



VMDSEMI

**VSXX065R18ANA**

**Datasheet**



VMDSEMI

**General Description**
**Symbol**

$V_{(BR)DSS}$	$R_{DS(ON)_{max}}$	$I_D$
650V	180mΩ@10V	21.2A

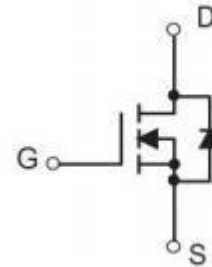


Figure 1 Symbol of VSXX065R18ANA

**Features**

- Ultra Low Gate Charge
- Ultra Low  $R_{DS(ON)}$
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved

**Application**

- UPS, Inverter, etc
- Solar
- TV Power
- High Power AC/DC Power Supply

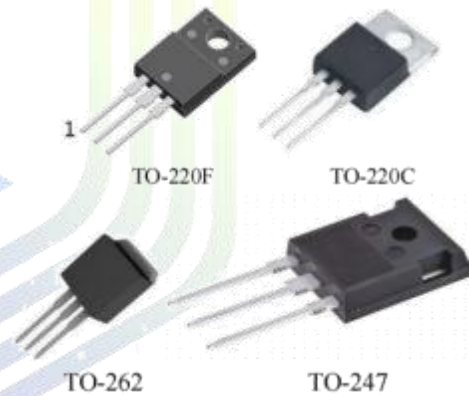
**Package Type**


Figure 2 Package Type of VSXX065R18ANA

**Ordering Information**

Product Name	Package
VSTD065R18AND	TO-220F
VSTA065R18AND	TO-220C
VSTN065R18AND	TO-262
VSTF065R18AND	TO-247

**Absolute Maximum Ratings<sup>Note1</sup>**

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DSS}$	650	V
Gate-Source Voltage	$V_{GSS}$	±30	V
Continuous Drain Current $T_C=25\text{ }^\circ\text{C}$	$I_D$	21.2	A
Continuous Drain Current $T_C=100\text{ }^\circ\text{C}$		9.5	
Pulsed Drain Current <sup>Note2</sup>	$I_{DM}$	64	
Continuous diode forward current	$I_S$	21.2	
Diode pulsed current	$I_{S,PULSE}$	64	mJ
Single Pulsed Avalanche Energy <sup>Note3</sup>	$E_{AS}$	505	
Avalanche Energy, Repetitive <sup>Note2</sup>	$E_{AR}$	0.7	
Avalanche Current, Repetitive <sup>Note2</sup>	$I_{AR}$	3.6	A
MOSFET dv/dt Ruggedness, $V_{DS}\leq 480\text{V}$	dv/dt	50	V/ns
Reverse Diode dv/dt, $V_{DS}\leq 480\text{V}$ , $I_{SD}\leq I_D$	dv/dt	15	V/ns
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{STG}$	-55 to 150	
Lead Temperature (Soldering, 10 sec)	$T_{LEAD}$	260	

**Note:**

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3.  $I_{AS}=3.6\text{A}$ ,  $V_{DD}=60\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25\text{ }^\circ\text{C}$

