

JHB30N60EE2/JHG30N60EE2/ JHH30N60EE2/JHP30N60EE2

Product Preview

600V 30A FIELD-STOP TRENCH IGBT WITH DIODE

Features

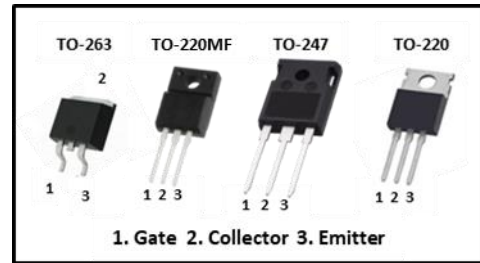
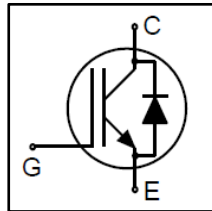
- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated



Product Summary	
V_{CES}	600V
I_C	30A
$V_{CE(sat),typ.}$	1.6V ($T_J = 25^\circ C$)
Package	JHB30N60EE2: TO-263 JHG30N60EE2: TO-220MF JHH30N60EE2: TO-247 JHP30N60EE2: TO-220

Applications

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



Ordering Information

Part Number	Marking	Package	Packing
JHB30N60EE2	HB30N60EE2	TO-263	Tube
JHB30N60EE2_R	HB30N60EE2	TO-263	Tape and reel
JHG30N60EE2	HG30N60EE2	TO-220MF	Tube
JHH30N60EE2	HH30N60EE2	TO-247	Tube
JHP30N60EE2	HP30N60EE2	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 ($T_c = 90^\circ\text{C}$, limited by max T_j)	TO-263, TO-247, TO-220	I_C	30	A
	TO-220MF		21.5	
Pulsed Collector Current (pulse width limited by max T_j)		I_{CM}	120	
Diode Forward Current ($T_c = 90^\circ\text{C}$, limited by max T_j)	TO-263, TO-247, TO-220	I_F	23.5	
	TO-220MF		15.5	
Diode Pulsed Current (pulse width limited by max T_j)		I_{FM}	90	
Maximum Power Dissipation ($T_c = 25^\circ\text{C}$, $T_j = 150^\circ\text{C}$)	TO-263, TO-247, TO-220	$P_{D(max)}$	147	W
	TO-220MF		89	
Operating Junction Temperature		T_j	-40 to +150	$^\circ\text{C}$
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}	$V_{GE} = 0V, I_C = 250\mu\text{A}$	600	-	-	V
Collector-to-Emitter Leakage Current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V$	-	-	10	μA
		$V_{CE} = 600V, V_{GE} = 0V$ $T_j = 150^\circ\text{C}$	-	-	250	
Gate-to-Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\mu\text{A}$	5.0	6.0	7.0	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 30A$	-	1.6	1.9	V
		$V_{GE} = 15V, I_C = 30A,$ $T_j = 150^\circ\text{C}$	-	2.0	-	
Diode Forward Voltage	V_F	$V_{GE} = 0V, I_F = 30A$	-	1.9	2.5	V
		$V_{GE} = 0V, I_F = 30A$ $T_j = 150^\circ\text{C}$	-	1.65	-	

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-Ambient Thermal Resistance (TO-247)		-	-	40	
Junction-to-Case Thermal Resistance (TO-263, TO-247, TO-220), IGBT	$R_{\theta JC}$	-	-	0.85	
Junction-to-Case Thermal Resistance (TO-263, TO-247, TO-220), Diode		-	-	1.4	
Junction-to-Case Thermal Resistance (TO-220MF), IGBT		-	-	1.4	
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	$V_{CC} = 400V,$ $V_{GE} = 15V,$ $I_C = 30A$	-	61	-	nC
Input Capacitance	C_{iss}	$V_{CE} = 25V,$ $V_{GE} = 0V,$ $f = 1MHz$	-	1458	-	pF
Output Capacitance	C_{oss}		-	98	-	
Reverse Transfer Capacitance	C_{rss}		-	30	-	

Switching Characteristics, Inductive Load ^{(1), (2)}

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(ON)}$	$V_{CC} = 400V,$ $V_{GE} = 0/15V,$ $R_G = 10\Omega,$ $I_C = 30A,$ $L_{load} = 0.82mH$	-	27	-	ns
Rise Time	t_r		-	38	-	
Turn-off delay time	$t_{d(OFF)}$		-	88	-	
Fall Time	t_f		-	75	-	
Turn-On Switching Loss	E_{on}	(Energy losses include "tail" and FRD reverse recovery)	-	0.65	-	mJ
Turn-Off Switching Loss	E_{off}		-	0.55	-	
Total Switching Loss	E_{ts}		-	1.2	-	
Short Circuit Capability	t_{SC}	$V_{GE} = 15V,$ $V_{CC} \leq 400V,$ $V_p \leq 600V$	5	-	-	μs
Short Circuit Collector Current	$I_{C(SC)}$		-	130	-	A

(1) $T_j = 25^\circ C$ unless otherwise specified.

