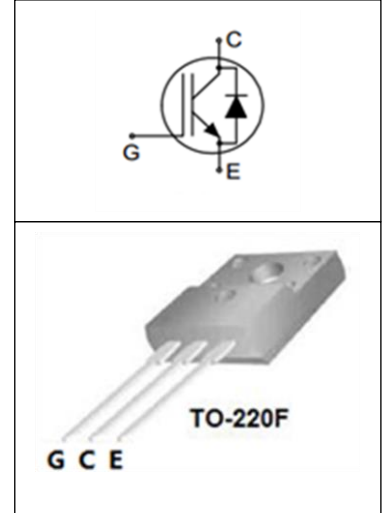


IGBT

Features

- 600V,15A
- $V_{CE(sat)(typ.)}=2.1V@V_{GE}=15V,I_C=15A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA



General Description

JIAEN trench IGBTs offer lower losses and higher energy efficiency for application such as general inverter and other soft switching applications.

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Continuous Collector Current ($T_C=25^\circ C$)	30	A
	Continuous Collector Current ($T_C=100^\circ C$)	15	A
I_{CM}	Pulsed Collector Current (Note 1)	30	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ C$)	15	A
I_{FM}	Diode Maximum Forward Current (Note 1)	30	A
t_{sc}	Short Circuit Withstand Time	15	us
P_D	Maximum Power Dissipation ($T_C=25^\circ C$)	28.4	W
	Maximum Power Dissipation ($T_C=100^\circ C$)	11.4	W
T_J	Operating Junction Temperature Range	-55 ~150	$^\circ C$
T_{STG}	Storage Temperature Range	-55~150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case for IGBT	4.4	$^\circ C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	5.2	$^\circ C/W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ C/W$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	600	-	-	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=600V, V_{GE}=0V$	-	-	100	μA
I_{GES}	Gate Leakage Current, Forward	$V_{GE}=20V, V_{CE}=0V$	-	-	100	nA
	Gate Leakage Current, Reverse	$V_{GE}=-20V, V_{CE}=0V$	-	-	-100	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=250\mu A$	4.5	-	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=15A$	-	2.1	2.4	V
Q_g	Total Gate Charge	$V_{CC}=480V$ $V_{GE}=15V$ $I_C=15A$	-	31.9		nC
Q_{ge}	Gate-Emitter Charge		-	10.8		nC
Q_{gc}	Gate-Collector Charge		-	19.1		nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=15A$ $R_G=15\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	19	-	ns
t_r	Turn-on Rise Time		-	22	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	84	-	ns
t_f	Turn-off Fall Time		-	90	-	ns
E_{on}	Turn-on Switching Loss		-	0.40	-	mJ
E_{off}	Turn-off Switching Loss		-	0.32	-	mJ
E_{ts}	Total Switching Loss		-	0.72	-	mJ
C_{ies}	Input Capacitance	$V_{CE}=25V$	-	740	-	pF
C_{oes}	Output Capacitance	$V_{GE}=0V$	-	44	-	pF
C_{res}	Reverse Transfer Capacitance	$f=1\text{MHz}$	-	14	-	pF

Electrical Characteristics of Diode ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=15A$	-	1.45	2.2	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=400V$	-	74		ns
I_{rr}	Diode peak Reverse Recovery Current	$I_F=15A$	-	14		A
Q_{rr}	Diode Reverse Recovery Charge	$R_g=15\Omega$	-	547		nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Performance Characteristics

