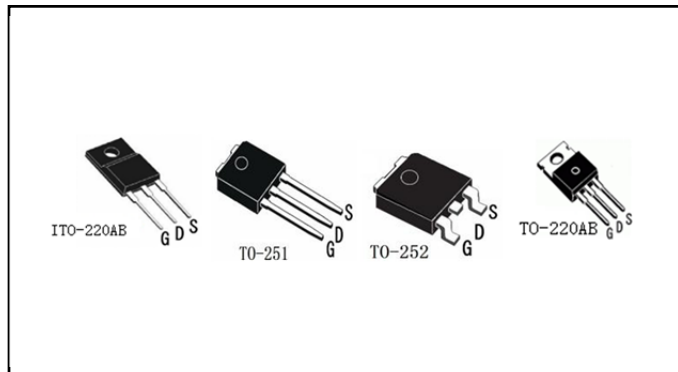


N-Channel Enhancement Mode Mosfet

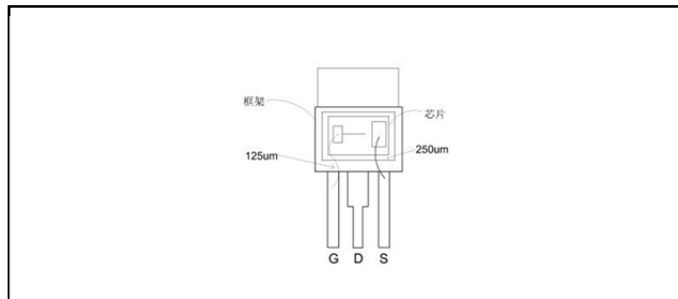


Feature:

- Low Crss
- Low Gate Charge
- Fast Switching
- Improved ESD Capability
- Improved dv/dt Capability
- 100% Avalanche Energy Test

Mechanical Data:

- **Package: MOS**
Molding compound meets UL 94 V-0 flammability rating, RoHS-compliant
- **Terminal: Tin plated leads,**
Solderable per J-STD-002 and JESD22-B102
- **Polarity:** As marked on body



■ Ordering Information

P/N	PACKAGE	PACKING CODE	UNIT WEIGHT(g)	MINIIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJ4N60CI	ITO-220AB	B1	Approximate 1.7	50	1000	5000	TUBE
YJ4N60CZ	TO-220AB	B1	Approximate 2.0	50	1000	5000	TUBE
YJ4N60CM	TO-263	B1	Approximate 1.4	50	1000	5000	TUBE
YJ4N60CH	TO-251	B1	Approximate 0.4	75	4500	22500	TUBE
YJ4N60CP	TO-252	F1	Approximate 0.4	2500	5000	25000	


■ Maximum Ratings ($T_a=25^{\circ}\text{C}$ Unless otherwise specified)

Parameter	Symbol		Value	Unit
Drain-Source Voltage	V_{DSS}		600	V
Continues Drain Current	I_D	$T_c=25^{\circ}\text{C}$	4*	A
		$T_c=100^{\circ}\text{C}$	2.5*	
Plused Drain Current (note 1)	I_{DM}		16	A
Gate-to-Source Voltage	V_{GS}		± 30	V
Single Pulsed Avalanche Energy (note 2)	E_{AS}		218	mJ
Avalanche Current (note 1)	I_{AR}		4.0	A
Repetitive Avalanche Energy (note 1)	E_{AR}		10	mJ
Peak Diode Recovery (note 3)	dv/dt		4.5	V/ns
Power Dissipation	P_D $T_c=25^{\circ}\text{C}$	TO-220AB	100	W
		ITO-220AB	33	
		TO-251/TO-252	51	
Power Dissipation Derating Factor	$P_{D(DF)}$ Above 25°C	TO-220AB	0.8	$\text{W}/^{\circ}\text{C}$
		ITO-220AB	0.26	
		TO-251/TO-252	0.39	
Operating and Storage Temperature Range	T_J, T_{STG}		150, $-55 \sim +150$	$^{\circ}\text{C}$
Maximum Temperature for Soldering	T_L		300	$^{\circ}\text{C}$

■ Electrical Characteristics ($T_a=25^{\circ}\text{C}$ Unless otherwise specified)

