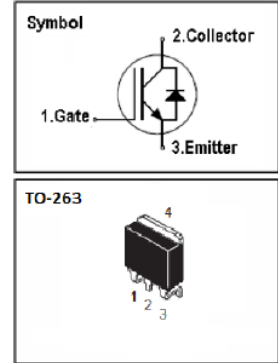


IGBT

Features

- 650V,20A
- $V_{CE(sat)(typ.)}=1.85V@V_{GE}=15V,I_C=20A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA using NPT technology



General Description

JIAEN NPT IGBTs offer lower losses and higher energy efficiency for application such as IH (induction heating), UPS, general inverter and other soft switching applications.

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Continuous Collector Current ($T_C=25^\circ C$)	40	A
	Continuous Collector Current ($T_C=100^\circ C$)	20	A
I_{CM}	Pulsed Collector Current (Note 1)	60	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ C$)	20	A
I_{FM}	Diode Maximum Forward Current (Note 1)	60	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation ($T_C=25^\circ C$)	140	W
	Maximum Power Dissipation ($T_C=100^\circ C$)	56	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	0.9	$^\circ C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	1.6	$^\circ C/W$
$R_{th\ j-a}$	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	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=650V, V_{GE}=0V$	-	-	100	μA
I_{GES}	Gate Leakage Current	$V_{GE}=\pm 30V, V_{CE}=0V$	-	-	± 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	$V_{GE}=15V, I_C=20A$	-	1.85	2.5	V
Q_g	Total Gate Charge	$V_{CC}=480V$ $V_{GE}=15V$ $I_C=20A$	-	39.7	-	nC
Q_{ge}	Gate-Emitter Charge		-	7.0	-	nC
Q_{gc}	Gate-Collector Charge		-	21.9	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=20A$ $R_G=15\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	18	-	ns
t_r	Turn-on Rise Time		-	26	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	98	-	ns
t_f	Turn-off Fall Time		-	89	-	ns
E_{on}	Turn-on Switching Loss		-	0.42	-	mJ
E_{off}	Turn-off Switching Loss		-	0.88	-	mJ
E_{ts}	Total Switching Loss		-	1.3	-	mJ
C_{ies}	Input Capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=1\text{MHz}$	-	717	-	pF
C_{oes}	Output Capacitance		-	39.5	-	pF
C_{res}	Reverse Transfer Capacitance		-	23.2	-	pF
R_{Gint}	Integrated gate resistor		-	2.14	-	Ω

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	$I_F=20A$	-	1.9	2.5	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=400V$ $I_F=20A$ $R_G=15\Omega$	-	60	-	ns
I_{rr}	Diode peak Reverse Recovery Current		-	13.75	-	A
Q_{rr}	Diode Reverse Recovery Charge		-	459	-	nC

Notes:

