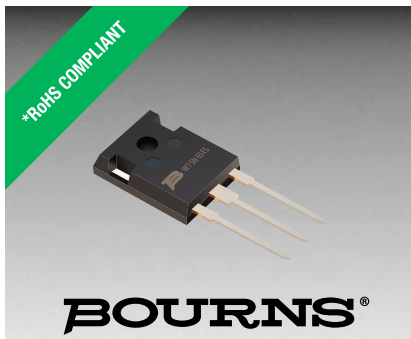




Features

- 650 V, 75 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Novel trench-gate field-stop technology
- Optimized for conduction
- Medium speed switching
- Maximum operating $T_j = 175\text{ }^{\circ}\text{C}$
- RoHS compliant*

Applications

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

BIDW75N65ES5 Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDW75N65ES5 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

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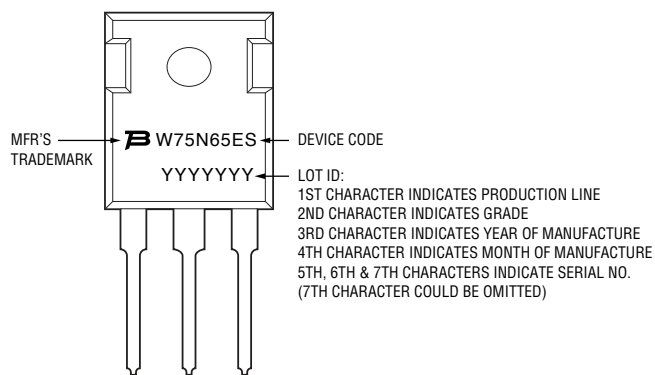
Maximum Electrical Ratings ($T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

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	150	A
Continuous Collector Current ($T_C = 100\text{ }^{\circ}\text{C}$), limited by T_{jmax}	I_C	75	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	300	A
Gate-Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage ($t_p \leq 10\text{ }\mu\text{s}$, $D < 0.01$)	V_{GE}	± 30	V
Continuous Forward Current ($T_C = 100\text{ }^{\circ}\text{C}$), limited by T_{jmax}	I_F	75	A
Total Power Dissipation	P_{total}	394	W
Storage Temperature	T_{STG}	-55 to $+150$	$^{\circ}\text{C}$
Operating Junction Temperature	T_j	-40 to $+175$	$^{\circ}\text{C}$

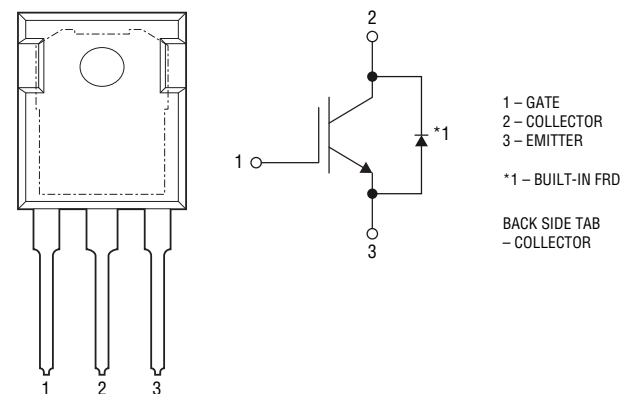
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)}_{IGBT}$	0.38	$^{\circ}\text{C/W}$
Diode Thermal Resistance Junction - Case	$R_{th(j-c)}_{Diode}$	0.4	$^{\circ}\text{C/W}$