Off-Characteristics						
Parameter	Symbol	Tests Conditions	Min	Type	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	600	-	-	V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$, referenced to 25°C	-	0.7	-	$\text{V}/^{\circ}\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=600\text{V}, V_{GS}=0\text{V}, T_c=25^{\circ}\text{C}$	-	-	1	μA
		$V_{DS}=480\text{V}, T_c=125^{\circ}\text{C}$	-	-	10	
Gate-body leakage current, forward	I_{GSSF}	$V_{DS}=0\text{V}, V_{GS}=30\text{V}$	-	-	100	nA
Gate-body leakage current, reverse	I_{GSSR}	$V_{DS}=0\text{V}, V_{GS}=-30\text{V}$	-	-	-100	nA



On-Characteristics

Parameter	Symbol	Tests Conditions	Min	Type	Max	Unit
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	2.0	-	4.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS} = 10V$, $I_D = 2.0A$	-	2.0	2.5	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 40V$, $I_D = 2.0A$ (note4)	-	4.0	-	S

Dynamic Characteristics

Parameter	Symbol	Tests Conditions	Min	Type	Max	Unit
Input capacitance	C_{iss}	$V_{DS} = 25V$, $V_{GS} = 0V$, $f = 1.0MHz$	-	580	720	pF
Output capacitance	C_{oss}		-	54	70	pF
Reverse transfer capacitance	C_{rss}		-	8	10	pF

Switching Characteristics

Parameter	Symbol	Tests Conditions	Min	Type	Max	Unit
Turn-On delay time	$t_{d(on)}$	$V_{DD} = 300V$, $I_D = 4A$, $R_G = 25\Omega$ (note 4, 5)	-	16	42	ns
Turn-On rise time	t_r		-	48	112	ns
Turn-Off delay time	$t_{d(off)}$		-	48	105	ns
Turn-Off Fall time	t_f		-	38	86	ns
Total Gate Charge	Q_g	$V_{DS} = 480V$, $I_D = 4A$, $V_{GS} = 10V$ (note 4, 5)	-	15	20	nC
Gate-Source charge	Q_{gs}		-	2.8	-	nC
Gate-Drain charge	Q_{gd}		-	6.8	-	nC

Drain-Source Diode Characteristics and Maximum Ratings

Parameter	Symbol	Tests Conditions	Min	Type	Max	Unit
Maximum Continuous Drain-Source Diode Forward Current	I_S		-	-	4	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}		-	-	16	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0V$, $I_S = 4A$	-	-	1.4	V
Reverse recovery time	t_{rr}	$V_{GS} = 0V$, $I_S = 4A$ $dI_F/dt = 100A/\mu s$ (note 4)	-	320	-	ns
Reverse recovery charge	Q_{rr}		-	2.4	-	μC

■ Thermal Characteristics (T_a=25°C Unless otherwise specified)

Parameter	Symbol		Max	Unit
Thermal Resistance, Junction to Case	R _{th(j-c)}	TO-220AB	1.25	°C/W
		ITO-220AB	3.79	
		TO-251/TO-252	2.5	
Thermal Resistance, Junction to Ambient	R _{th(j-a)}	TO-220AB	62.5	°C/W
		ITO-220AB	62.5	
		TO-251/TO-252	83	

* Drain current limited by maximum junction temperature

Notes:

- 1: Pulse width limited by maximum junction temperature
- 2: L=25mH, I_{AS}=4A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C
- 3: I_{SD} ≤4A, di/dt ≤300A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C
- 4: Pulse Test: Pulse Width ≤300μs, Duty Cycles≤2%
- 5: Essentially independent of operating temperature

■ Characteristics (Typical)

