JHB15N60EE2/JHG15N60EE2/ JHP15N60EE2

Product Preview

600V 15A FIELD-STOP TRENCH IGBT WITH DIODE

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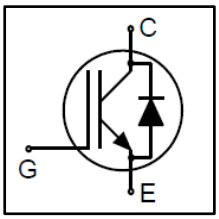
Features

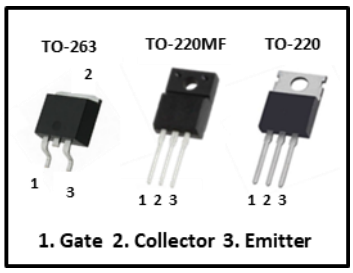
- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated

Applications

- Motor Control
- Servo
- Home Appliances
- General Purpose Inverters

Product Summary	
V_{CES}	600V
I_C	15A(1)
$V_{CE(sat),typ.}$	1.7V (T_J = 25°C)
Package	JHB15N60EE2: TO-263 JHG15N60EE2: TO-220MF JHP15N60EE2: TO-220





Ordering Information

Part Number	Marking	Package	Packing
JHB15N60EE2	HB15N60EE2	TO-263	Tube
JHB15N60EE2_R	HB15N60EE2	TO-263	Tape and reel
JHG15N60EE2	HG15N60EE2	TO-220MF	Tube
JHP15N60EE2	HP15N60EE2	TO-220	Tube

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Absolute Maximum Ratings

Parameter		Symbol	Limit	Unit
Collector-to-Emitter Voltage		V_{CES}	600	V
Gate-to-Emitter Voltage		V_{GES}	±20	
DC Collector Current (T_c = 90°C, limited by max T_J)	TO-263, TO-220	I_C	15	A
	TO-220MF		10	
Pulsed Collector Current (pulse width limited by max T_J)		I_{CM}	50	
Diode Forward Current (T_c = 90°C, limited by max T_J)	TO-263, TO-220	I_F	23.5	
	TO-220MF		15.5	
Diode Pulsed Current (pulse width limited by max T_J)		I_{FM}	60	
Maximum Power Dissipation (T_c = 25°C, T_J = 150°C)	TO-263, TO-220	$P_{D(max)}$	83	W
	TO-220MF		42	
Operating Junction Temperature		T_J	-40 to +150	°C
Storage Temperature		T_{stg}	-40 to +150	

Static Electrical Characteristics (2)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Unit
Collector-to-Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0V, I_C = 250μA	600	-	-	V
Collector-to-Emitter Leakage Current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V	-	-	10	μA
		V_{CE} = 600V, V_{GE} = 0V T_J = 150°C	-	-	250	
Gate-to-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V	-	-	100	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250μA	5.2	6.2	7.2	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 15A	-	1.7	2.0	V
		V_{GE} = 15V, I_C = 15A, T_J =150°C	-	2.1	-	
Diode Forward Voltage	V_F	V_{GE} = 0V, I_F = 15A	-	1.6	2.2	V
		V_{GE} = 0V, I_F = 15A T_J =150°C	-	1.4	-	

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Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Junction-to-Ambient Thermal Resistance (TO-263, TO-220)	$R_{\theta JA}$	-	-	62	°C/W
Junction-to-Ambient Thermal Resistance (TO-220MF)		-	-	65	
Junction-to-Case Thermal Resistance (TO-263, TO-220), IGBT	$R_{\theta JC}$	-	-	1.5	
Junction-to-Case Thermal Resistance (TO-263, TO-220), Diode		-	-	1.4	
Junction-to-Case Thermal Resistance (TO-220MF), IGBT		-	-	2.95	
Junction-to-Case Thermal Resistance (TO-220MF), Diode		-	-	2.4	

Dynamic Electrical Characteristics (2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Total Gate Charge	Q_g	V_{CC} = 400V, V_{GE} = 15V, I_C = 15A	-	21	-	nC
Input Capacitance	C_{iss}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	570	-	pF
Output Capacitance	C_{oss}		-	56	-	
Reverse Transfer Capacitance	C_{rss}		-	12	-	

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Switching Characteristics, Inductive Load (2), (3)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(ON)}$	V_{CC} = 400V, V_{GE} = 0/15V, R_G = 10Ω, I_C = 15A, L_{load} = 0.82mH (Energy losses include "tail" and FRD reverse recovery)	-	17	-	ns
Rise Time	t_r		-	19	-	
Turn-off delay time	$t_{d(OFF)}$		-	59	-	
Fall Time	t_f		-	92	-	
Turn-On Switching Loss	E_{on}		-	0.27	-	mJ
Turn-Off Switching Loss	E_{off}		-	0.25	-	
Total Switching Loss	E_{ts}		-	0.52	-	
Short Circuit Capability	t_{SC}	V_{GE} = 15V, V_{CC} ≤ 400V, V_P ≤ 600V	5	-	-	μs
Short Circuit Collector Current	$I_{C(SC)}$		-	65	-	A

(1) T_c = 90°C, T_J = 150°C.