(2) t_r : from 10% of I_C to 90% of I_C ; t_f : from 90% of I_C to 10% of I_C ;

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

Typical Electrical Characteristics

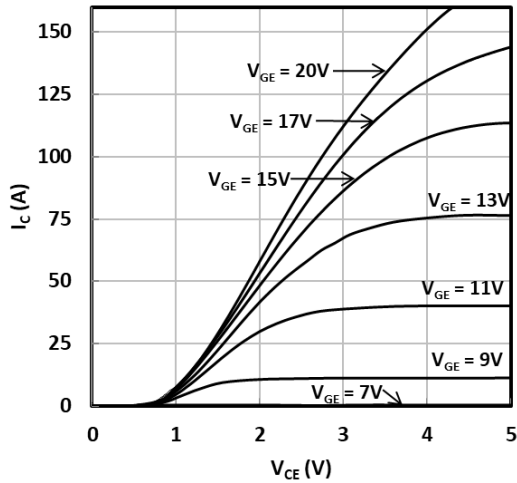


Fig. 1 Typical output characteristics

($T_j = 25\text{ }^\circ\text{C}$, $t_p = 250\text{ }\mu\text{s}$)

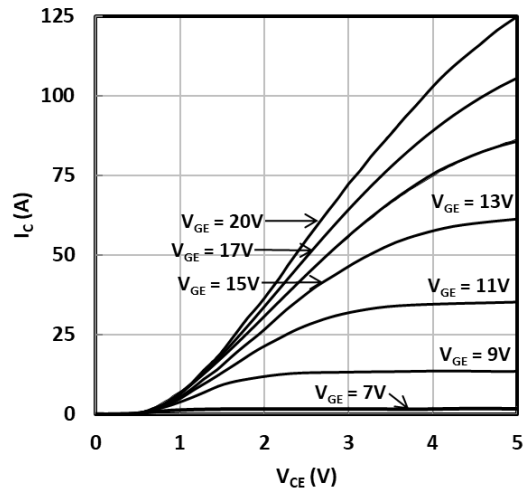


Fig. 2 Typical output characteristics

($T_j = 150\text{ }^\circ\text{C}$, $t_p = 250\text{ }\mu\text{s}$)

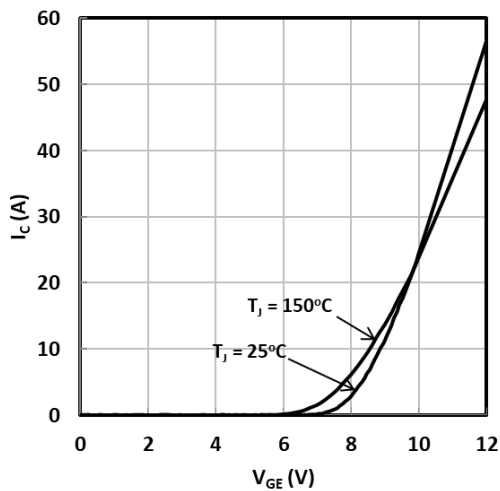


Fig. 3 Typical transfer characteristics

($V_{ce} = 10\text{ V}$, $t_p = 250\text{ }\mu\text{s}$)

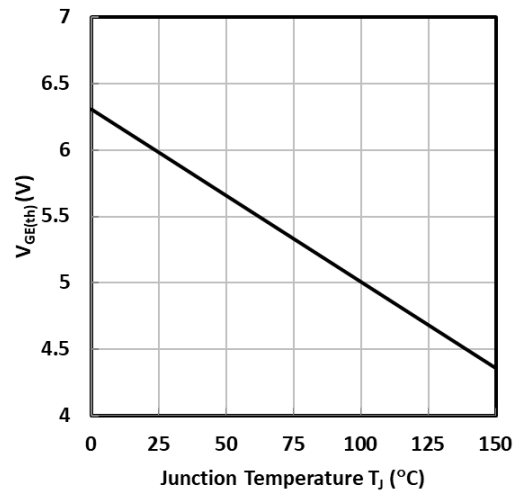


Fig. 4 Typical gate threshold voltage as a function of junction temperature

($V_{ce} = V_{ge}$, $I_c = 250\text{ }\mu\text{A}$)

