JHB15N60FE/JHG15N60FE/ JHP15N60FE

Product Preview

600V 15A FIELD-STOP TRENCH IGBT WITH DIODE

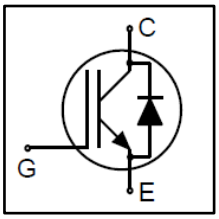
Features

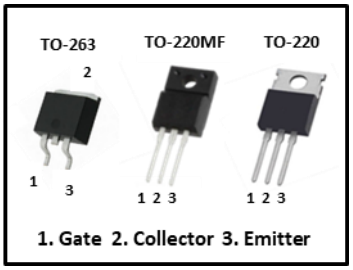
- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-circuit Rated

Product Summary	
V_{CES}	600V
I_C	15A
$V_{CE(sat),typ}$	1.5V (T_J = 25°C)
Package	JHB15N60FE: TO-263 JHG15N60FE: TO-220MF JHP15N60FE: TO-220

Applications

- Home Appliances
- Compressors / Air Conditioning
- Motor Control
- General Purpose Inverters





Ordering Information

Part Number	Marking	Package	Packing
JHB15N60FE	HB15N60FE	TO-263	Tube
JHB15N60FE_R	HB15N60FE	TO-263	Tape and reel
JHG15N60FE	HG15N60FE	TO-220MF	Tube
JHP15N60FE	HP15N60FE	TO-220	Tube

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	20.6	A
	TO-220MF		15.8	
Pulsed Collector Current (pulse width limited by max T_J)		I_{CM}	60	
Diode Forward Current (T_c = 90°C, limited by max T_J)	TO-263, TO-220	I_F	20[3]	
	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	$P_{D(max)}$	114	W
	TO-220MF		74	
Operating Junction Temperature		T_J	-40 to +150	°C
Storage Temperature		T_{stg}	-40 to +150	

Static Electrical Characteristics [1]

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 = 125°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	5.0	6.0	7.0	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 15A	-	1.5	1.9	V
		V_{GE} = 15V, I_C = 15A, T_J = 125°C	-	1.8	-	
Diode Forward Voltage	V_F	V_{GE} = 0V, I_F = 15A	-	1.6	2.1	V
		V_{GE} = 0V, I_F = 15A, T_J = 125°C	-	1.4	-	

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	$R_{\theta JC}$	-	-	1.1	
Junction-to-Case Thermal Resistance (TO-263, TO-220), Diode		-	-	1.4	
Junction-to-Case Thermal Resistance (TO-220MF), IGBT		-	-	1.7	
Junction-to-Case Thermal Resistance (TO-220MF), Diode		-	-	2.4	

Dynamic Electrical Characteristics (1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Total Gate Charge	Q_g	V_{CC} = 400V, V_{GE} = 15V, I_C = 15A	-	45	-	nC
Input Capacitance	C_{iss}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	930	-	pF
Output Capacitance	C_{oss}		-	85	-	
Reverse Transfer Capacitance	C_{rss}		-	16	-	

Switching Characteristics, Inductive Load (1), (2)

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} = 3mH (Energy losses include "tail" and diode reverse recovery)	-	24	-	ns
Rise Time	t_r		-	19	-	
Turn-off delay time	$t_{d(OFF)}$		-	89	-	
Fall Time	t_f		-	70	-	
Turn-On Switching Loss	E_{on}		-	0.28	-	mJ
Turn-Off Switching Loss	E_{off}		-	0.28	-	
Total Switching Loss	E_{ts}		-	0.56	-	
Diode Reverse Recovery Time	t_{rr}		-	46	-	ns
Short Circuit Capability	t_{SC}	V_{GE} = 15V, V_{CC} ≤ 400V, V_P ≤ 600V	5	10	-	μs
Short Circuit Collector Current	$I_{C(SC)}$		-	60	-	A

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

(2) 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.

(3) Limited by bonding wire(s).