(2) T_J = 25°C unless otherwise specified.

(3) t_r: from 10% of Ic to 90% of Ic; t_f: from 90% of Ic to 10% of Ic;

E_{on}: from 10% of V_{GE} to 10% of V_{CE}; E_{off}: from 90% of V_{GE} to 10% of Ic.

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Typical Electrical Characteristics

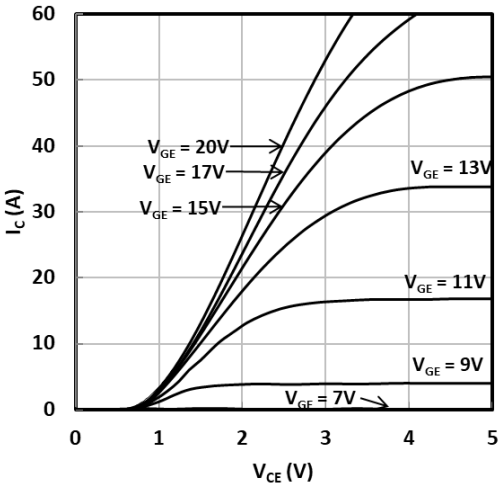

Fig. 1 Typical output characteristics

(T_J = 25 °C, t_p = 250 µs)

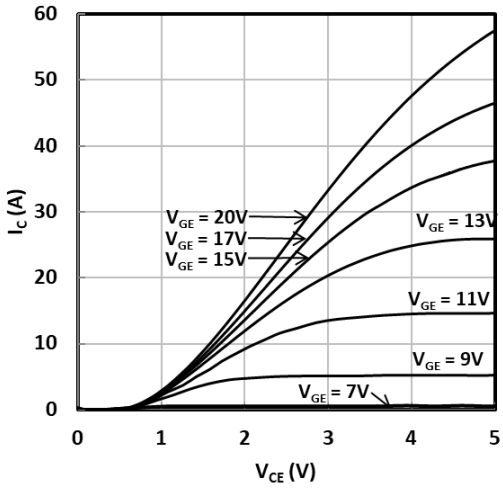

Fig. 2 Typical output characteristics

(T_J = 150 °C, t_p = 250 µs)

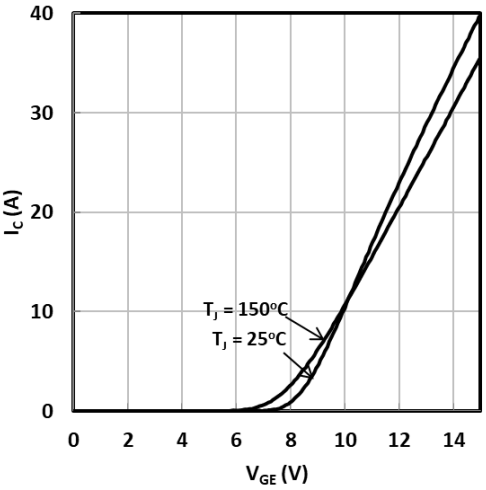

Fig. 3 Typical transfer characteristics

(V_{CE} = 20 V, t_p = 250 µs)

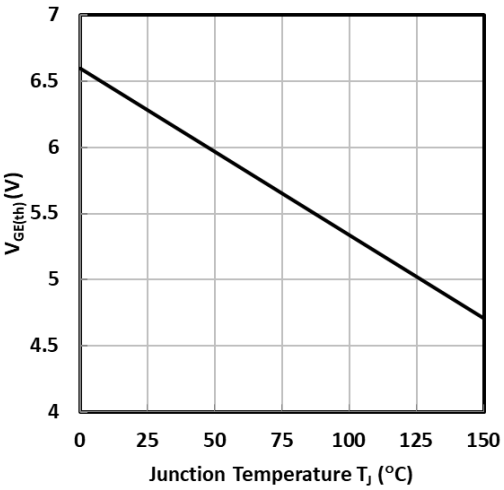

Fig. 4 Typical gate threshold voltage as a function of junction temperature

(V_{CE} = V_{GE} , I_C = 250 µA)