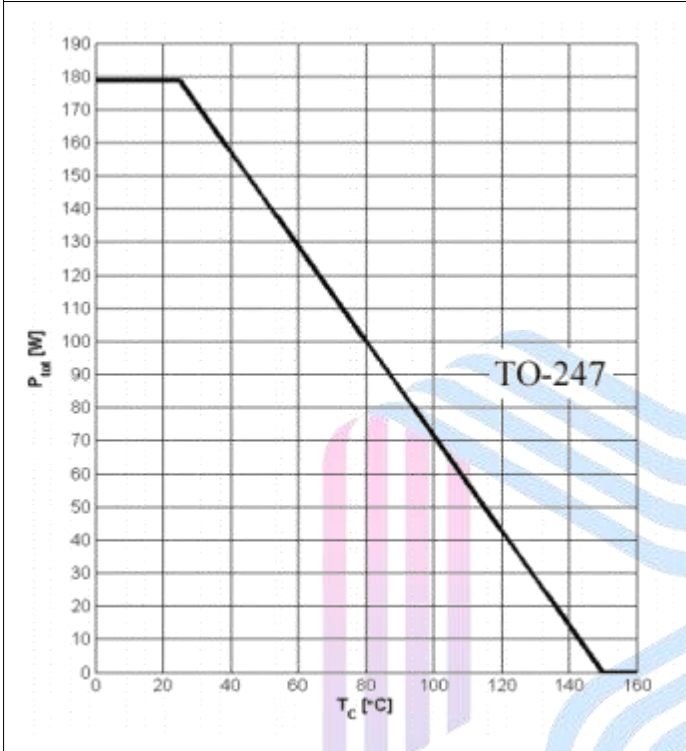
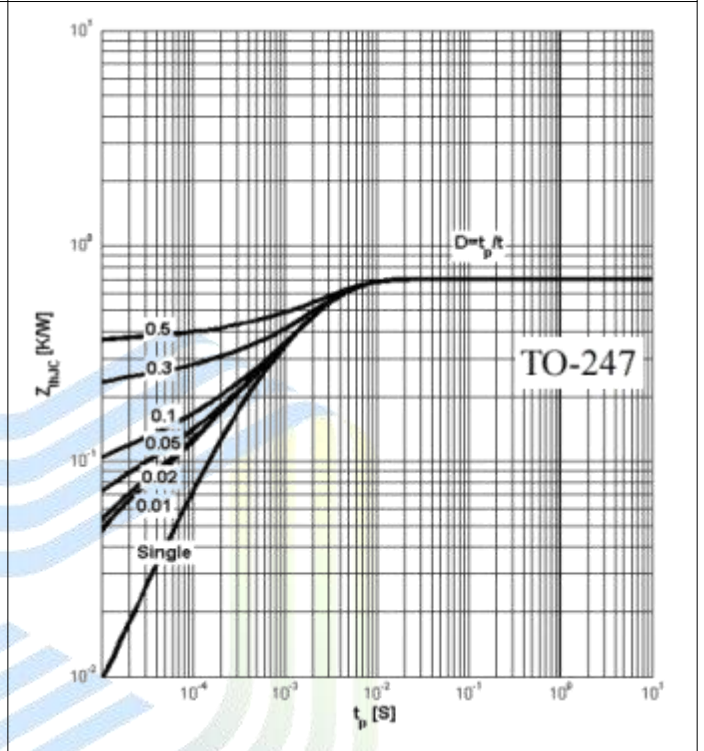
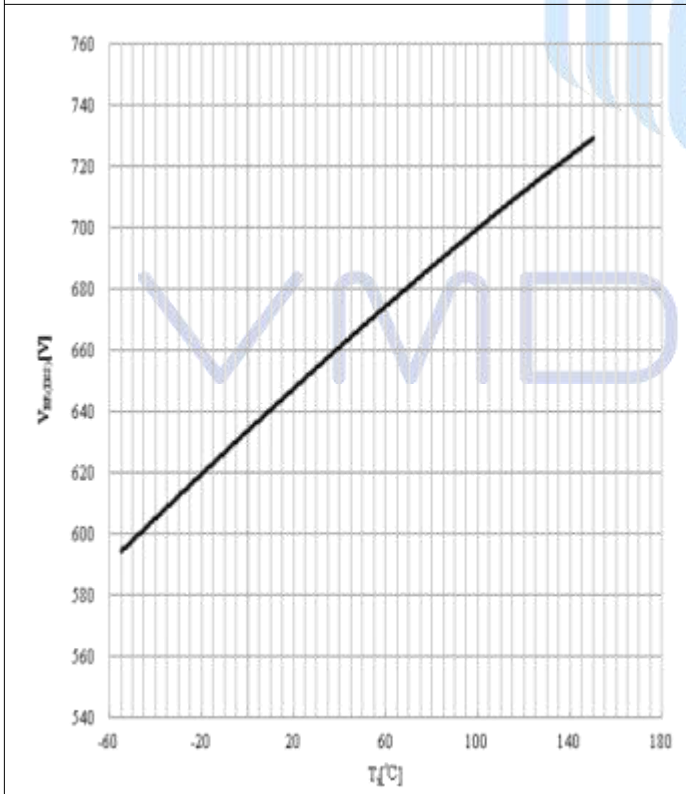
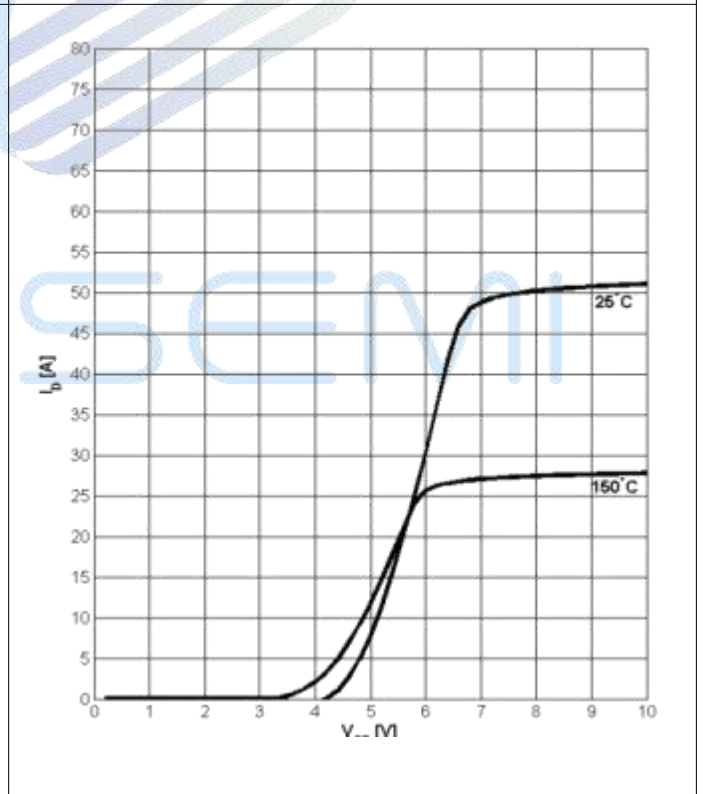


**Electrical Characteristics** ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Statistic Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=30V, V_{DS}=0V$			0.1	$\mu A$
		$V_{GS}=-30V, V_{DS}=0V$			-1.0	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.4	3.4	4.4	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$		160	180	$m\Omega$
Gate Resistance	$R_g$	$f=1MHz, \text{Open drain}$		1.7		$\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=50V$		1630		pF
Output Capacitance	$C_{OSS}$	$V_{GS}=0V$		110		pF
Reverse Transfer Capacitance	$C_{RSS}$	$f=1MHz$		22		pF
Effective output capacitance, energy related <sup>NOTE4</sup>	$C_{O(er)}$	$V_{GS}=0V$		71		nF
Effective output capacitance, time related <sup>NOTE5</sup>	$C_{O(tr)}$	$V_{DS}=0\text{.....}480V$		301		
Total Gate Charge	$Q_g$	$V_{DS}=480V$ $V_{GS}=0 \text{ to } 10V$ $I_D=10A$		10.6		nC
Gate-Source Charge	$Q_{gs}$			12.2		
Gate-Drain Charge	$Q_{gd}$			38		
Gate Plateau Voltage	$V_{plateau}$			5.5		V
<b>Switching Parameters</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=400V$		11		ns
Turn-on Rise Time	$t_r$	$V_{GS}=10V$		10		
Turn-off Delay Time	$t_{d(off)}$	$I_D=10A$		76		
Turn-off Fall Time	$t_f$	$R_G=3.4\Omega$		8		
<b>Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=10A$		0.83	1.1	V
Reverse Recovery Time	$t_{rr}$	$I_S=10A$		330		ns
Reverse Recovery Charge	$Q_{rr}$	$V_R=400V$		4.5		nC
Peak Reverse Recovery Current	$I_{rrm}$	$di/dt=100A/us$		27		A