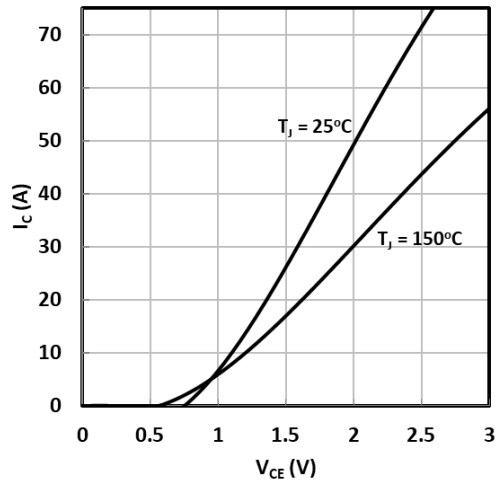


Fig. 5 Typical saturation voltage characteristics
($V_{GE} = 15\text{ V}$, $t_p = 250\ \mu\text{s}$)

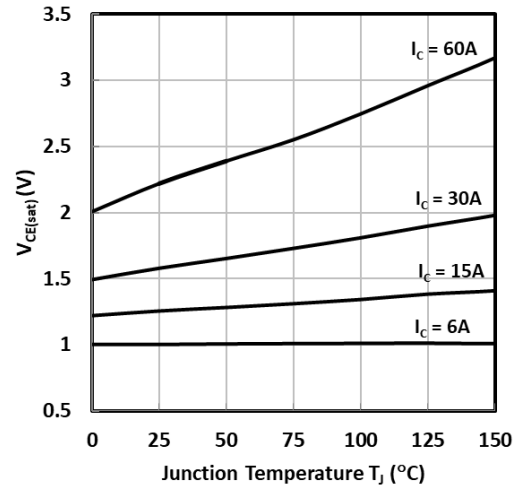


Fig. 6 Typical saturation voltage as a function of junction temperature
($V_{GE} = 15\text{ V}$, $t_p = 250\ \mu\text{s}$)

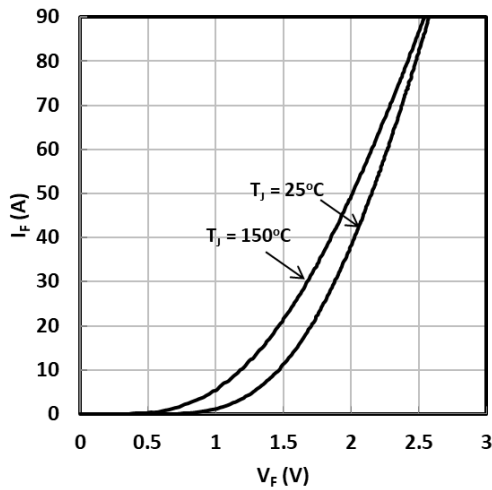


Fig. 7 Typical diode forward current as a function of forward voltage
($V_{GE} = 0\text{ V}$, $t_p = 250\ \mu\text{s}$)

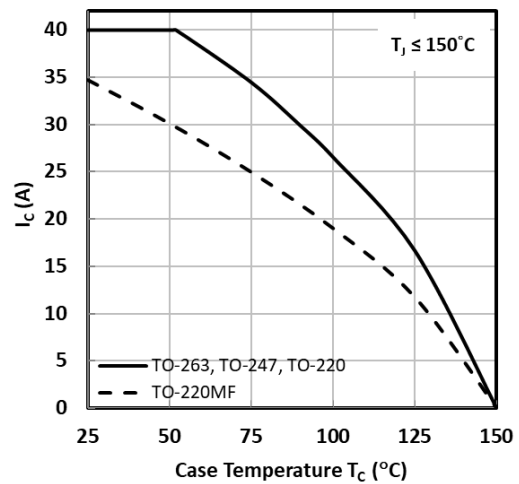


Fig. 8 Maximum DC collector current as a function of case temperature
(I_c limited by bonding wire)

