VTXX015R059N

Datasheet

General Description

The VMD VTXX015R059N is a low voltage power MOSFET, fabricated using advanced split gate trench technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and synchronous rectification.

The VTXX015R059N break down voltage is 150V and it has a high rugged avalanche characteristics.

The VTXX015R059N is available in TO-220C and TO-263-2 and TO-247 and TOLL packages

Symbol

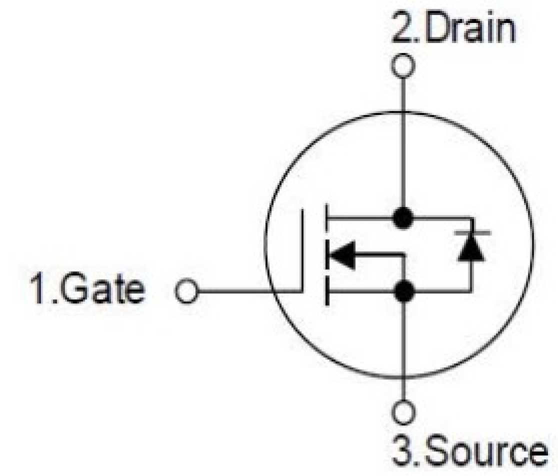


Figure 1 Symbol of VTXX015R059N

Features

- $R_{DS(ON)_TYP}$ = 5.1mΩ,TO-220C,@V_{GS} = 10V.
- $R_{DS(ON)_TYP}$ = 5.0mΩ,TO-263-2,@V_{GS} = 10V.
- $R_{DS(ON)_TYP}$ = 5.1mΩ,TO-247,@V_{GS} = 10V.
- $R_{DS(ON)_TYP}$ = 4.1mΩ,TOLL,@V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=53.6nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Package Type

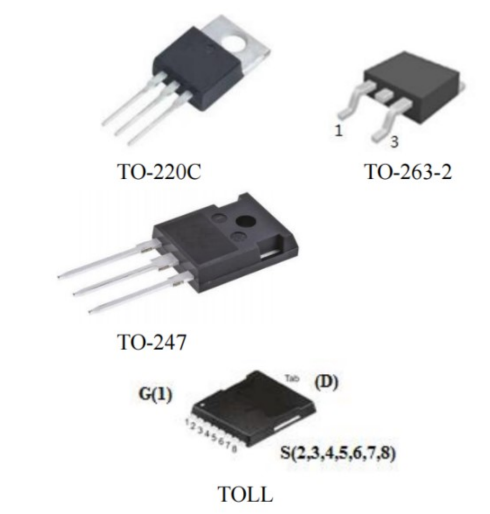
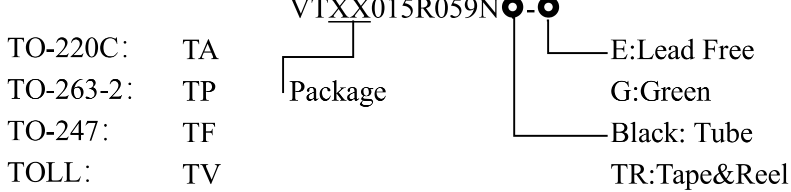


Figure 2 Package Type of VTXX015R059N

Application

- BMS
- Server/Telecom
- High Power Supply
- E-Tools

Ordering Information



Package	Part Number		Packing Type
	Lead Free	Green	
TO-220C	VTTA015R059N-E	VTTA015R059N-G	Tube
TO-263-2	VTTP015R059NTR-E	VTTP015R059NTR-G	Tape & Reel
TO-247	VTTF015R059N-E	VTTF015R059N-G	Tube
TOLL	VTTV015R050NTR-E	VTTV015R050NTR-G	Tape & Reel

Absolute Maximum Ratings

Parameter		Symbol	Rating		Unit
Drain-Source Voltage		V_{DSS}	150		V
Gate-Source Voltage		V_{GSS}	±20		V
Continuous Drain Current, Packaged limited	T_C=25℃	I_D	TO-220C	120	A
			TO-263-2	120	
			TO-247	120	
			TOLL	180	
	T_C=100℃		TO-220C	116	
			TO-263-2	116	
			TO-247	116	
			TOLL	160	
Continuous Drain Current,Silicon	T_C=25℃		TO-220C	159	
			TO-263-2	159	
			TO-247	159	
			TOLL	180	
Pulsed Drain Current (Note 2)		I_{DM}	TO-220C	480	A
			TO-263-2	480	
			TO-247	480	
			TOLL	720	
Max Power Dissipation		P_D	265		W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	900		mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	183		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.4		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	40		A
Continuous Diode Forward Current		I_S	120		A
Diode Pulse Current		$I_{S.PULSE}$	360		A
Operating Junction Temperature		T_J	175		℃
Storage Temperature		T_{STG}	-55 to 175		℃
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. IAS= 27A, VDD= 75V, RG= 25Ω, Starting TJ= 25°C
4. IAS _Limit= 60A, VDD = 75V, RG = 25Ω, Starting TJ = 25°C