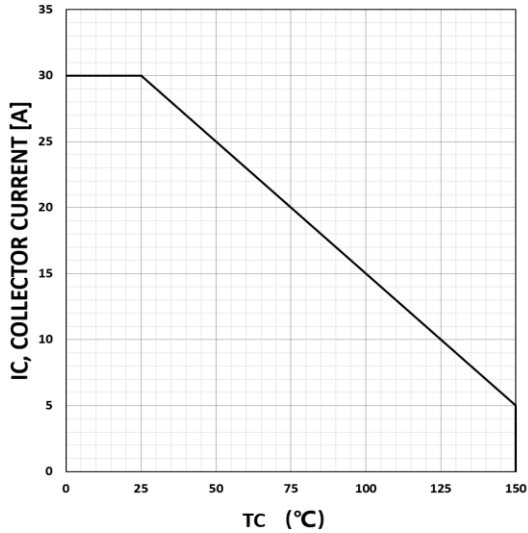


Figure 1. Maximum DC collector current VS. case temperature

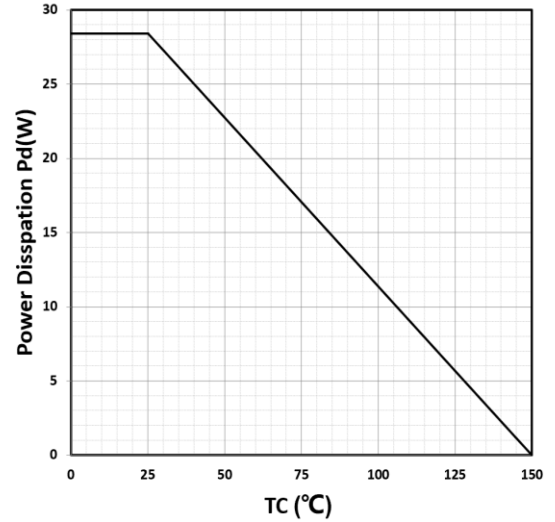


Figure 2. Power dissipation VS. case temperature

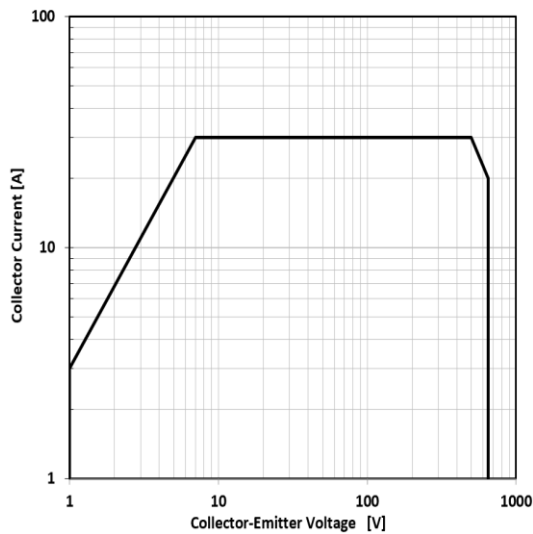


Figure 3. Reverse bias SOA, $T_j=125^{\circ}\text{C}$, $V_{ge}=15\text{V}$

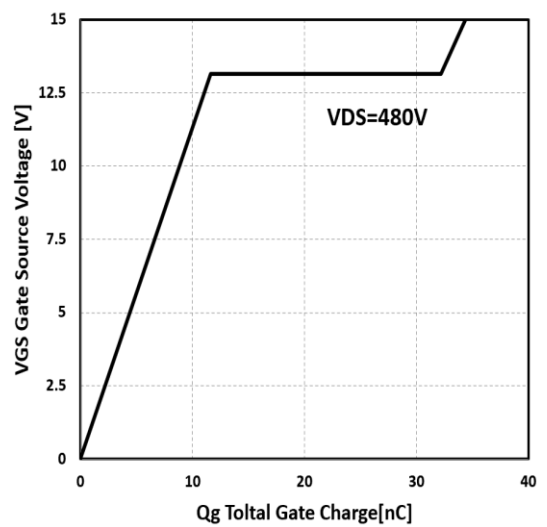


Figure 4. Typical gate charge VS. V_{GS} , $I_C=15\text{A}$

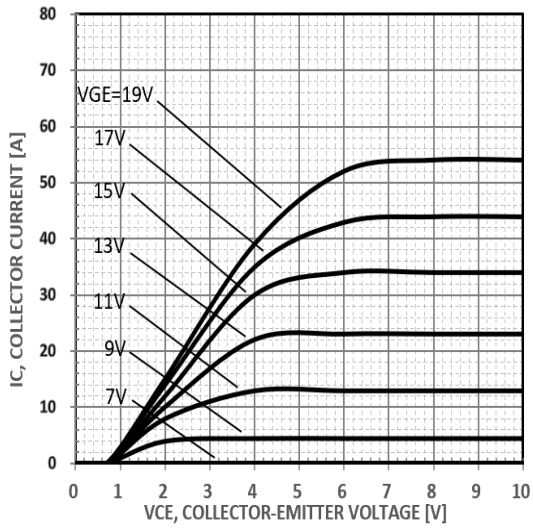


Figure 5. Typical output characteristics
 $t_p=300\mu s$ $T_c=25^\circ C$