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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BIDW75N65ES5 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}	$V_{GE} = 0\text{ V}$, $I_C = 250\text{ }\mu\text{A}$	650	—	—	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}$, $I_C = 75\text{ A}$, $T_C = 25\text{ }^{\circ}\text{C}$	—	1.42	1.85	V
		$V_{GE} = 15\text{ V}$, $I_C = 75\text{ A}$, $T_C = 150\text{ }^{\circ}\text{C}$	—	1.67	—	
Diode Forward On-Voltage	V_F	$I_F = 75\text{ A}$, $T_C = 25\text{ }^{\circ}\text{C}$	—	1.55	1.9	V
		$I_F = 75\text{ A}$, $T_C = 150\text{ }^{\circ}\text{C}$	—	1.52	—	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$	3.2	4.0	4.8	V
Collector Cut-off Current	I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 650\text{ V}$	—	—	50	μA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	—	—	± 100	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}	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$	—	4823	—	pF
Output Capacitance	C_{oes}		—	131	—	
Reverse Transfer Capacitance	C_{res}		—	21	—	
Total Gate Charge	Q_g	$V_{CE} = 520\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 75\text{ A}$	—	184	—	nC
Gate-Emitter Charge	Q_{ge}		—	33	—	
Gate-Collector Charge	Q_{gc}		—	48	—	

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

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 75\text{ A}$, $R_G = 10\text{ }\Omega$	—	35	—	ns
Current Rise Time	t_r		—	39	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	194	—	ns
Current Fall Time	t_f		—	35	—	ns
Turn-on Switching Energy	E_{on}		—	1.56	—	mJ
Turn-off Switching Energy	E_{off}		—	1.07	—	mJ
Total Switching Energy	E_{ts}		—	2.63	—	mJ

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BIDW75N65ES5 Insulated Gate Bipolar Transistor (IGBT)

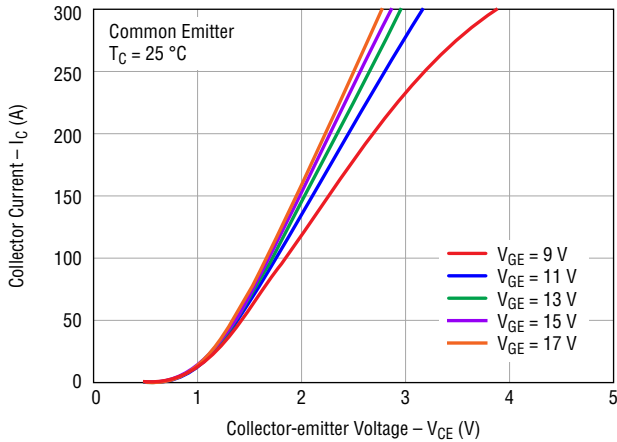
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Diode Switching Characteristics ($T_C = 25^\circ\text{C}$, unless otherwise specified)

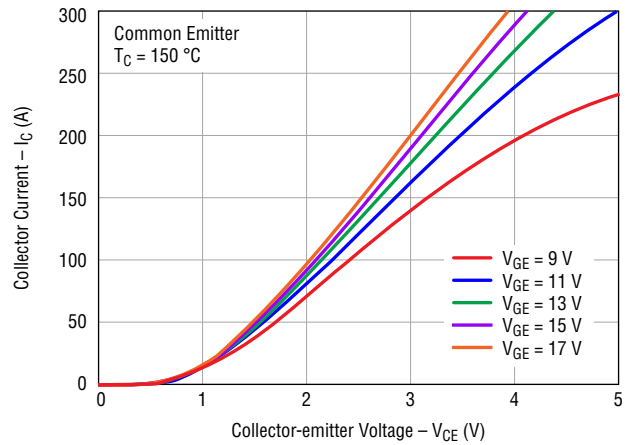
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	$di_F/dt = 200 \text{ A}/\mu\text{s}$, $I_F = 75 \text{ A}$	—	123	—	ns
Reverse Recovery Charge	Q_{rr}		—	0.4	—	μC