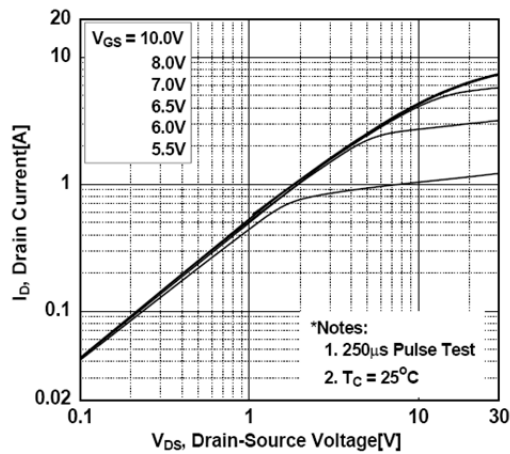


Fig. 1 On-State Characteristics

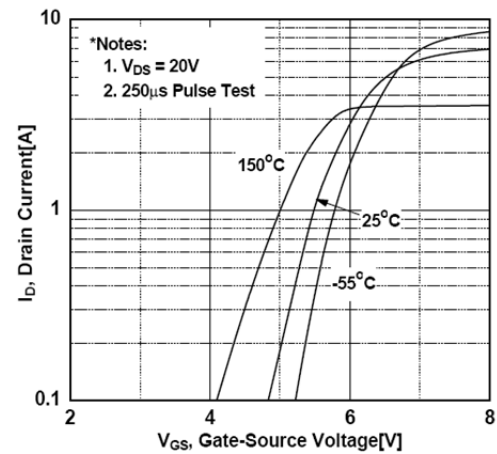


Fig. 2 Transfer Characteristics

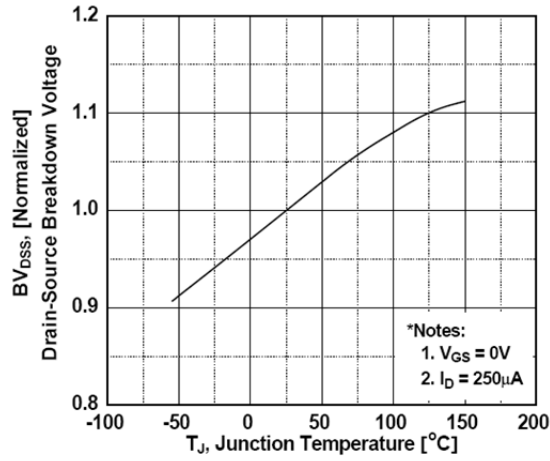


Fig. 3 Breakdown Voltage Variation vs Temperature

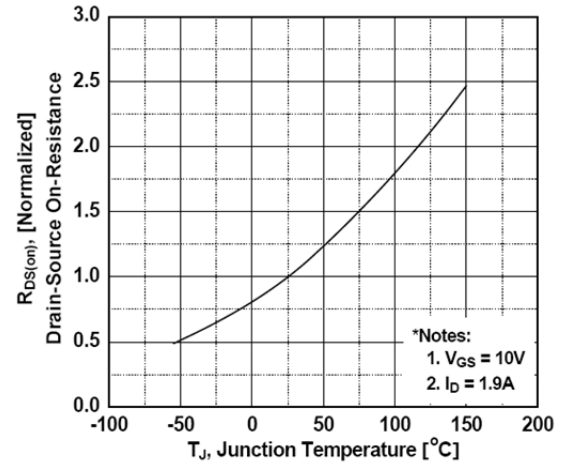


Fig. 4 On-Resistance Variation vs Temperature

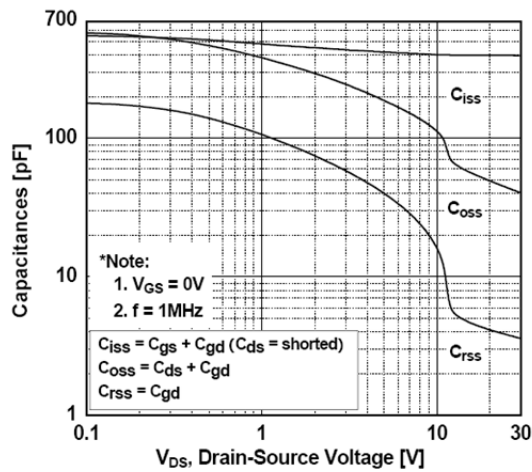


Fig. 5 Capacitance Characteristics