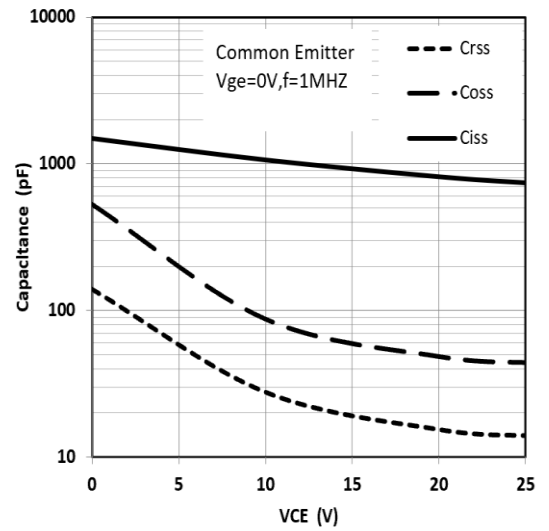


Figure 6. Typical capacitance VS. V_{CE} ,
 $V_{GE}=0V, f=1MHz$

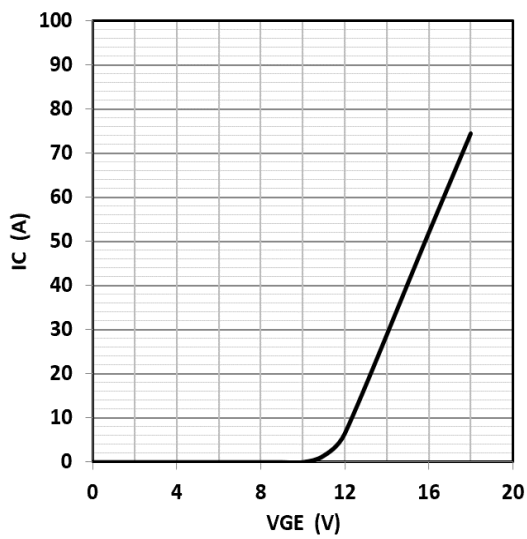


Figure 7. Typical gate threshold voltage

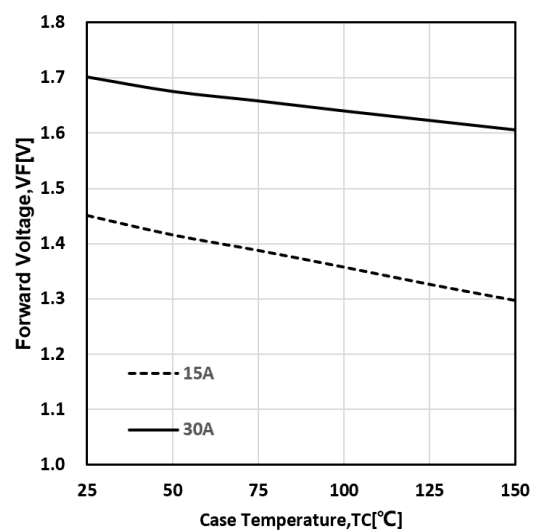


Figure 8. Typical forward voltage vs T_c

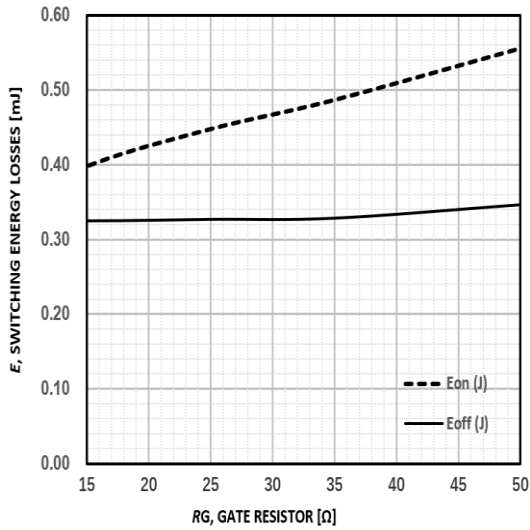


Figure 9. Typical energy loss VS. Rg, TC=25°C,
VCE=400V, VGE=15V, IC=15A

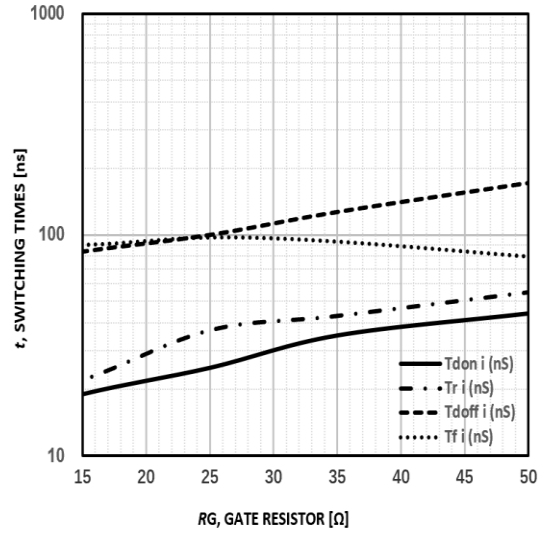


Figure 10. Typical switching time VS. Rg, TC=25°C,
VCE=400V, VGE=15V, IC=15A