Note:

- $C_{O(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 480V
- $C_{O(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 480 V

**Typical Performance Characteristics**
**Figure 3: Power Dissipation**

**Figure 4: Max Transient Thermal Impedance**

**Figure 5: Drain-Source Breakdown Voltage**

**Figure 6: Typ Transfer Characteristics**


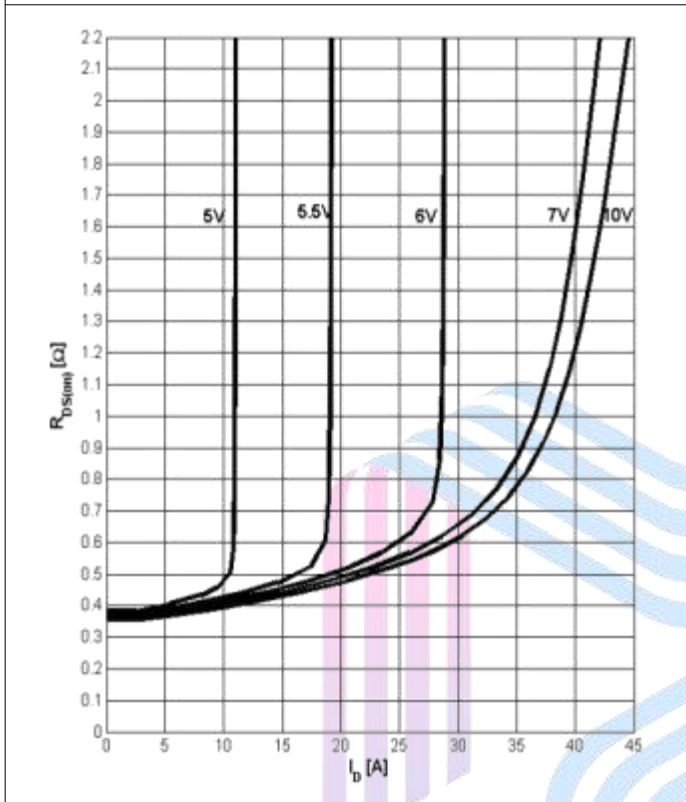
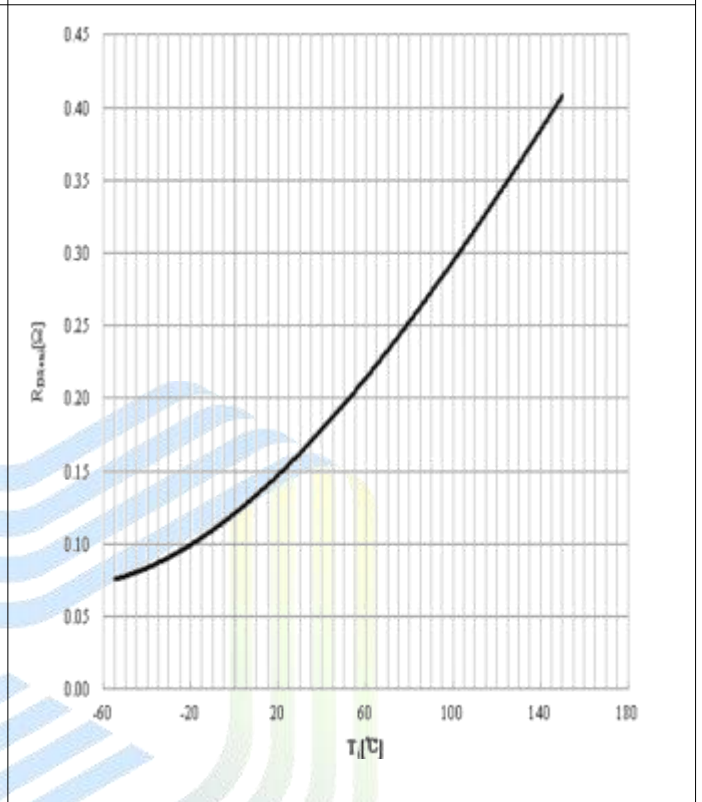
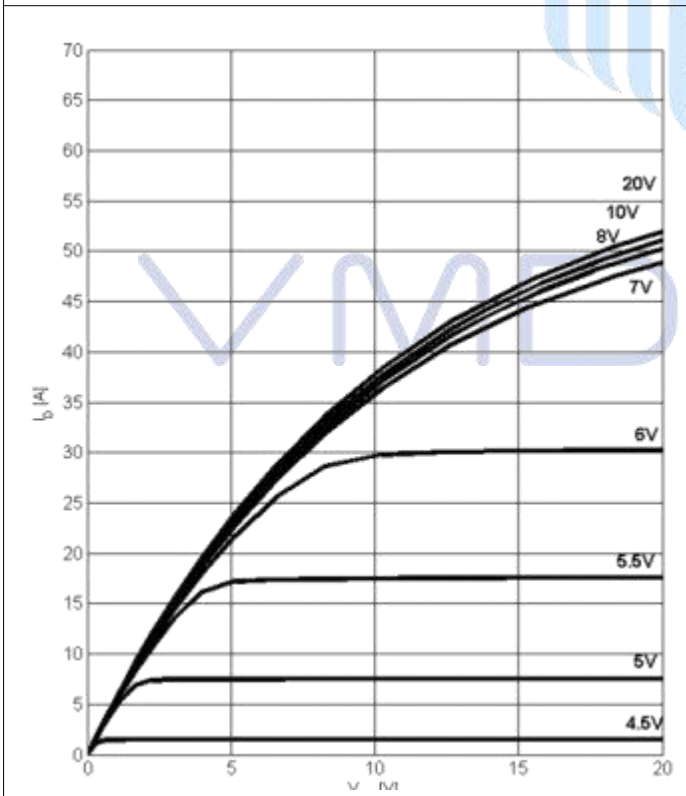
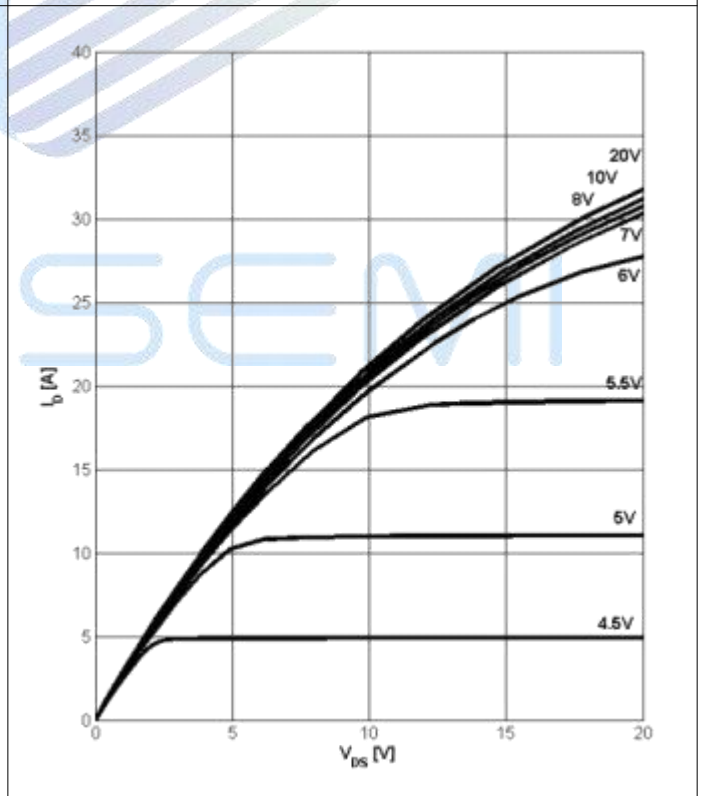
**Figure 7: Typ Drain-Source On- State Resistance**