Typical Electrical Characteristics

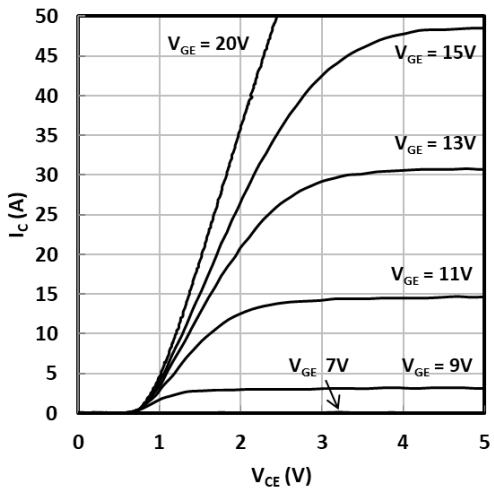


Fig. 1 Typical output characteristics

(T_J = 25 °C, t_p = 250 µs)

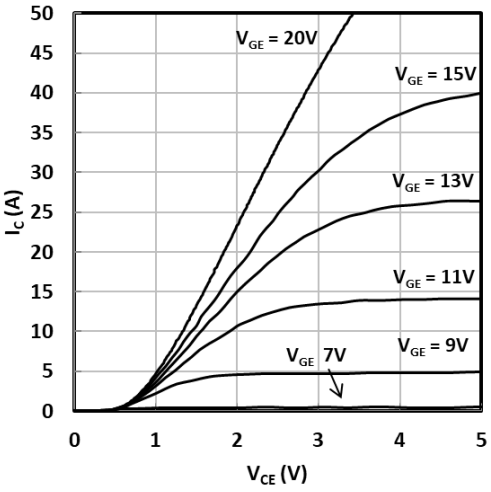


Fig. 2 Typical output characteristics

(T_J = 150 °C, t_p = 250 µs)

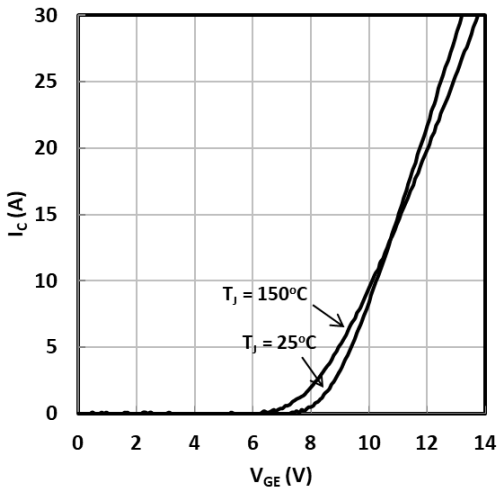


Fig. 3 Typical transfer characteristics

(V_{CE} = 20 V, t_p = 250 µs)

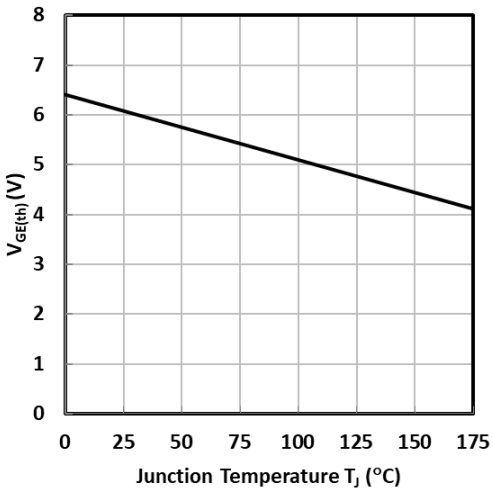


Fig. 4 Typical gate threshold voltage as a function of junction temperature

(V_{CE} = V_{GE} , I_C = 250 µA)