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

Typical Performance Characteristics

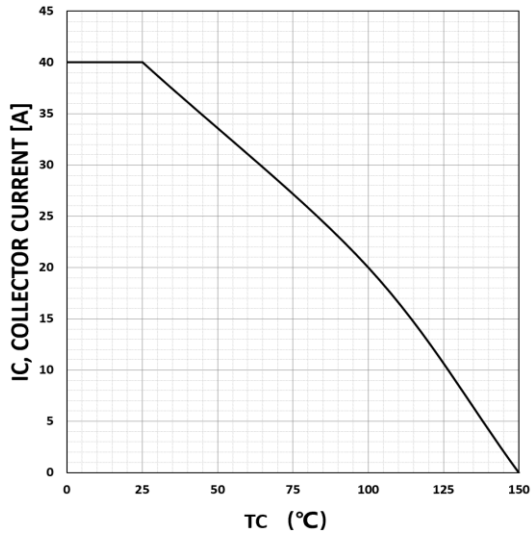


Figure 1. Maximum DC collector current VS. case temperature

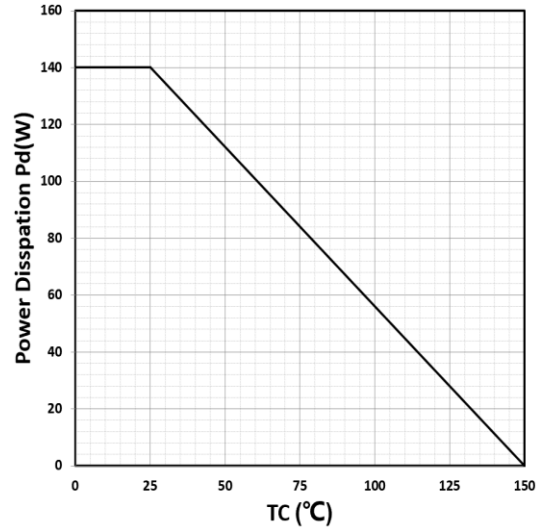


Figure 2. Power dissipation VS. case temperature

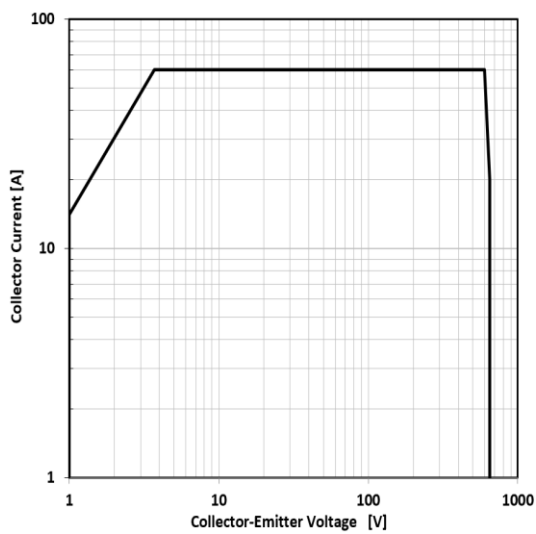


Figure 3. Reverse bias SOA, Tj=125°C, Vge=15V

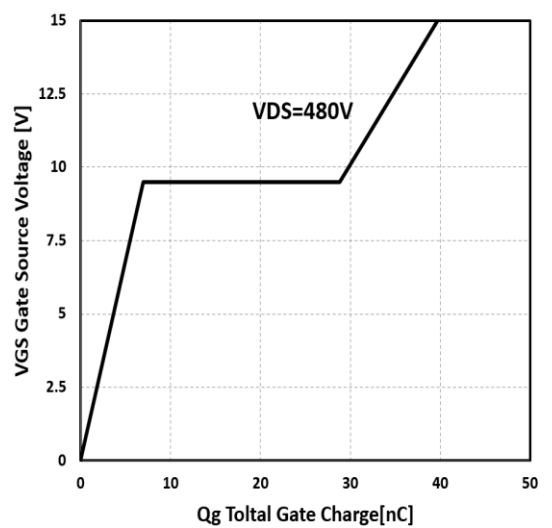


Figure 4: Typical gate charge VS. VGS, IC=20A

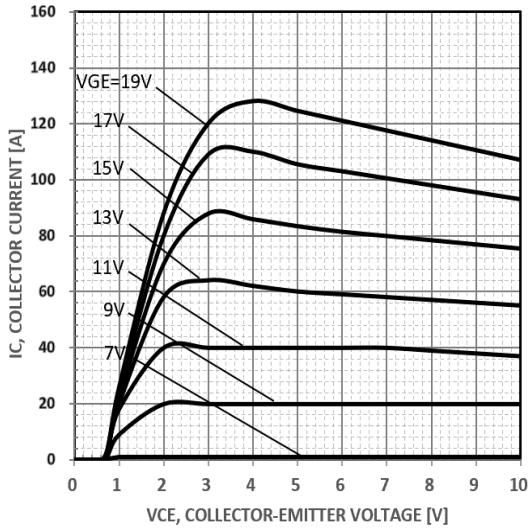