**Figure 8: Typ Drain-Source On- State Resistance**

**Figure 9: Typ Output Characteristics  $T_J = 25\text{ }^\circ\text{C}$** 

**Figure 10: Typ Output Characteristics  $T_J = 125\text{ }^\circ\text{C}$** 


Figure 11: Typ Capacitances

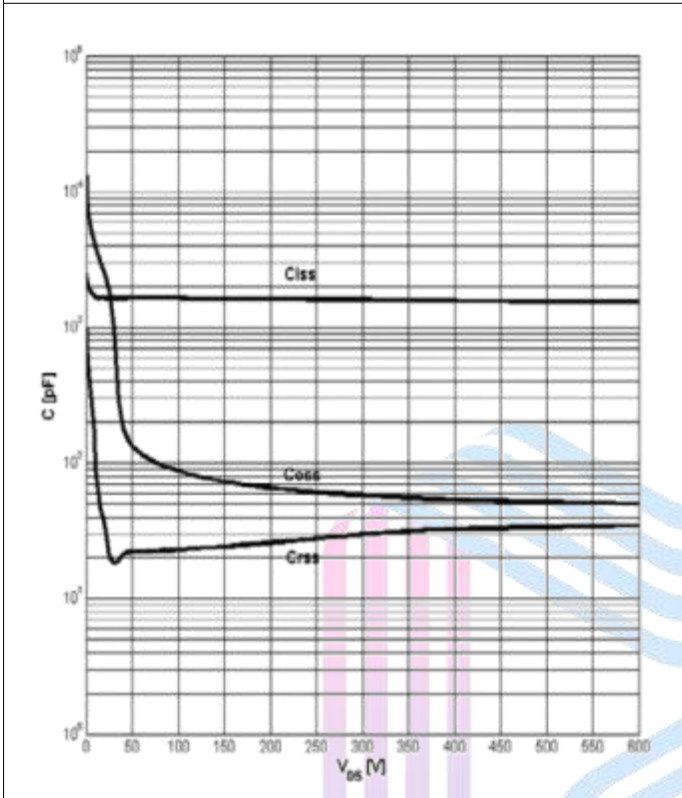


Figure 12: Typ Gate Charge

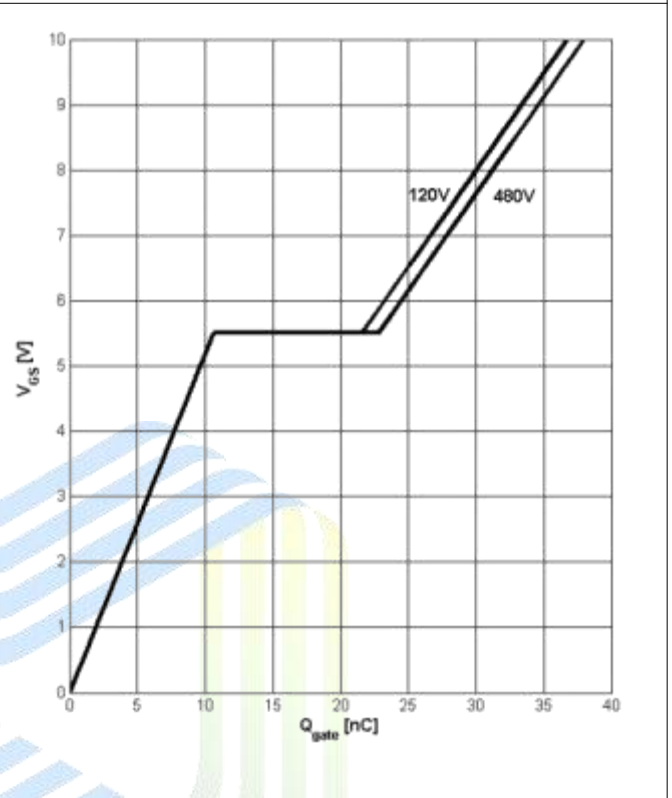


Figure 13: Coss Stored Energy

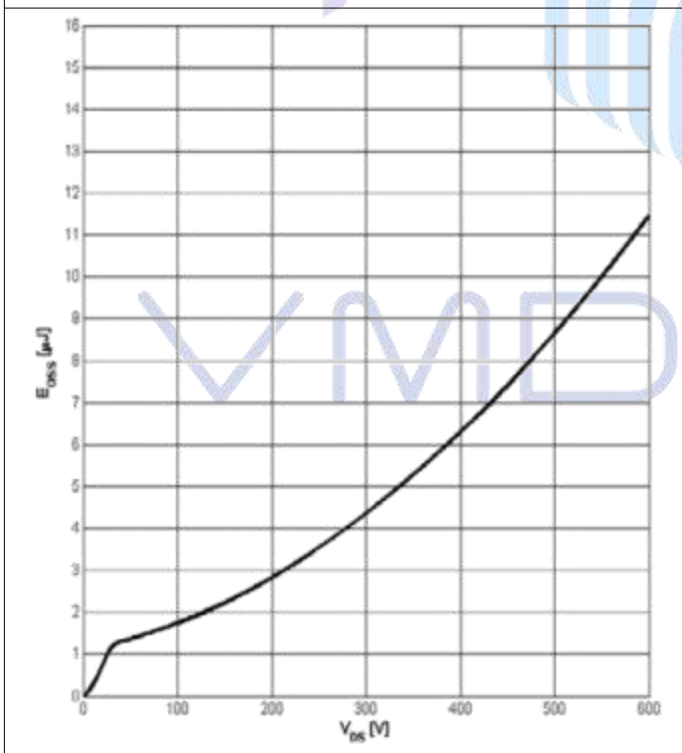