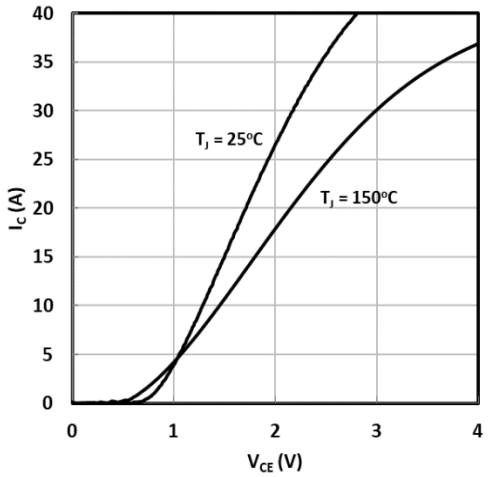


Fig. 5 Typical saturation voltage characteristics
(V_{GE} = 15 V, t_p = 250 µs)

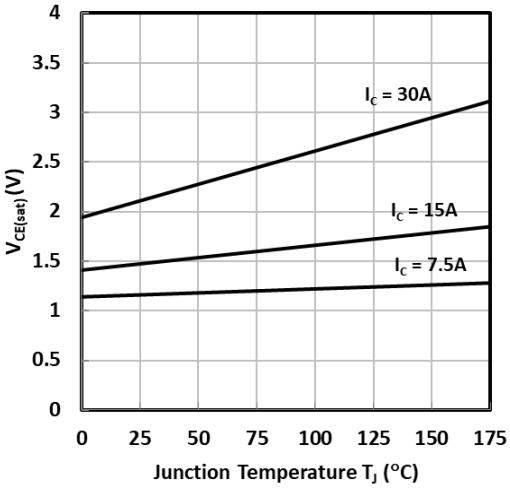


Fig. 6 Typical saturation voltage as a function of junction temperature
(V_{GE} = 15 V, t_p = 250 µs)

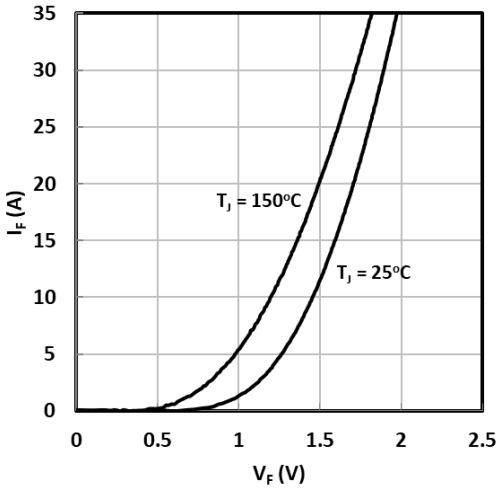


Fig. 7 Typical diode forward current as a function of forward voltage
(V_{GE} = 0 V, t_p = 250 µs)