Figure 5. Typical output characteristics
 $t_p=300\mu s$ $T_c=25^\circ C$

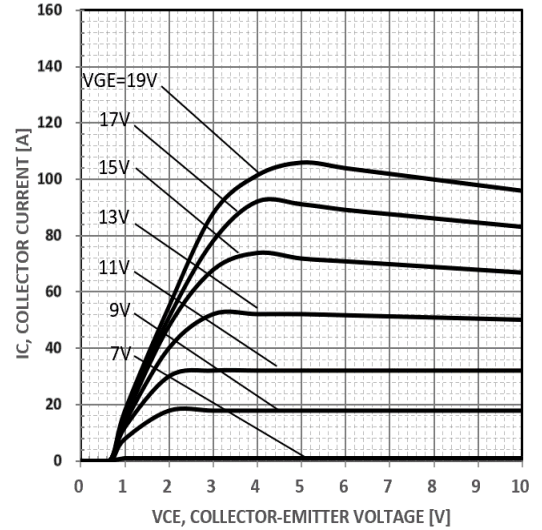


Figure 6. Typical output characteristics
 $t_p=300\mu s$ $T_c=150^\circ C$

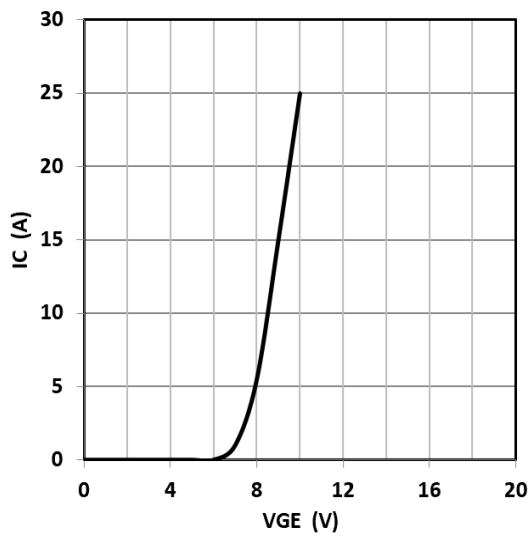


Figure 7. Typical gate threshold voltage

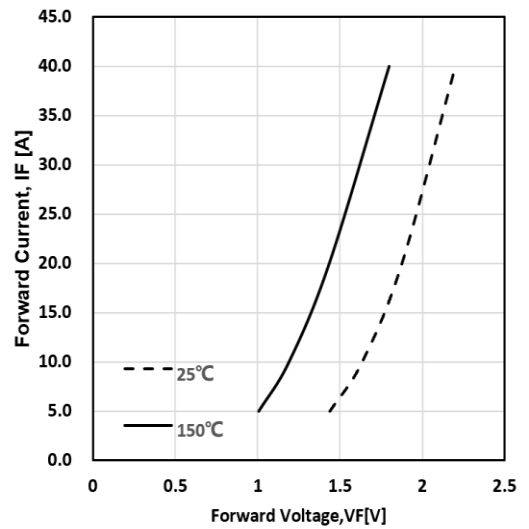


Figure 8. Typical forward voltage vs IF

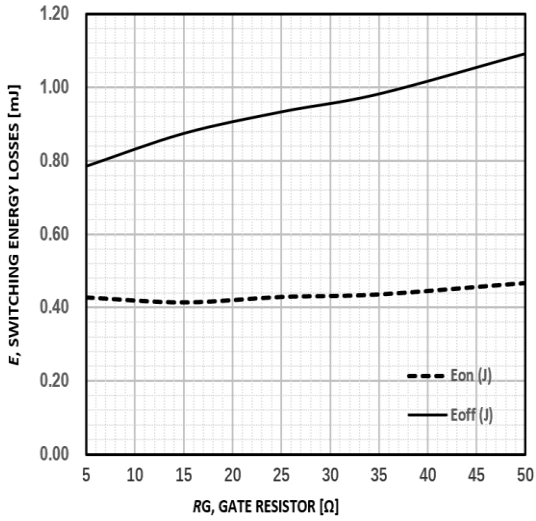


Figure9: Typical energy loss VS. R_g , $T_C=25^\circ\text{C}$,
 $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=20\text{A}$