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	TO-220C	R_{thJC}			0.47	ºC/W
	TO-263-2				0.47	
	TO-247				0.47	
	TOLL				0.4	
Thermal Resistance, Junction-to-Ambient		R_{thJA}			62	

Electrical Characteristics

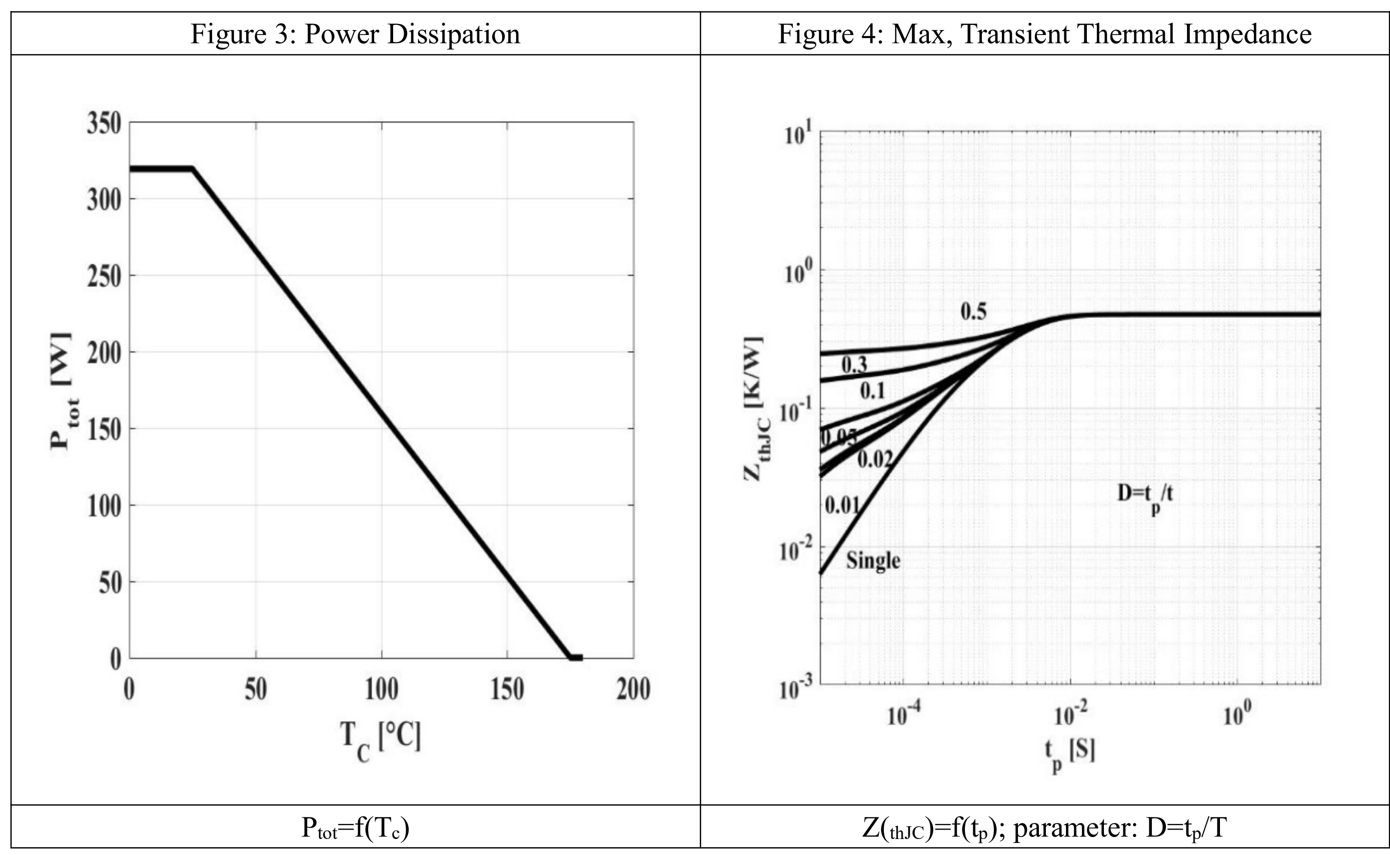
T_J= 25 ºC, unless otherwise specified

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	150			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=150V, V_{GS}=0V			1	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			100	nA
	Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-100	
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=0.25mA	2.0	3.0	4.0	V
Static Drain-Source On-Resistance	TO-220C	$R_{DS(ON)}$	V_{GS}=10V, I_D=60A		5.1	5.9	mΩ
	TO-263-2				5.0	5.8	
	TO-247				5.1	5.9	
	TOLL				4.1	5.0	
Gate Resistance		R_G	F=1MHz, Open Drain		1.3		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50, V_{GS}=0V, f=1MHz		3.6		nF
Output Capacitance		C_{OSS}			2.4		nF
Reverse Transfer Capacitance		C_{RSS}			39		pF
Effective output capacitance, energy related Note 5		$C_{O(ER)}$	V_{GS}=0V, V_{DS}=0…90V		2.3		nF