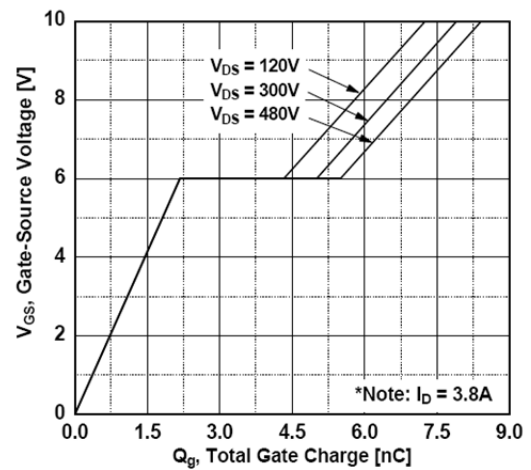


Fig. 6 Gate Charge Characteristics

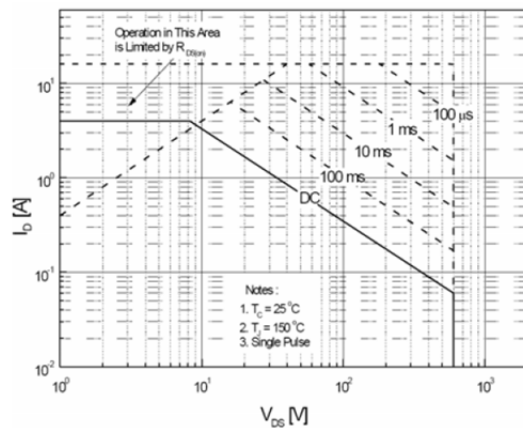


Fig. 7 Maximum Safe Operating Area

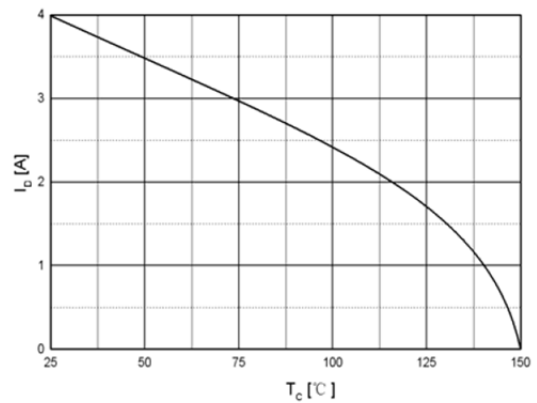


Fig. 8 Maximum Drain Current vs Case Temperature

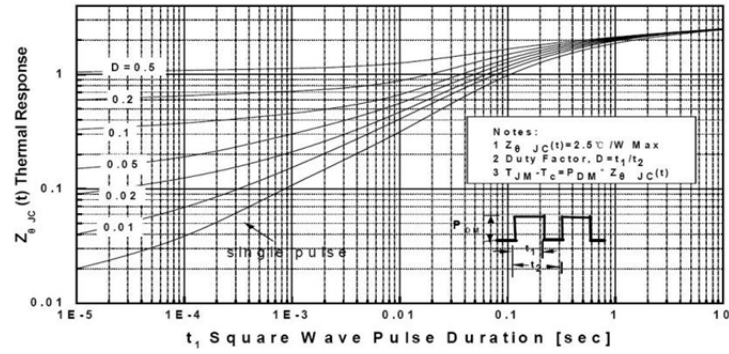


Fig. 9 Transient Thermal Response Curve(TO-251/TO-252)

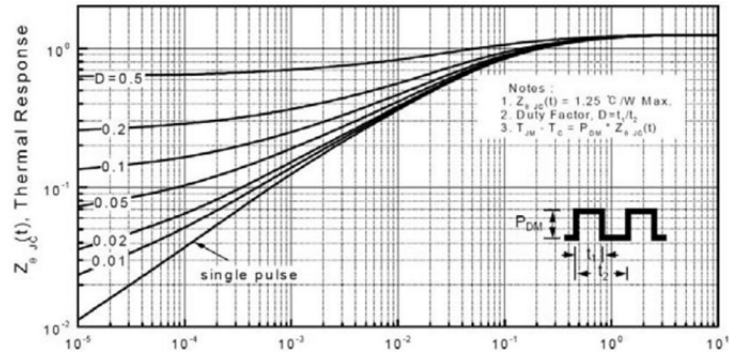


Fig. 10 Transient Thermal Response Curve(ITO-220)