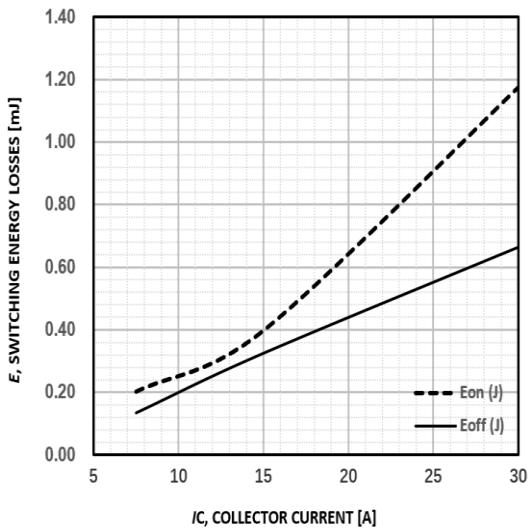


Figure 11. Typical energy loss VS. IC, TC=25°C,
VCE=400V, VGE=15V, RG=15Ω

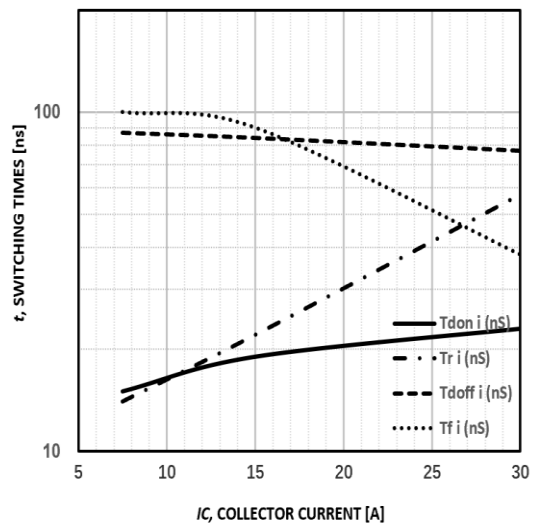


Figure 12. Typical switching time VS. IC, TC=25°C,
VCE=400V, VGE=15V, RG=15Ω

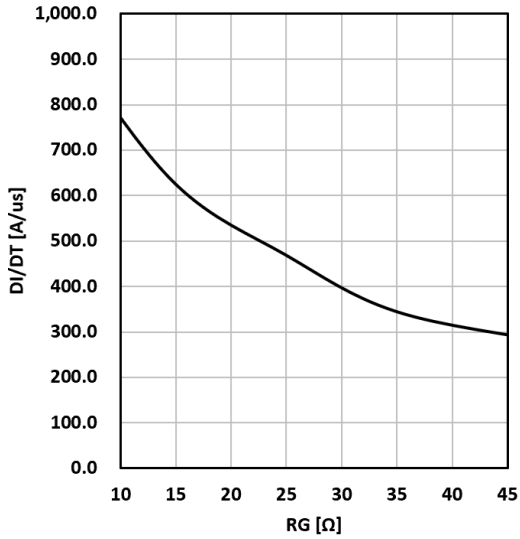


Figure 13. Typical diode di/dt vs rg Tc=25°C
VCE=400V VGE=15V IF=15A

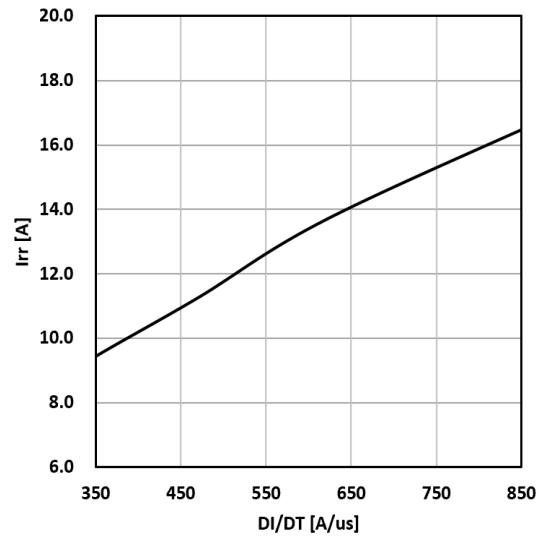


Figure 14. Typical diode irr vs di/dt Tc=25°C
VCE=400V VGE=15V IF=15A

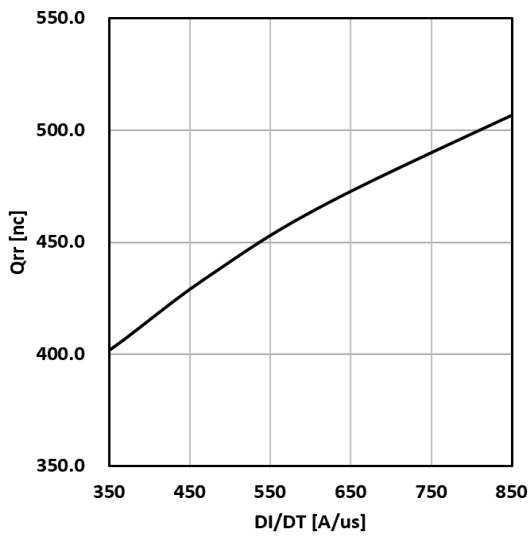