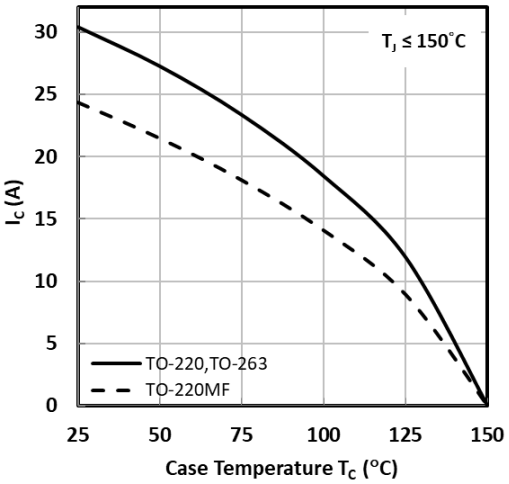


Fig. 8 Maximum DC collector current as a function of case temperature

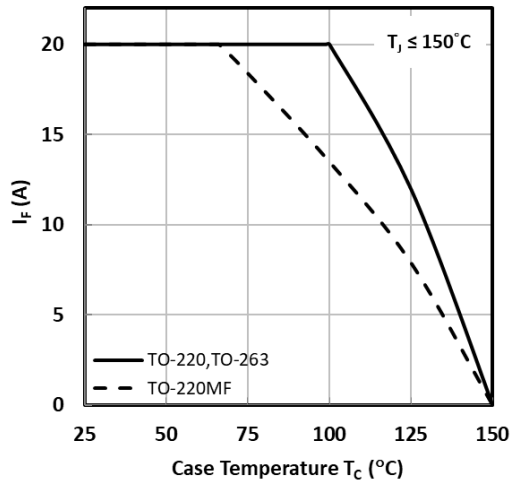


Fig. 9 Maximum DC diode forward current as a function of case temperature
(I_F limited by bonding wire)

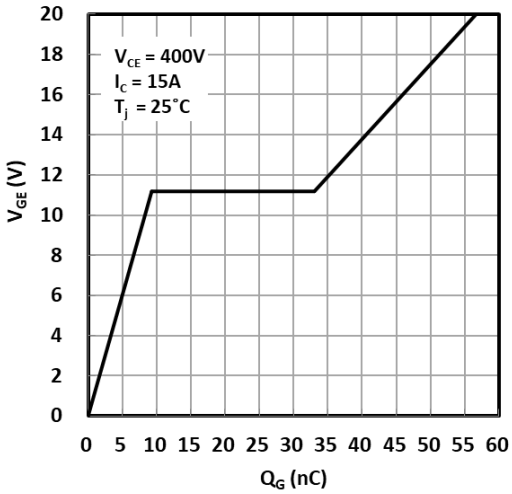


Fig. 10 Typical gate charge characteristics

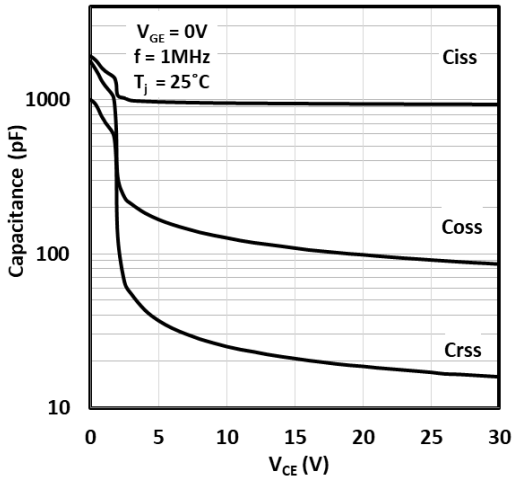
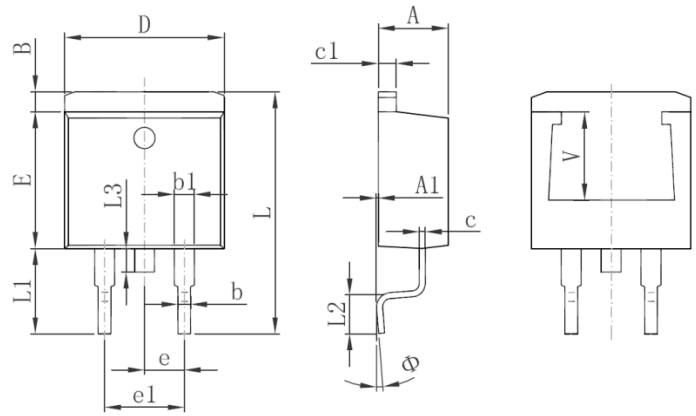


Fig. 11 Typical capacitance as a function of collector-to-emitter voltage

Package Drawing



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.470	4.670
A1	0.000	0.150
B	1.120	1.420
b	0.710	0.910
b1	1.170	1.370
c	0.310	0.530
c1	1.170	1.370
D	10.010	10.310
E	8.500	8.900
e	2.540 TYP.	
e1	4.980	5.180
L	14.940	15.500
L1	4.950	5.450
L2	2.340	2.740
L3	1.300	1.700
Φ	0°	8°
V	5.600 REF.	