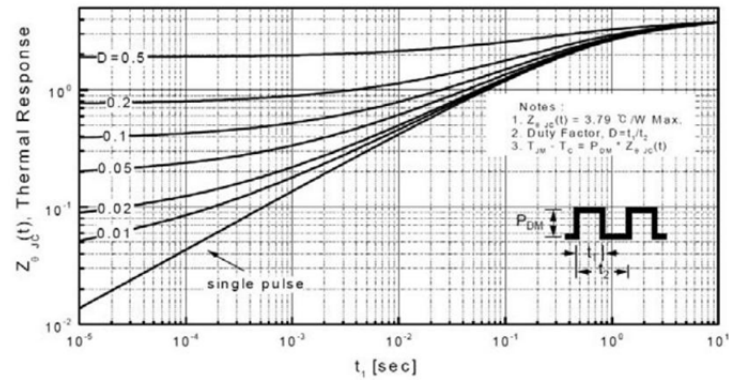
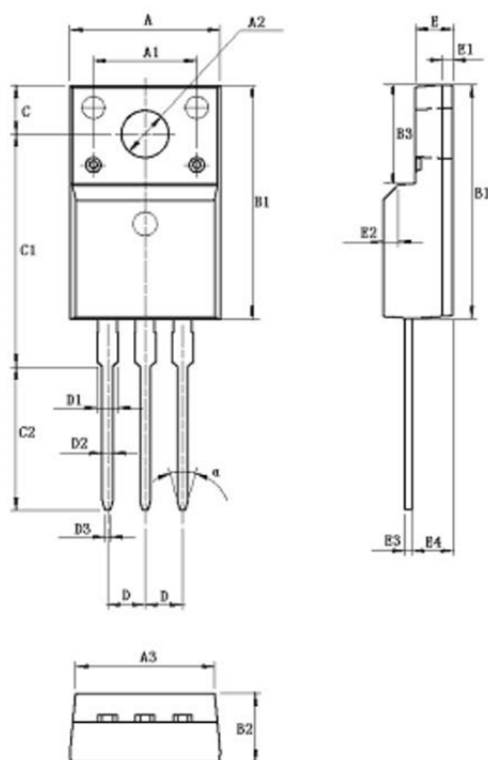


Fig. 11 Transient Thermal Response Curve(TO-220AB)

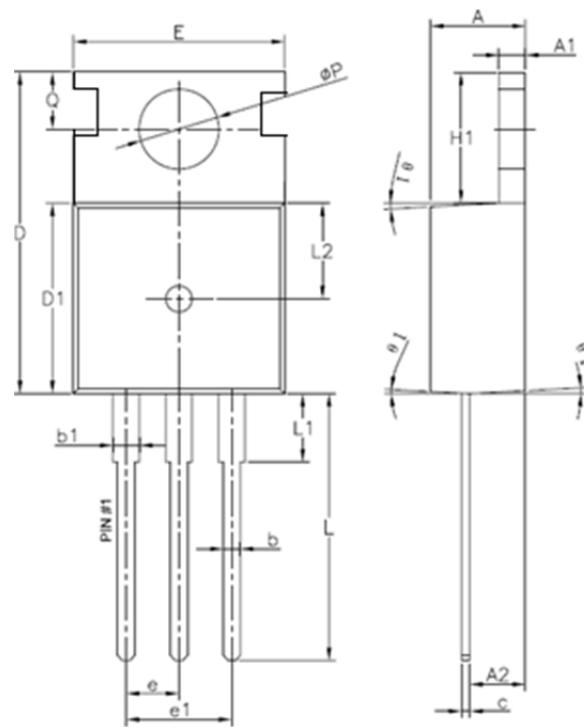
■ Outline Dimensions

ITO-220AB



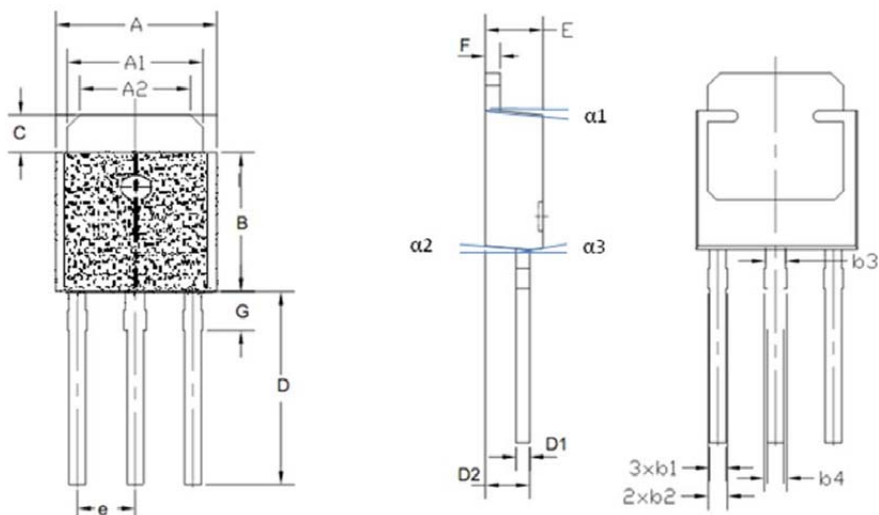
Symbol	Min	Max	Symbol	Min	Max
A	9.96	10.36	D	2.54	
A1	7.00		D1	1.15	1.35
A2	3.08	3.28	D2	0.70	0.90
A3	9.25	9.65	D3	0.28	0.48
B1	15.70	16.10	E	2.34	2.74
B2	4.50	4.90	E1	0.70	
B3	6.20	6.80	E2	1.0×45°	
C	3.20	3.40	E3	0.36	0.65
C1	15.20	16.00	E4	2.55	2.95
C2	9.75	10.15	a(度)	30°	