Figure 15. Typical diode Qrr vs di/dt Tc=25°C
VCE=400V VGE=15V IF=15A

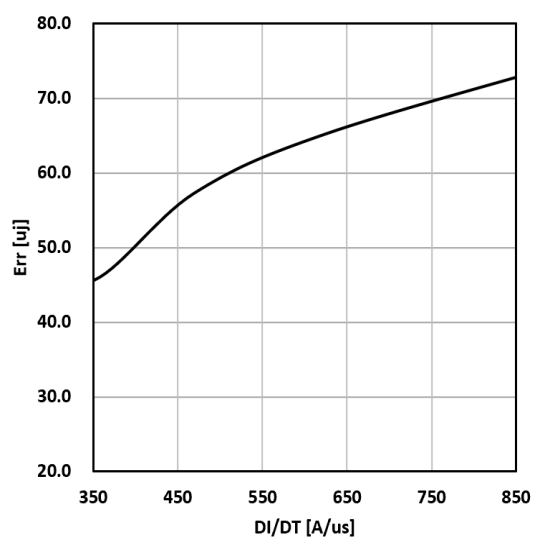


Figure 16. Typical diode Err vs di/dt Tc=25°C
VCC=400V VGE=15V IF=15A

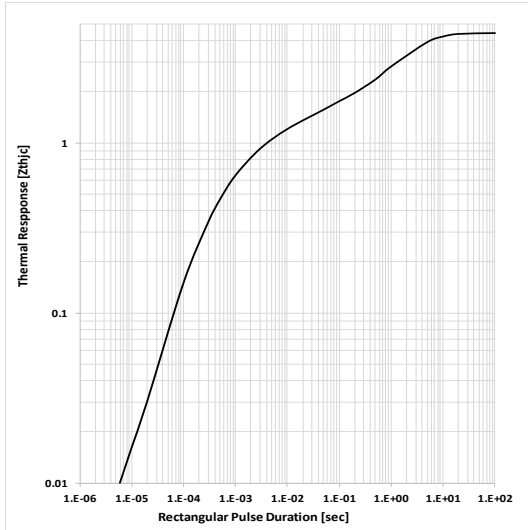
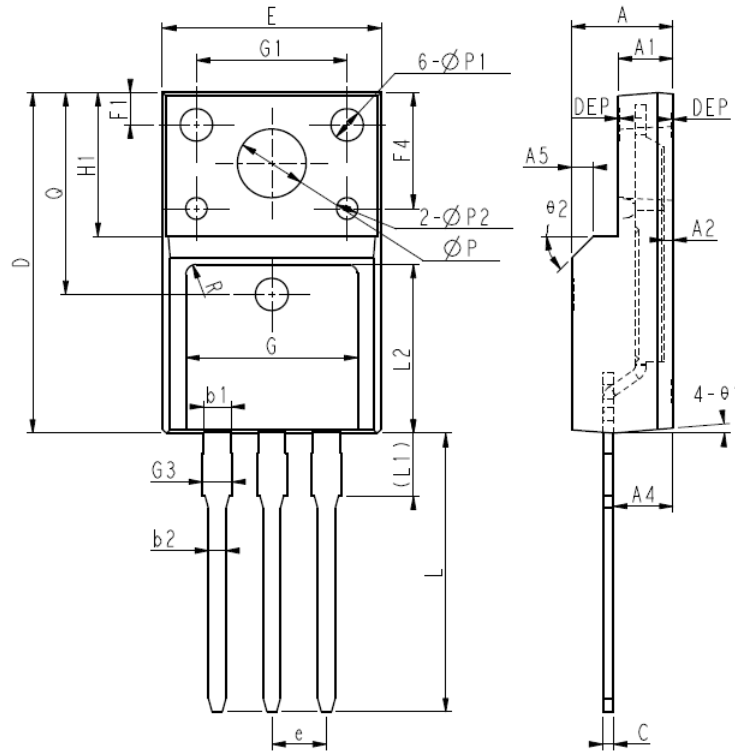


Figure 17. normalized transient thermal impedance, junction-to-case

Mechanical Dimensions



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	10.00	10.16	10.32
E1	9.91	10.04	10.14
E2	9.36	9.46	9.56
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.43	-	0.48
A4	2.66	2.76	2.86
A5	1.00REF		
c	0.45	0.50	0.60
D	15.67	15.87	16.07
q	9.40REF		
H1	6.70REF		
e	2.54BSC		
ØP	3.18REF		
L	12.78	12.98	13.18
L1	2.83	2.93	3.03
L2	7.70	7.80	7.90
ØP1	1.40	1.50	1.60
ØP2	0.95	1.00	1.05
ØP3	3.45REF		
θ1	3°	5°	7°
θ2	-	45°	-
DEP	0.05	0.10	0.15
F1	1.00	1.50	2.00
F2	13.80	13.90	14.00
F3	3.20	3.30	3.40
F4	5.30	5.40	5.50
G	7.80	8.00	8.20
G1	6.90	7.00	7.10
G3	1.25	1.35	1.45
b1	1.23	1.28	1.38
b2	0.75	0.80	0.90
K1	0.65	0.70	0.75
R	0.50REF		

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