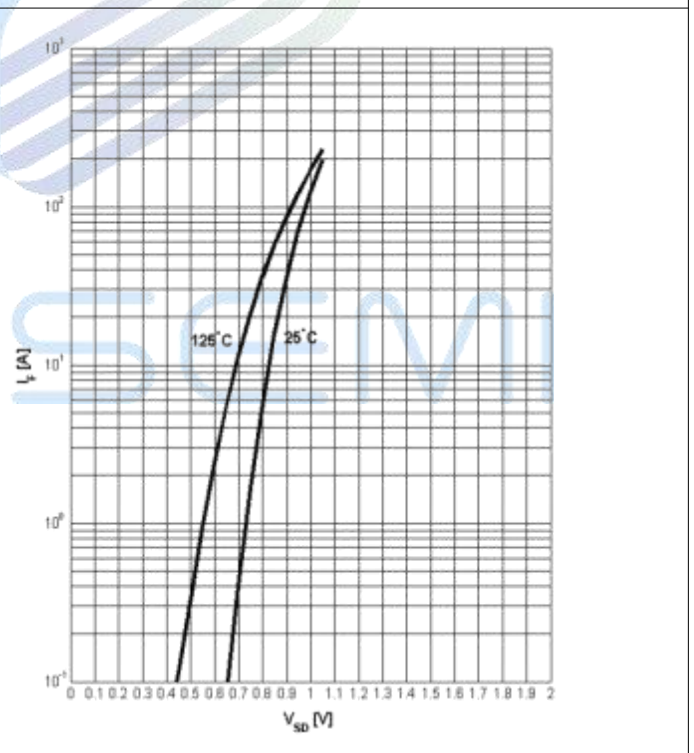
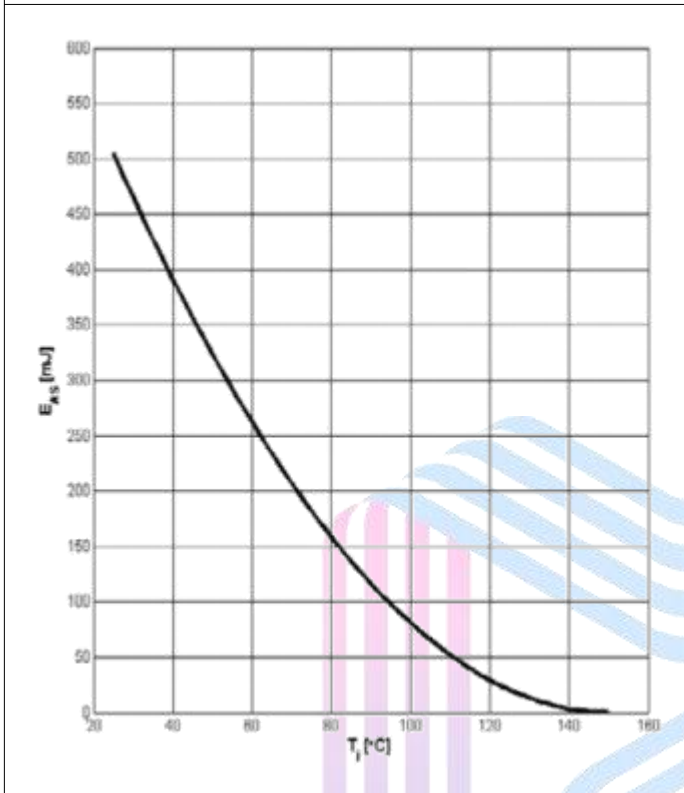
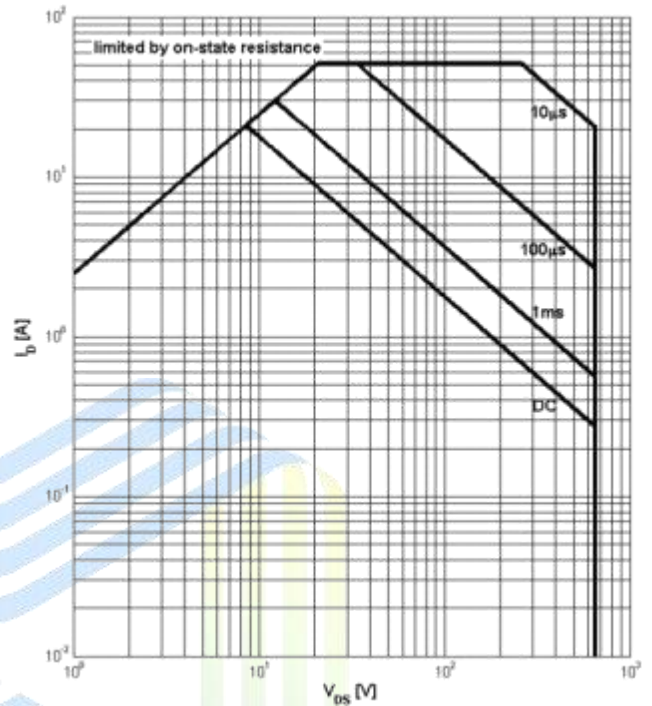
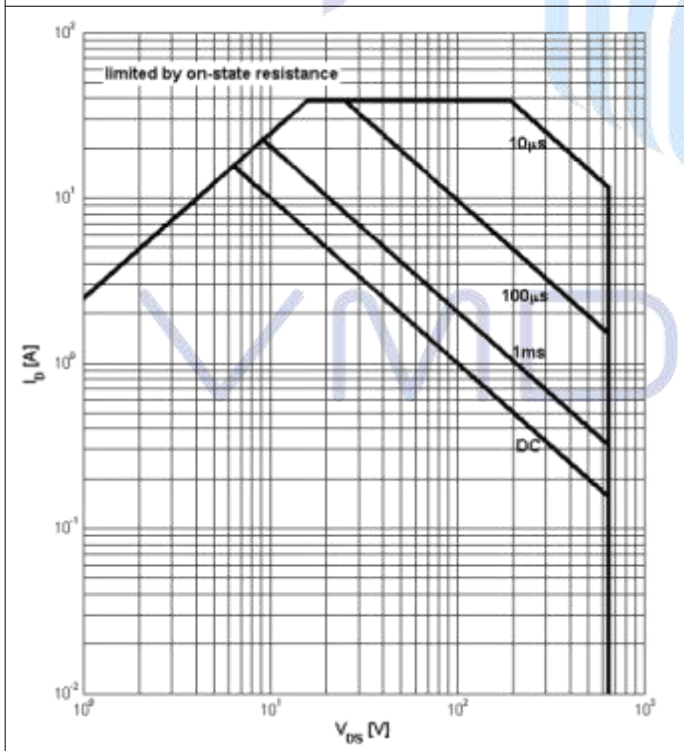
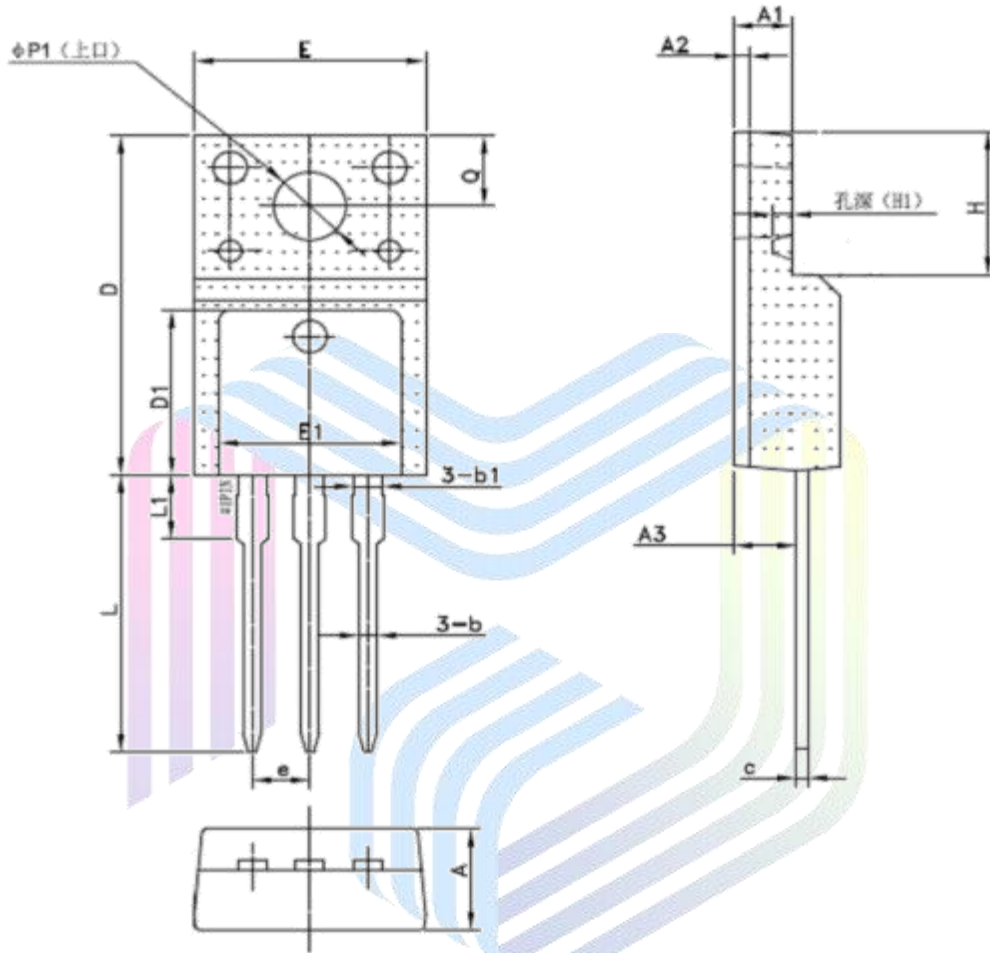