TO-220AB



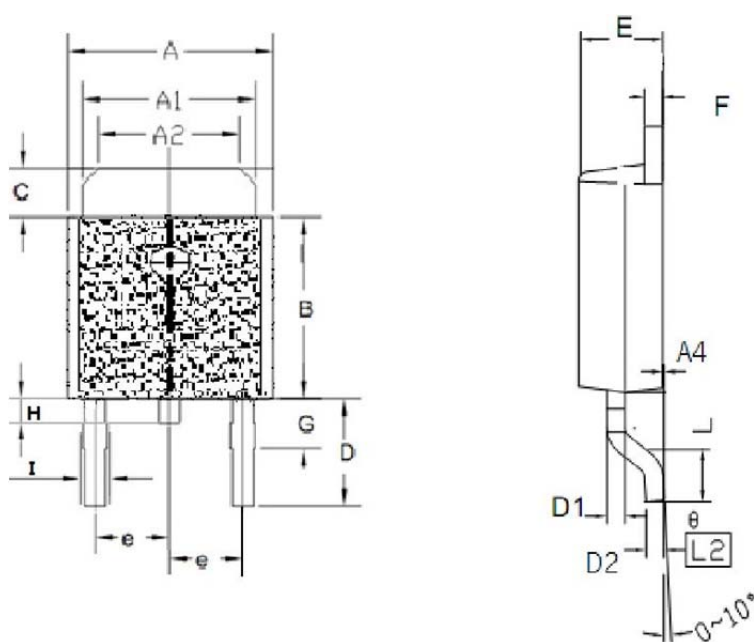
Symbol	Min	Normal	Max	Symbol	Min	Normal	Max
A	4.4	4.5	4.6	e		2.54	
A1	1.27	1.3	1.33	e1		5.08	
A2	2.3	2.4	2.5	H1	6.3	6.5	6.7
b	0.7	/	0.9	L	13.0	13.38	13.5
b1	1.25		1.42	L1	/	/	3.5
c	0.45	0.5	0.6	L2		4.6	
D	15.3	15.7	16.1	ΦP	3.55	3.6	3.65
D1	9.1	9.2	9.3	Q	2.73	/	2.87
E	9.7	9.9	10.2	$\theta 1$ (°)	1	3	5

TO-251



Symbol	Min	Max	Symbol	Min	Max
A	6.40	6.60	D1	0.45	0.55
A1	5.20	5.40	D2	1.51	1.61
A2	4.40	4.60	e	2.30	
B	6.00	6.20	E	2.20	2.40
b1	0.55	0.65	F	0.49	0.59
b2	0.60	0.90	G	1.70	
b3	0.80		α1(度)	8.00	
b4	0.95	1.05	α2(度)	8.00	
C	0.90	0.96	α3(度)	8.00	
D	9.15	9.55			

TO-252



Symbol	Min	Max	Symbol	Min	Max
A	6.40	6.60	D	2.90	3.10
A1	5.20	5.40	D1	0.45	0.55
A2	4.40	4.60	D2	0.45	0.55
A3	4.40	4.60	e	2.30	
A4	0.00	0.15	E	2.20	2.40
A5	4.65	4.95	F	0.49	0.59
B	6.00	6.20	G	1.70	
B1	1.57	1.77	L	1.40	1.60
C	0.90	0.96	θ(度)	0.00	10.00
I	0.60	0.90	H	0.49	0.52



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