Electrical Characteristic Performance

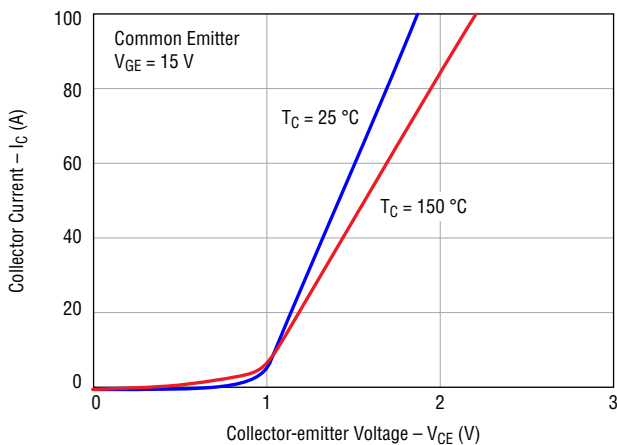
Typical Output Characteristics



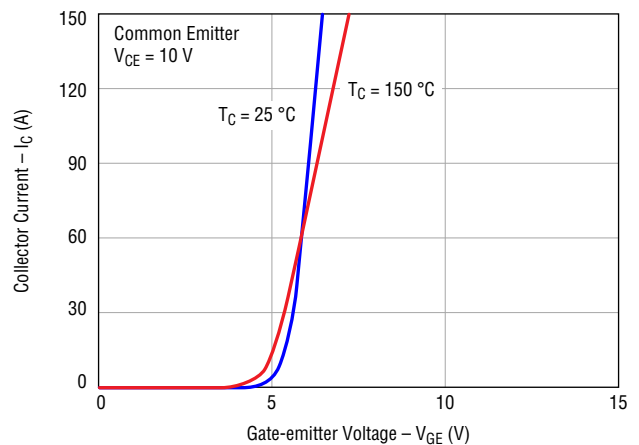
Typical Output Characteristics



Typical Saturation Voltage Characteristics



Typical Transfer Characteristics



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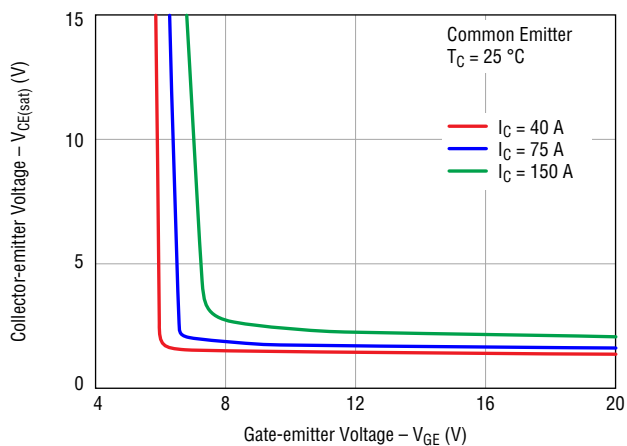
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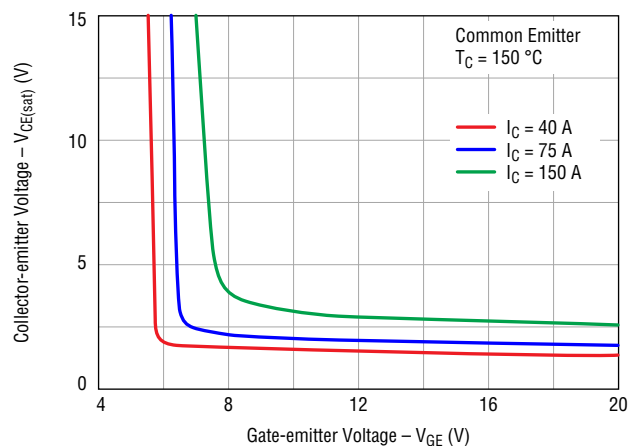
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Electrical Characteristic Performance (continued)