Figure 14: Forward Characteristics of Reverse Diode

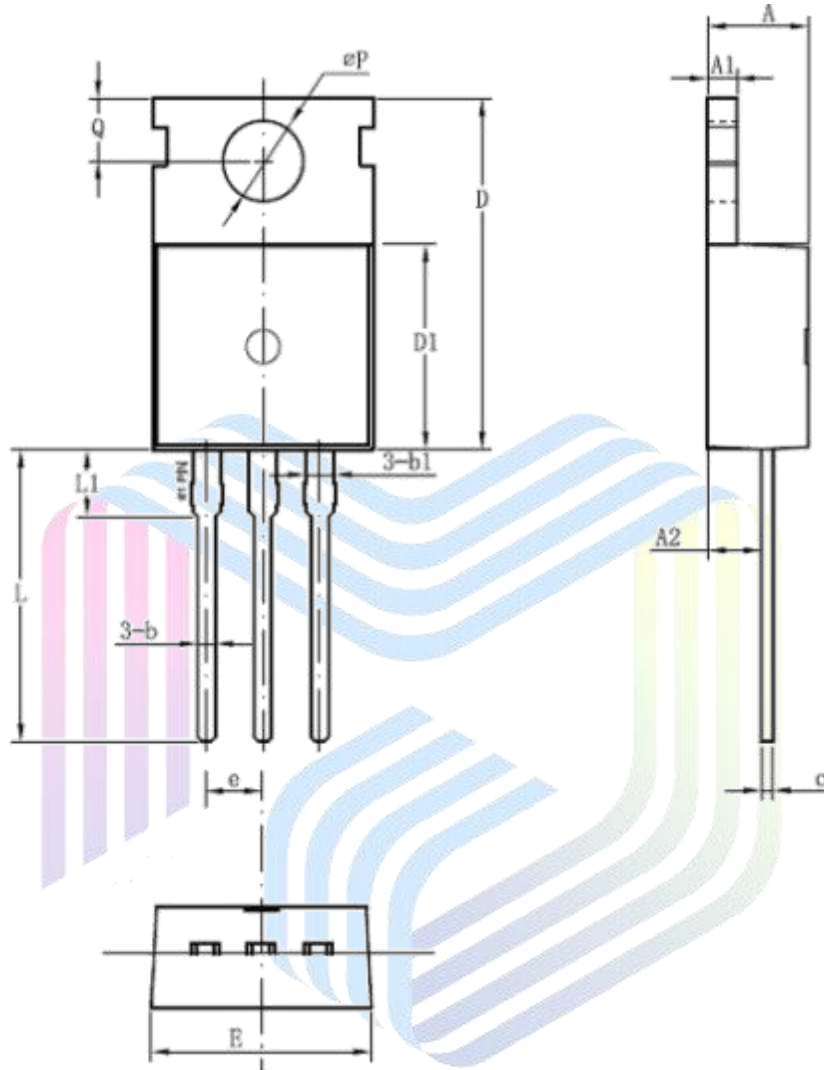


**Figure 15: Avalanche Energy**

**Figure 16: Safe Operating Area  $T_C= 25\text{ }^\circ\text{C}$** 

**Figure 17: Safe Operating Area  $T_C= 80\text{ }^\circ\text{C}$** 


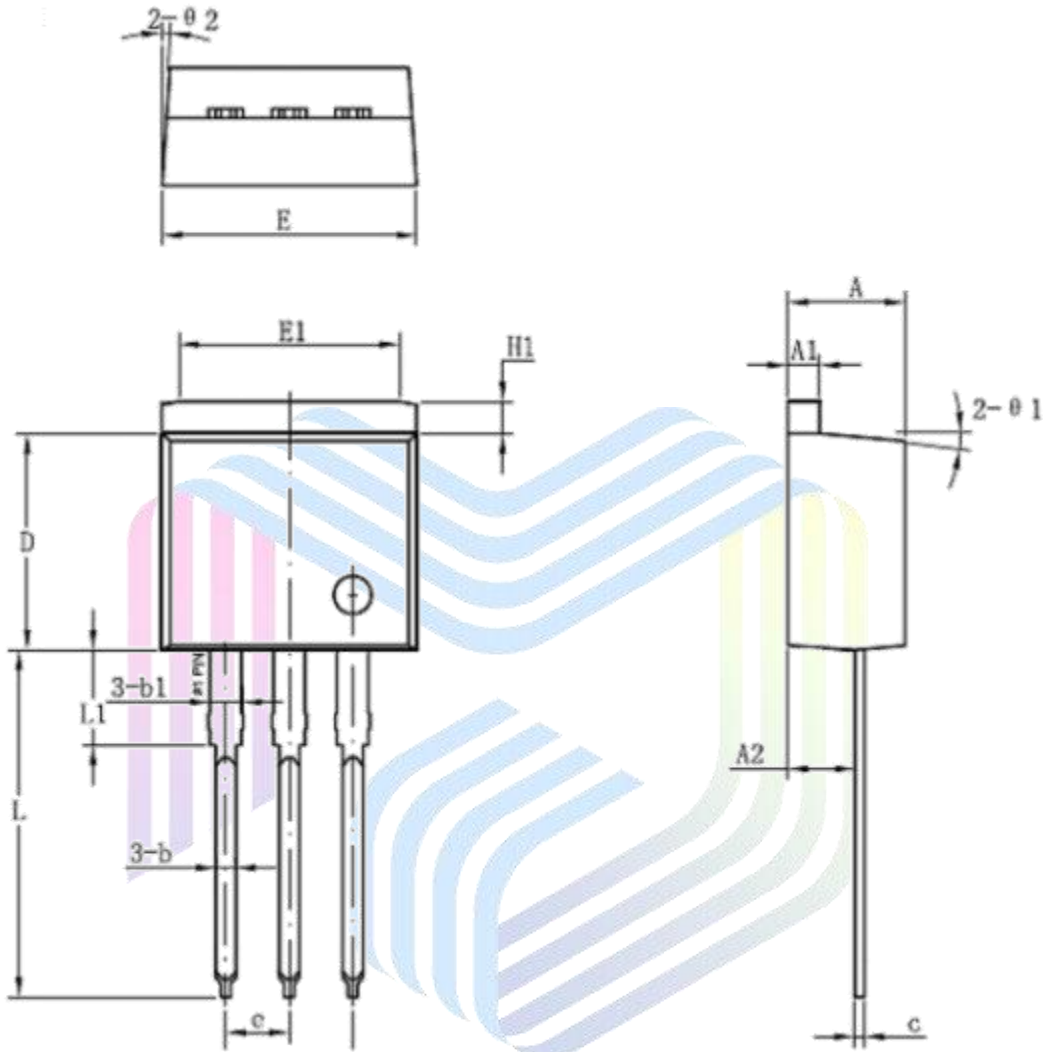


**Mechanical Dimensions:**
**TO-220F Package Information**


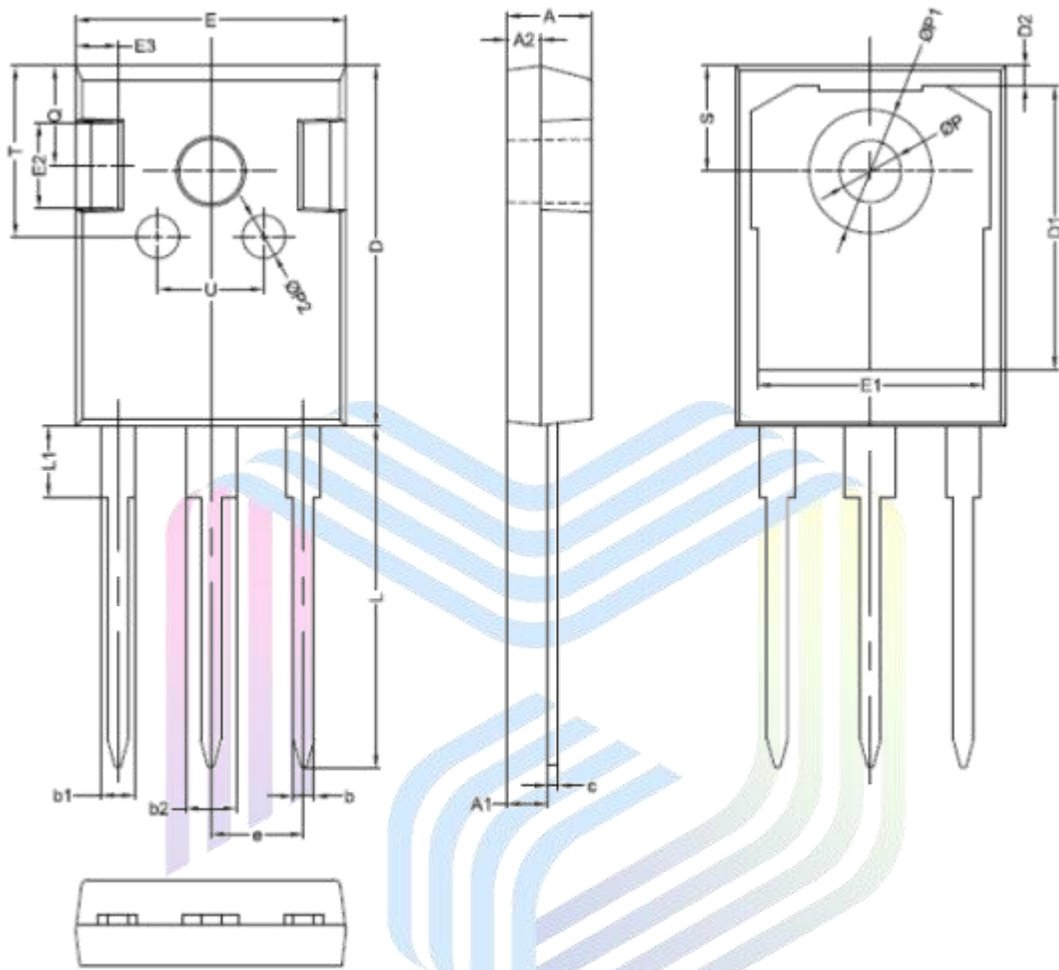
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.70	4.90
A1	2.34	2.54	2.90
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.55	-	0.95
b1	-	1.28	-
c	0.42	0.50	0.70
D	14.70	-	16.07
D1	-	7.70	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54(BSC)		
H	-	6.70	-
(H1)	-	(0.81)	-
L	12.48	12.98	13.50
L1	-	2.93	-
φP1	-	3.18	-
Q	2.90	3.30	3.50

**TO-220C Package Information**


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e	2.54(BSC)		
L	12.60	13.08	13.60
L1	-	3.00	-
$\Phi P$	3.50	3.60	3.80
Q	2.60	2.80	3.00

**TO-262 Package Information**


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.65	4.85
A1	1.17	1.27	1.40
A2	2.20	-	2.89
b	0.70	0.81	0.96
b1	-	1.27	-
c	0.36	0.40	0.61
D	8.55	-	9.4
E	9.80	10.10	10.31
E1	-	8.80	-
e	2.54(BSC)		
H1	1.00	1.25	1.40
L	12.60	-	14.08
L1	-	3.8	-
θ1	-	5°	-
θ2	-	4°	-

**TO-247 Package Information**


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E2	-	5.00	-
A1	2.21	2.41	2.61	E3	-	2.50	-
A2	1.90	2.00	2.10	e	5.44(BSC)		
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	-	7.40
D	20.80	21.00	21.20	P2	-	2.50	-
D1	-	16.55	-	Q	-	5.80	-
D2	-	1.20	-	S	6.05	6.15	6.25
E	15.60	15.80	16.00	T	-	10.00	-
E1	-	13.30	-	U	-	6.20	-

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