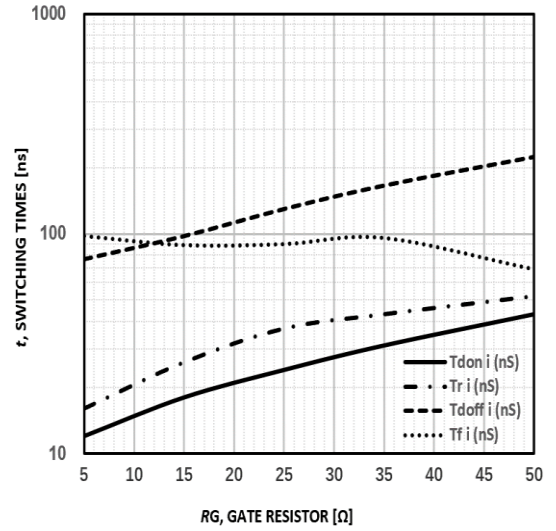


Figure10: Typical switching time VS. R_g , $T_C=25^\circ\text{C}$,
 $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=20\text{A}$

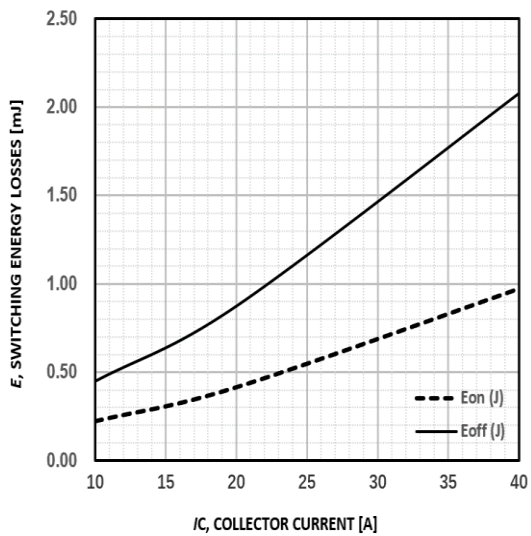


Figure11: Typical energy loss VS. I_C , $T_C=25^\circ\text{C}$,
 $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=15\Omega$

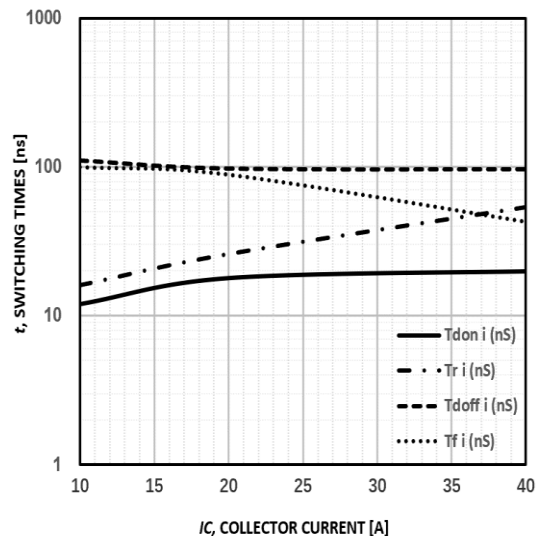


Figure12: Typical switching time VS. I_C , $T_C=25^\circ\text{C}$,
 $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=15\Omega$