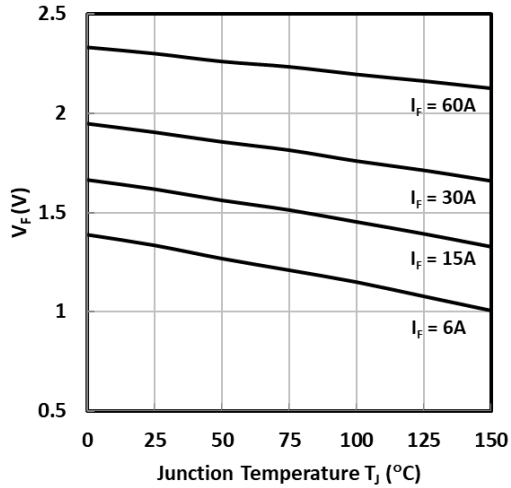


Fig. 9 Typical diode forward voltage as a function of junction temperature

($V_{GE} = 0V$, $t_p = 250 \mu s$)

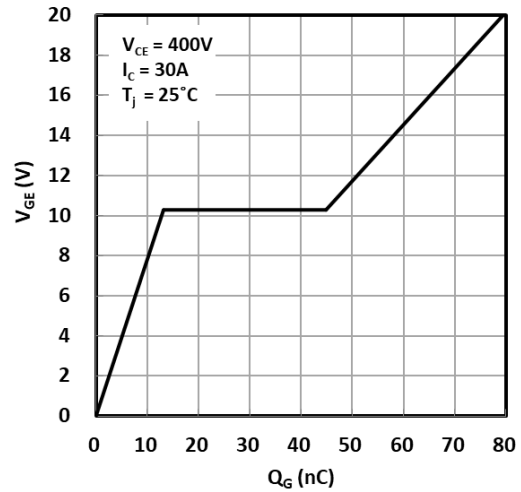


Fig. 10 Typical gate charge characteristics

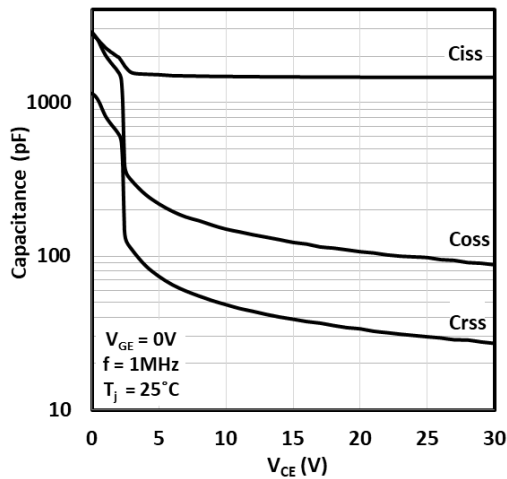
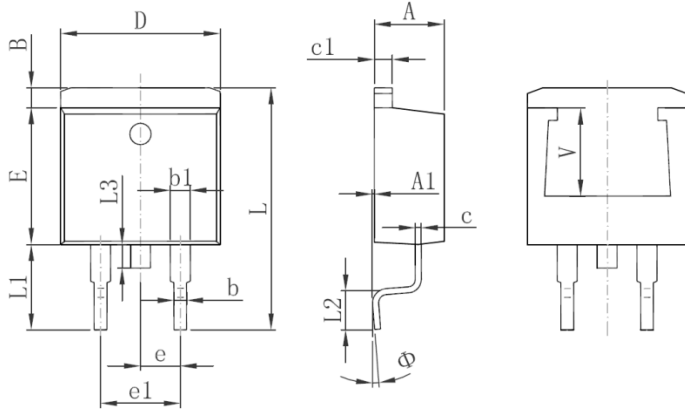


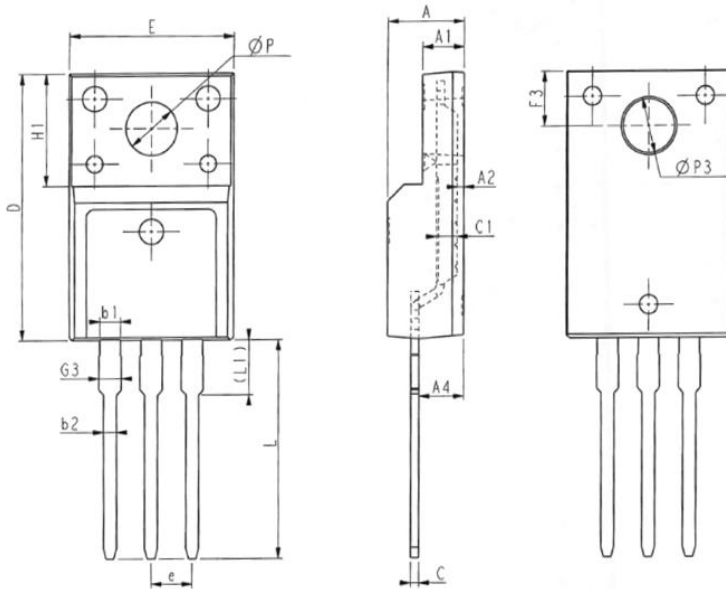
Fig. 11 Typical capacitance as a function of collector-to-emitter voltage