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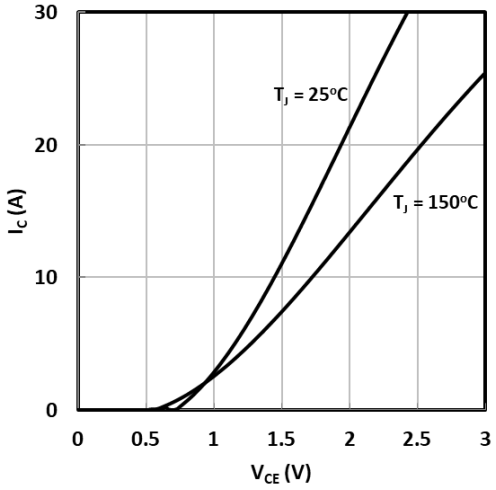

Fig. 5 Typical saturation voltage characteristics
(V_{GE} = 15 V, t_p = 250 µs)

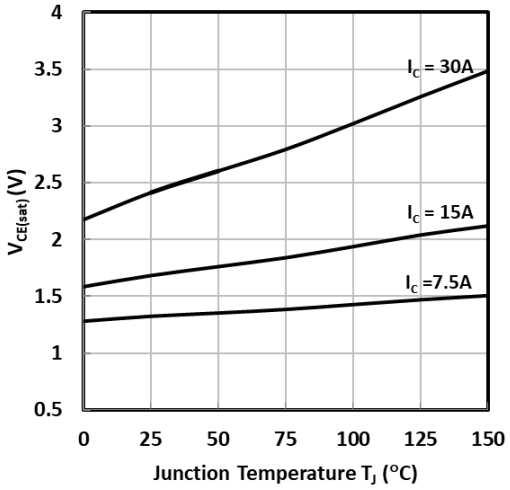

Fig. 6 Typical saturation voltage as a function of junction temperature
(V_{GE} = 15 V, t_p = 250 µs)

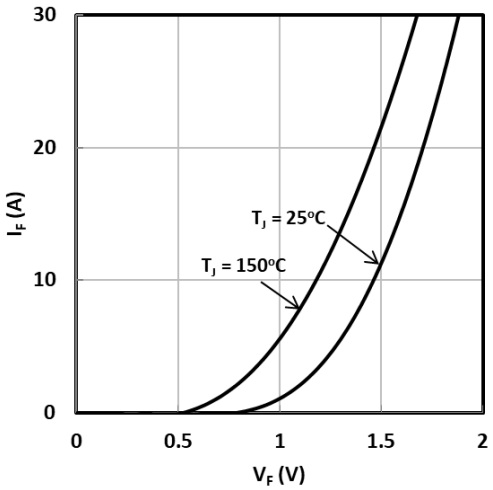

Fig. 7 Typical diode forward current as a function of forward voltage
(V_{GE} = 0 V, t_p = 250 µs)

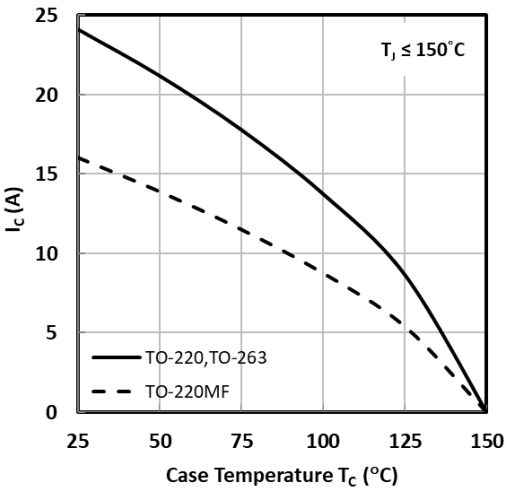

Fig. 8 Maximum DC collector current as a function of case temperature

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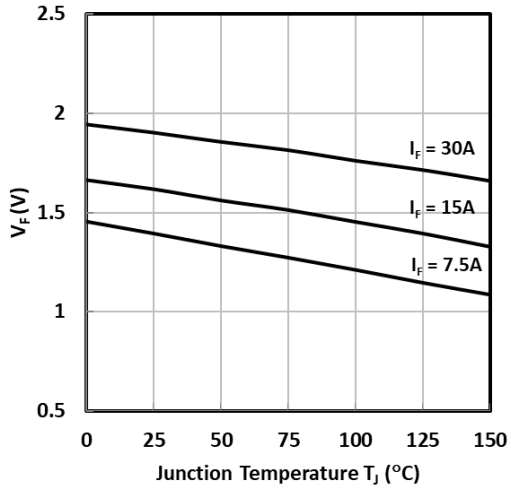