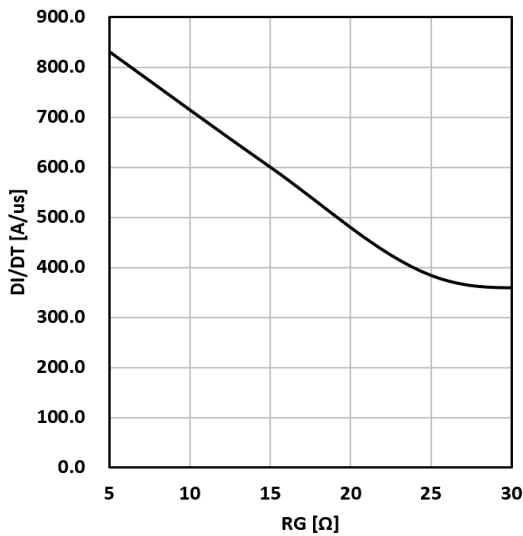


Figure 13. Typical diode di/dt vs rg Tc=25°C
VCE=400V VGE=15V IF=20A

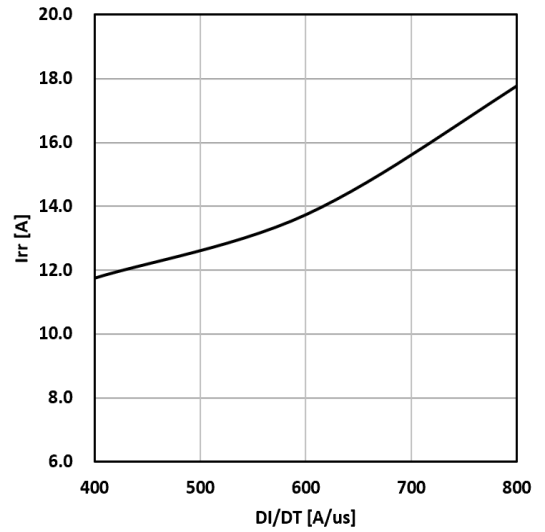


Figure 14. Typical diode Irr vs di/dt Tc=25°C
VCE=400V VGE=15V IF=20A

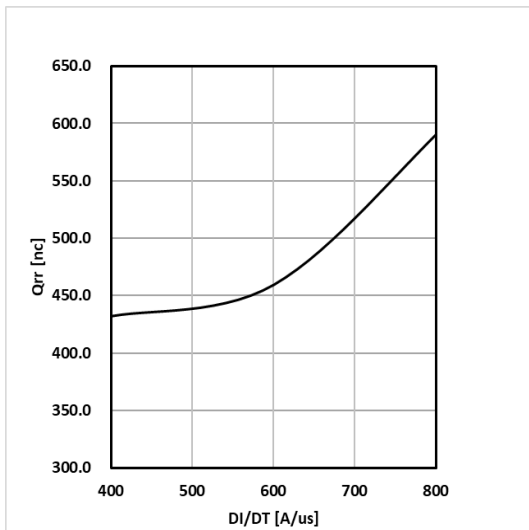


Figure 15. Typical diode Qrr vs di/dt Tc=25°C
VCE=400V VGE=15V IF=20A

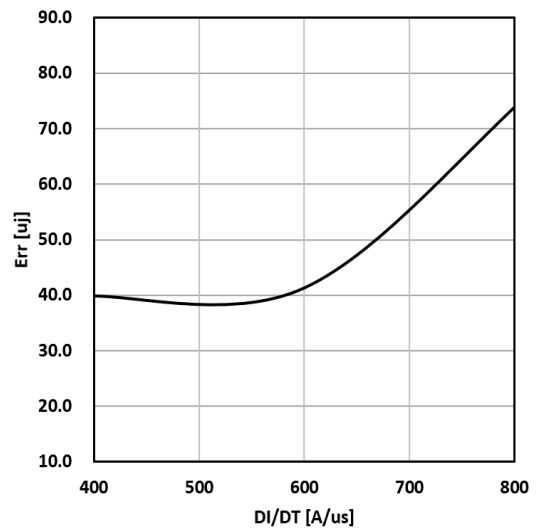


Figure 16. Typical diode Err vs di/dt Tc=25°C
VCC=400V VGE=15V IF=20A

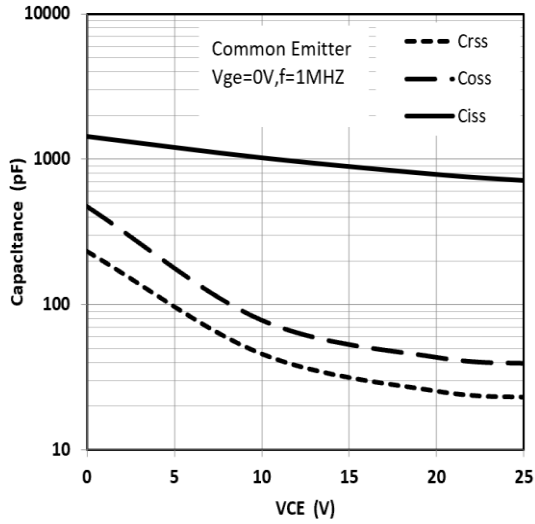


Figure17:Typical capacitance VS. VCE,
VGE=0V,f=1MHz

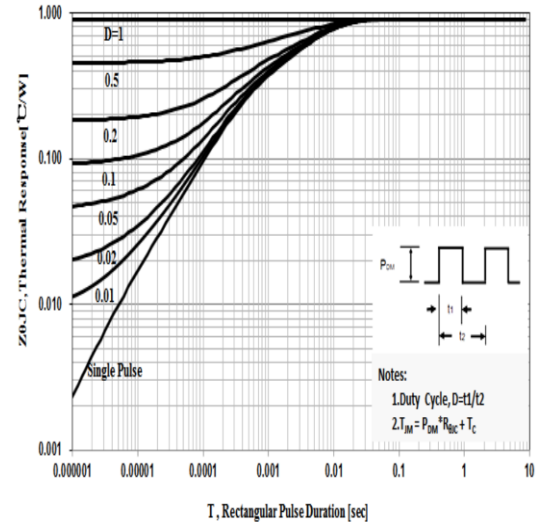
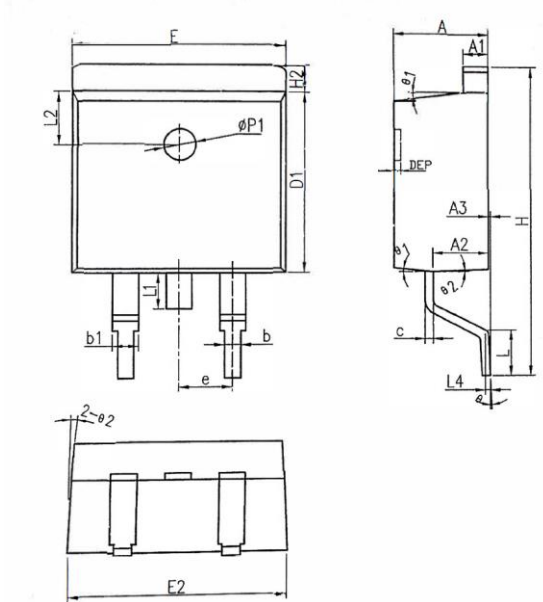


Figure18. normalized transient thermal impedance,
junction-to-case

TO-263 PACKAGE OUTLINE



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
A3	0.00	0.10	0.20	0.000	0.004	0.008
b	0.77	0.813	0.90	0.030	0.032	0.035
b1	1.20	1.270	1.36	0.047	0.050	0.054
c	0.34	0.381	0.47	0.013	0.015	0.019
D1	8.60	8.70	8.80	0.339	0.343	0.346
E	10.00	10.16	10.26	0.394	0.400	0.404
E2	10.00	10.10	10.20	0.394	0.398	0.402
e	2.54 BSC			0.100 BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
H2	1.17	1.27	1.40	0.046	0.050	0.055
L	2.00	2.30	2.60	0.079	0.091	0.102
L1	1.45	1.55	1.70	0.057	0.061	0.067
L2	2.50 REF			0.098 REF		
L4	0.25 BSC			0.010 BSC		
θ	0°	5°	8°	0°	5°	8°
$\theta 1$	5°	7°	9°	5°	7°	9°
$\theta 2$	1°	3°	5°	1°	3°	5°
$\phi P1$	1.40	1.50	1.60	0.055	0.059	0.063
DEP	0.05	0.10	0.20	0.002	0.004	0.008

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