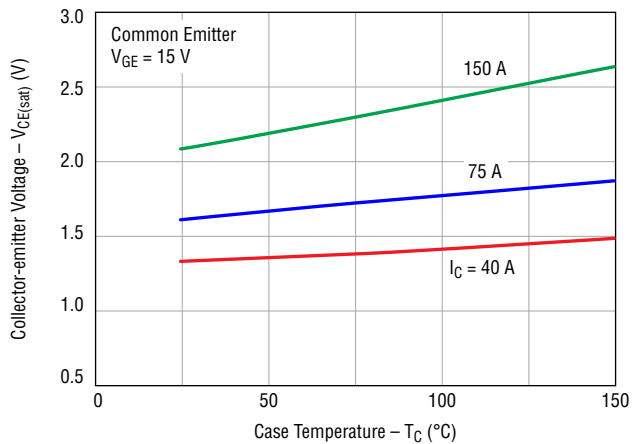
Typical Saturation Voltage Drop vs V_{GE}



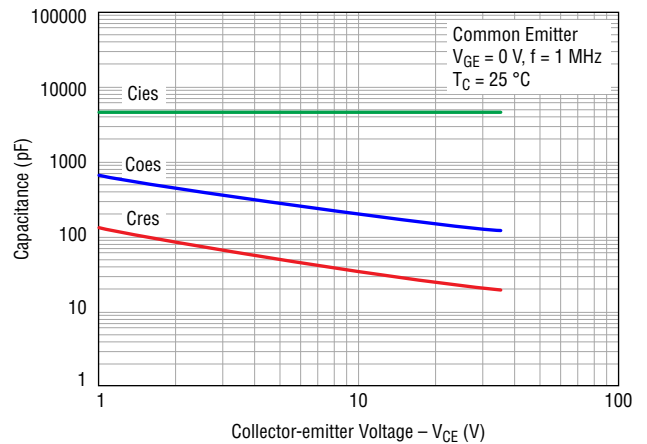
Typical Saturation Voltage Drop vs V_{GE}



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



Typical Capacitance Characteristics



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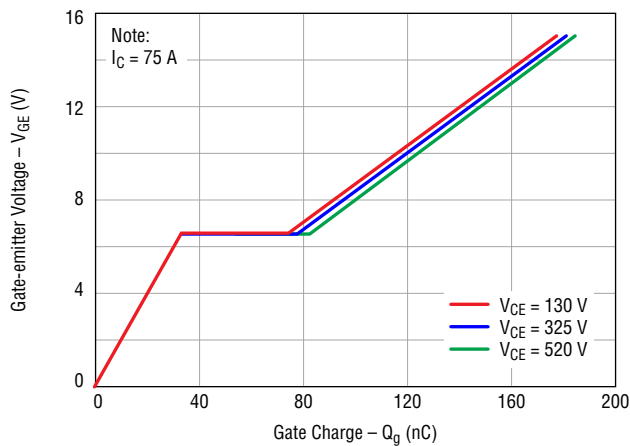
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BIDW75N65ES5 Insulated Gate Bipolar Transistor (IGBT)

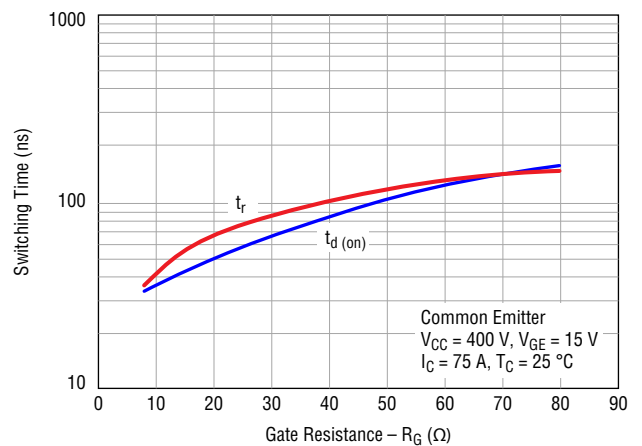
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Electrical Characteristic Performance (continued)