Fig. 9 Typical diode forward voltage as a function of junction temperature

(V_{GE} = 0 V, t_p = 250 µs)

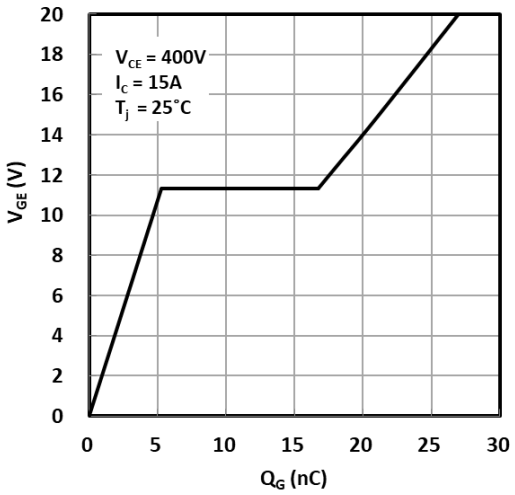

Fig. 10 Typical gate charge characteristics

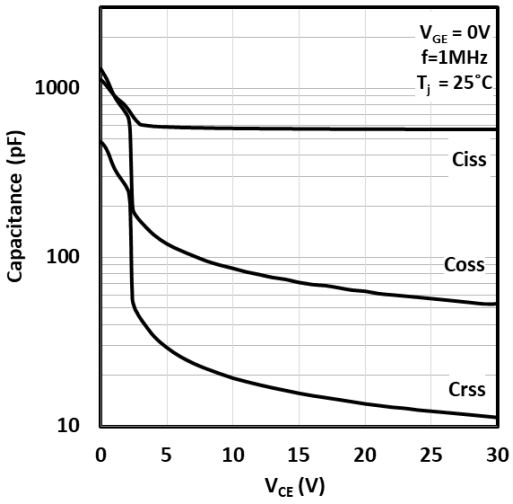

Fig. 11 Typical capacitance as a function of collector-to-emitter voltage

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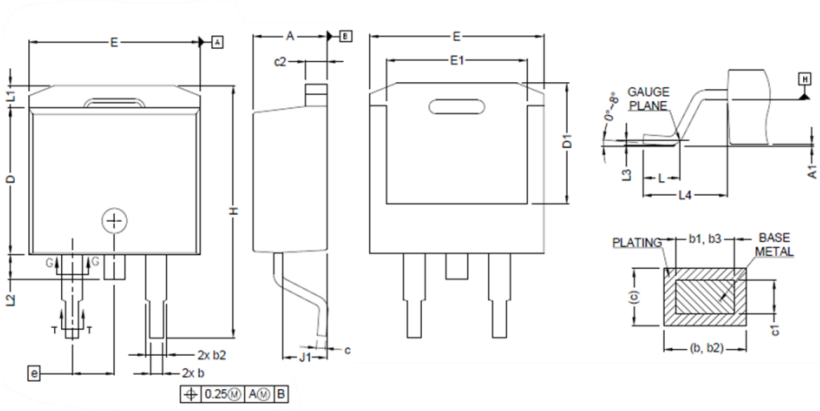
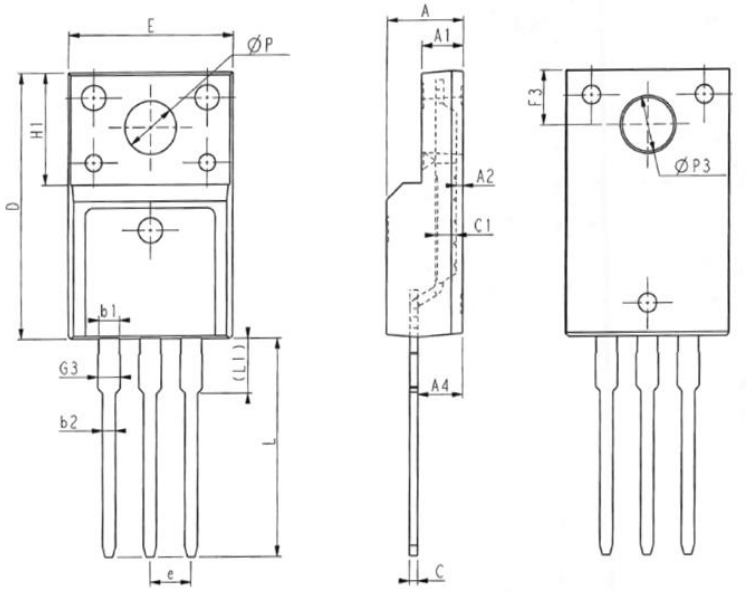
Package Drawing