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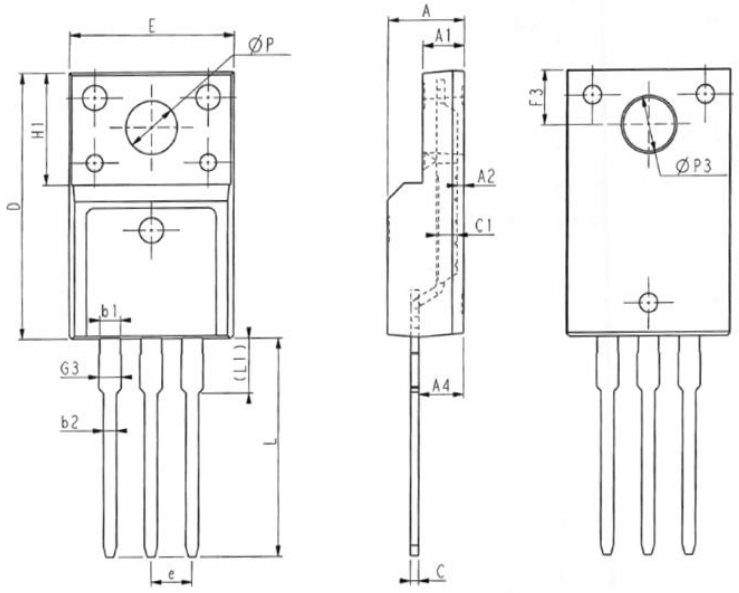
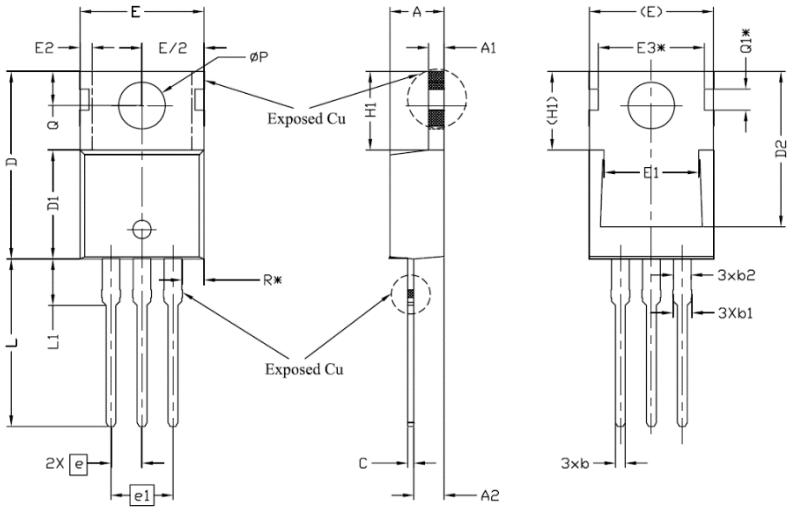


SYMBOL	MM		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
c1	1.20	1.30	1.35
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	3.03	3.23	3.43
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35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

TO-220MF



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	1.15	1.27	1.40
A2	2.30	2.48	2.70
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
D	14.70	15.37	16.00
D1	8.82	8.92	9.02
D2	12.63	12.73	12.83
E	9.96	10.16	10.36
E1	6.86	7.77	8.89
E2	-	-	0.76
E3*	8.70REF.		
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.45	6.60
L	13.47	13.72	13.97
L1	3.60	3.80	4.00
ØP	3.75	3.84	3.93
Q	2.60	2.80	3.00
Q1*	1.73REF.		
R*	1.82REF.		

TO-220

Revision history of JHB15N60FE/JHG15N60FE/JHP15N60FE Specification

Version	Change Items	Effective Date
1.00	Initial Release.	23-Jul-20

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