Package Drawing



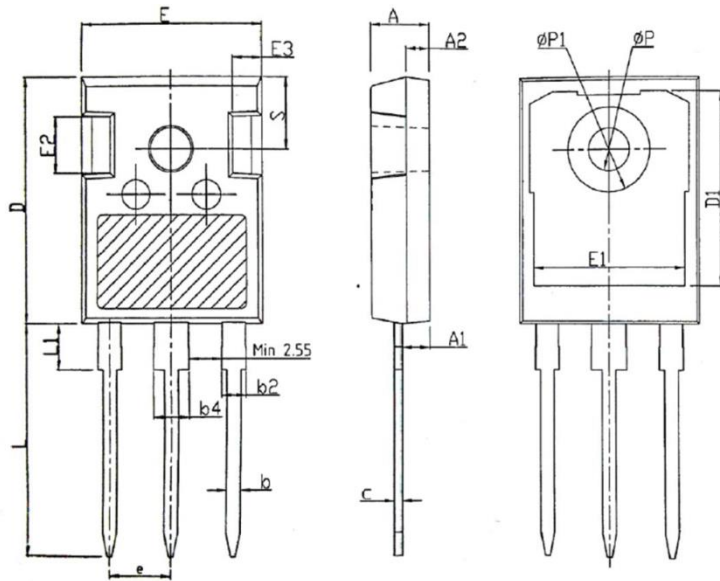
Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.470	4.670
A1	0.000	0.150
B	1.120	1.420
b	0.710	0.910
b1	1.170	1.370
c	0.310	0.530
c1	1.170	1.370
D	10.010	10.310
E	8.500	8.900
e	2.540 TYP.	
e1	4.980	5.180
L	14.940	15.500
L1	4.950	5.450
L2	2.340	2.740
L3	1.300	1.700
Φ	0°	8°
V	5.600 REF.	

TO-263



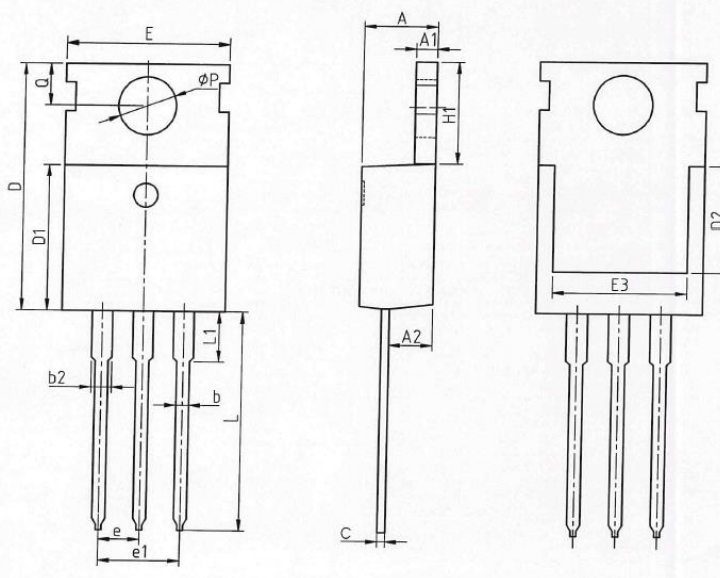
SYMBOL	MM		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
c1	1.20	1.30	1.35
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	3.03	3.23	3.43
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35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

TO-220MF



Symbol	Dimension (mm)		
	Min.	Typ.	Max.
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.80	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

TO-247



Symbol	Dimension (mm)		
	Min.	Typ.	Max.
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54BSC		
e1	5.08BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

TO-220

Revision history of JHB30N60EE2/JHG30N60EE2/JHH30N60EE2/JHP30N60EE2 Specification

Version	Change Items	Effective Date
1.00	Initial Release.	22-Jun-20
1.01	Thermal specification and package updates.	24-Jun-20

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