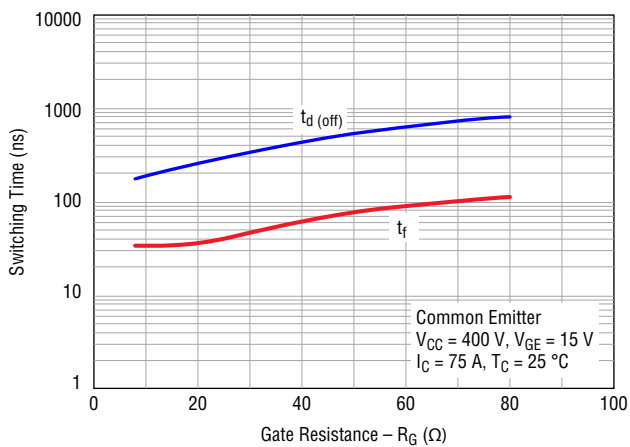
Typical Gate Charge Characteristics



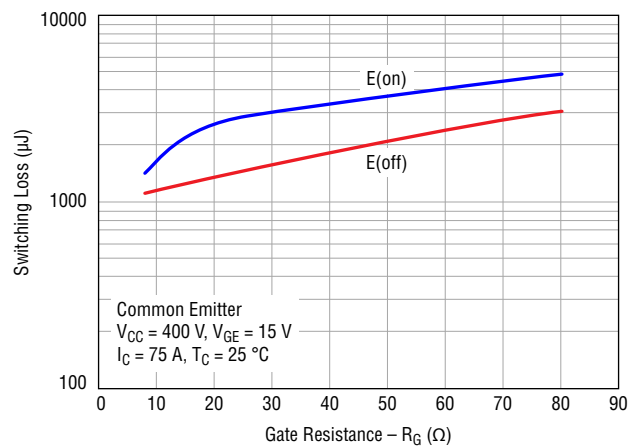
Typical Turn-on Characteristics vs Gate Resistance



Typical Turn-off Characteristics vs Gate Resistance



Typical Switching Loss vs Gate Resistance



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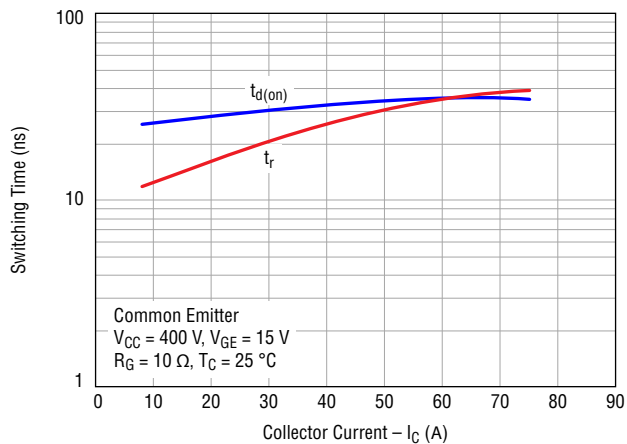
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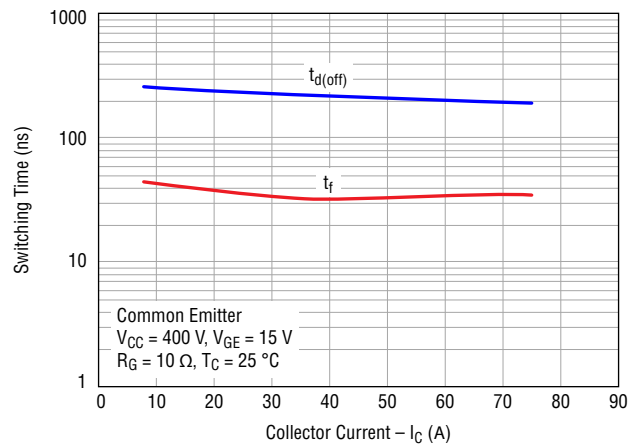
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Electrical Characteristic Performance (continued)