SYMBOL	MIN.	MAX.
A	4.36	4.56
A1	0	0.25
b	0.70	0.90
b1	0.51	0.89
b2	1.20	1.46
b3	1.17	1.37
c	0.38	0.694
c1	0.38	0.534
c2	1.19	1.34
D	8.60	9.00
D1	6.9	7.5
E	10.15	10.55
E1	8.1	8.7
e	2.54 BSC	
H	15.0	15.6
L	1.9	2.5
L1	-	1.65
L2	-	1.78
L3	0.25 TYP	
L4	4.78	5.28
J1	2.56	2.96

TO-263



SYMBOL	MM		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
c1	1.20	1.30	1.35
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	3.03	3.23	3.43
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95

TO-220MF

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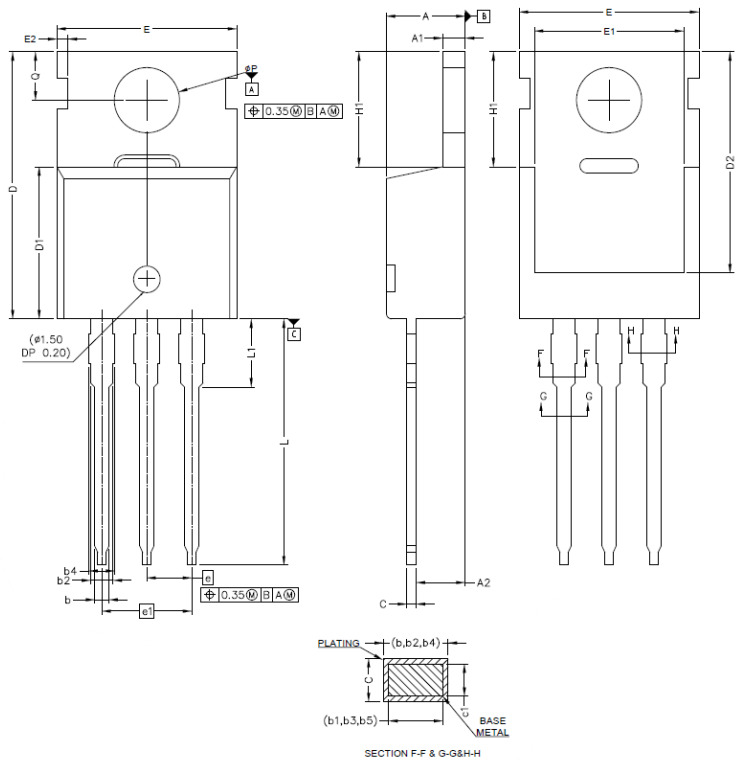

SYMBOL	MIN	MAX
A	4.25	4.65
A1	1.20	1.34
A2	2.56	2.92
b	0.71	0.97
b1	0.38	0.91
b2	1.14	1.78
b3	1.14	1.73
b4	1.14	1.78
b5	1.14	1.73
c	0.46	0.61
c1	0.36	0.56
D	14.32	15.86
D1	8.39	8.79
D2	12.20	12.80
E	9.96	10.36
E1	8.14	8.74
E2	0.59	0.69
e	2.54 BSC	
e1	5.08 BSC	
H1	6.30	6.70
L	13.40	14.40
L1	3.65	4.05
ØP	3.60	3.80
Q	2.54	2.94

TO-220

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Revision history of JHB15N60EE2/ JHG15N60EE2/ JHP15N60EE2 Specification

Version	Change Items	Effective Date
1.00	Initial Release.	22-Jun-20
1.01	Thermal specification updates.	24-Jun-20
1.02	Package updates.	07-Aug-20

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