, V_{GE} = 15 V, I_C = 50 A, R_G = 10 Ω

Environmental Characteristics

ESD Class (HBM).....2

Product Dimensions



DIMENSIONS: MM / (INCHES)

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

Packaging Specifications

BIDW50N65T ..... 30 pieces per tube

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EMEA: Tel: +36 88 885 877
Email: eurocus@bourns.com

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