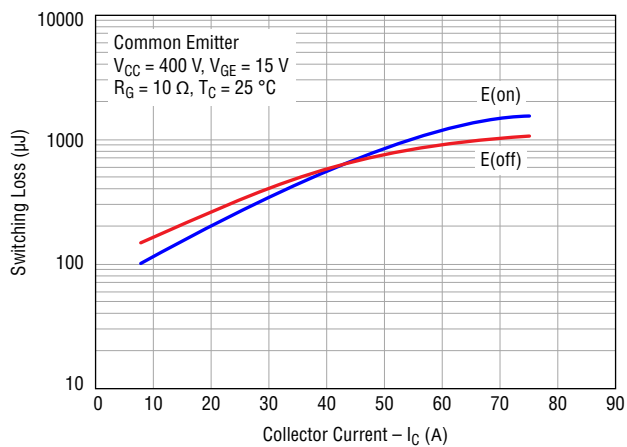
Typical Turn-on Characteristics vs Collector Current



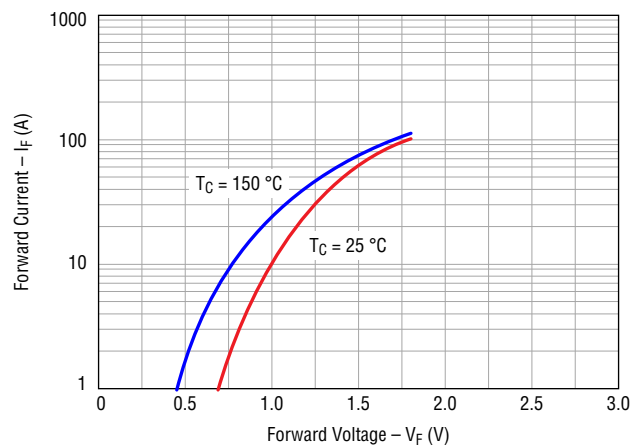
Typical Turn-off Characteristics vs Collector Current



Typical Switching Loss vs Collector Current



Typical Forward Characteristics



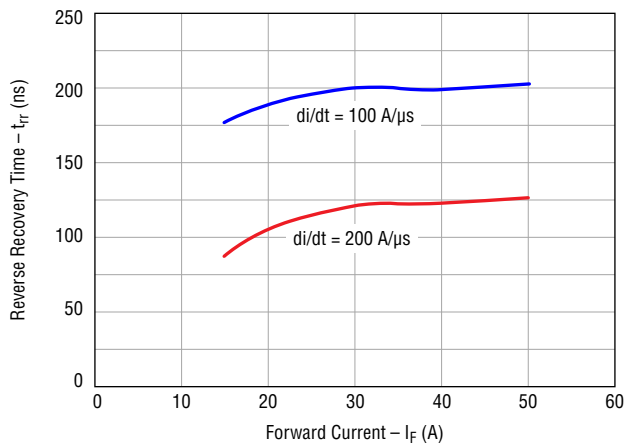
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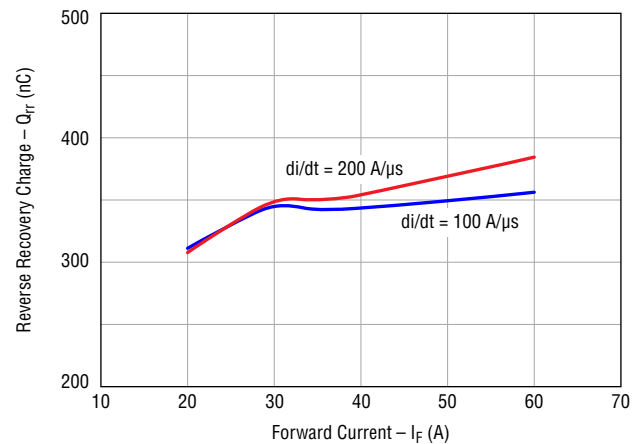
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Electrical Characteristic Performance (continued)

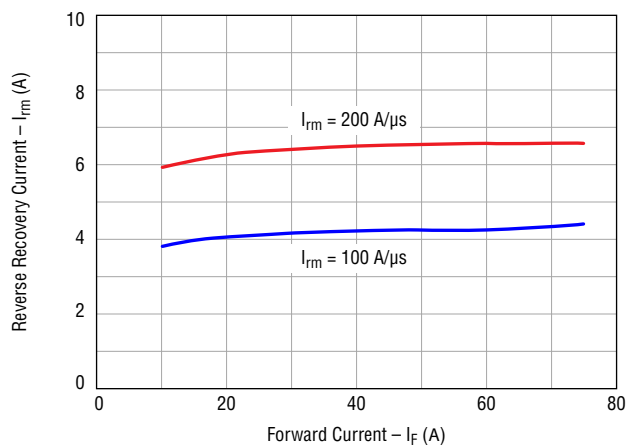
Typical Reverse Recovery Time vs Forward Current



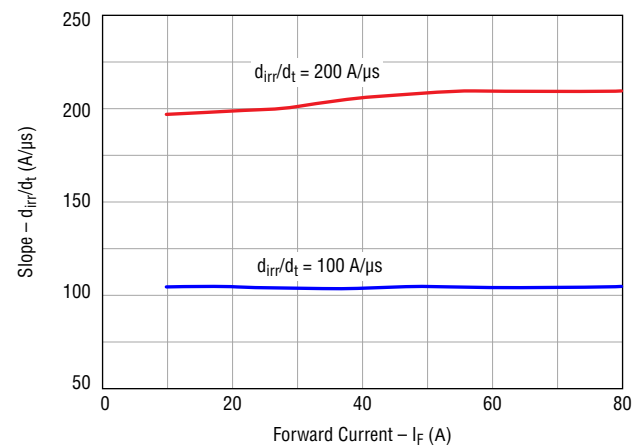
Typical Reverse Recovery Charge vs Forward Current



Typical Reverse Recovery Current vs Forward Current



Slope vs Forward Current

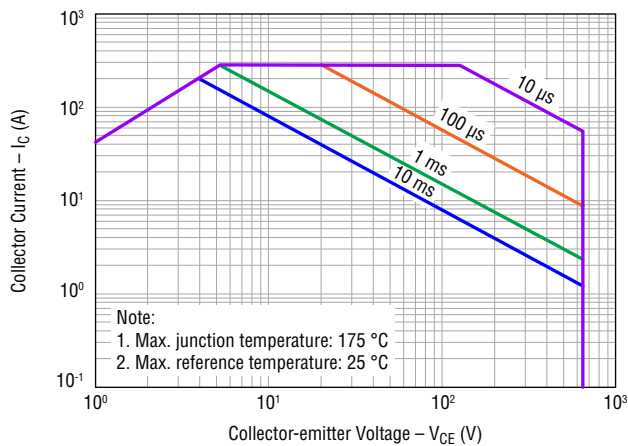


BIDW75N65ES5 Insulated Gate Bipolar Transistor (IGBT)

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Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area

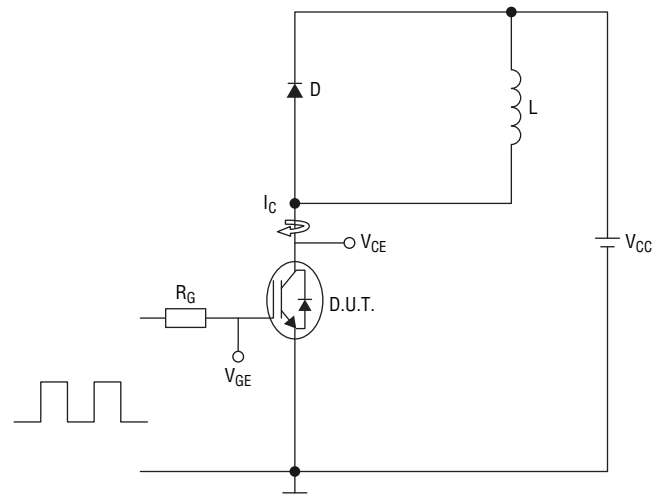


How to Order

B I D W 75 N 65 E S 5

B = Bourns®
I = IGBT
Type
D = Discrete
Package Code
W = TO-247-3L
Current Rating
75 = 75 A
Device Type
N = N-channel
Nominal Voltage (divided by 10)
65 = 650 V
Optimization
ES = Efficient Medium Speed
Version Number

Inductive Load Test Circuit



$L = 100 \mu\text{H}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = 15 \text{ V}$, $I_C = 75 \text{ A}$, $R_G = 10 \Omega$

Environmental Characteristics

ESD Class (HBM).....2

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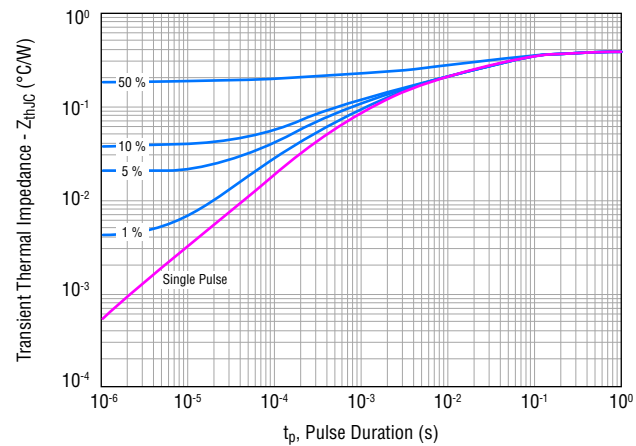
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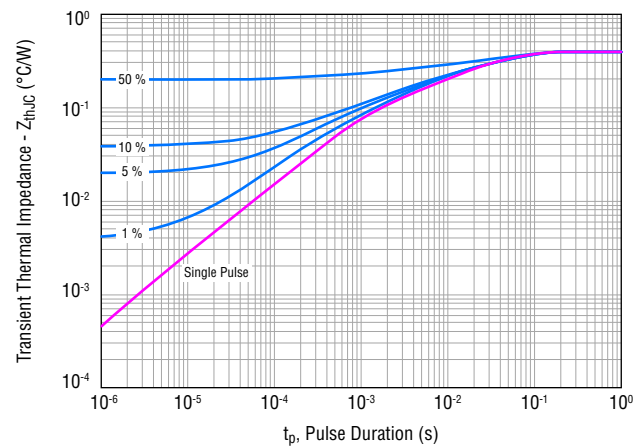
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Electrical Characteristic Performance (continued)

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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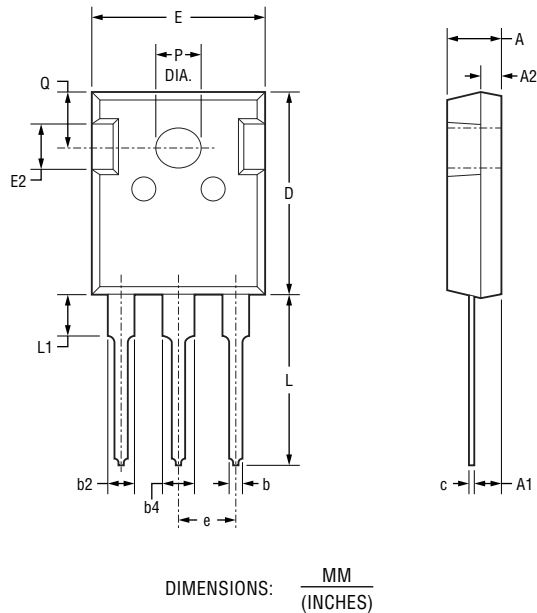
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BIDW75N65ES5 Insulated Gate Bipolar Transistor (IGBT)

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Product Dimensions



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

BIDW75N65ES5..... 30 pieces per tube

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