Effective output capacitance, time related Note 6		$C_{O(TR)}$			2.8		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=50V, I_D=30A, R_G=1.6Ω, V_{GS}=10V		12		nS
Rise Time		t_r			5		
Turn-off Delay Time		$t_{d(off)}$			14		
Fall Time		t_f			4		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=75V, I_D=60A, V_{GS}=0 to 10V		18		nC
Gate to Drain Charge		Q_{gd}			12.4		
Gate Charge Total		Q_g			53.6		
Gate Plateau Voltage		$V_{Plateau}$			5.0		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		44.8		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=60A		0.87	1.1	V
Reverse Recovery Time		t_{rr}	V_R=75V, I_F=60A, dI_F/dt=100A/us		52		nS
Reverse Recovery Charge		Q_{rr}			86		nC
Peak Reverse Recovery Current		I_{rrm}			3.3		A

Note:

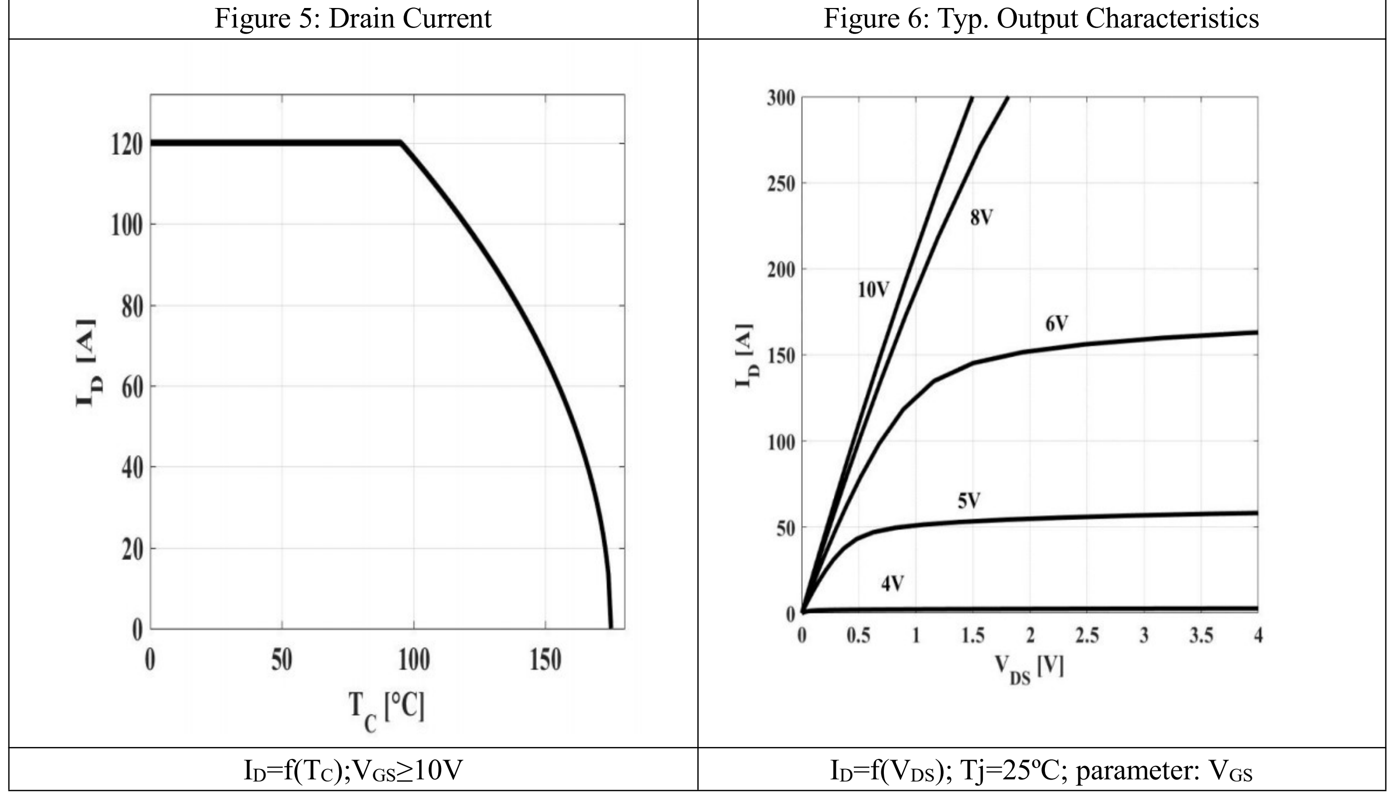
5. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as COSS while VDS is rising from 0 to 60V
6. $C_{O\ (tr)}$ is a fixed capacitance that gives the same charging time as COSS while VDS is rising from 0 to 60 V

Typical Performance Characteristics



$P_{tot}=f(T_c)$

$Z_{(thJC)}=f(t_p)$; parameter: $D=t_p/T$



$I_D=f(T_C)$;$V_{GS}\geq 10V$

$I_D=f(V_{DS})$; Tj=25°C; parameter: V_{GS}

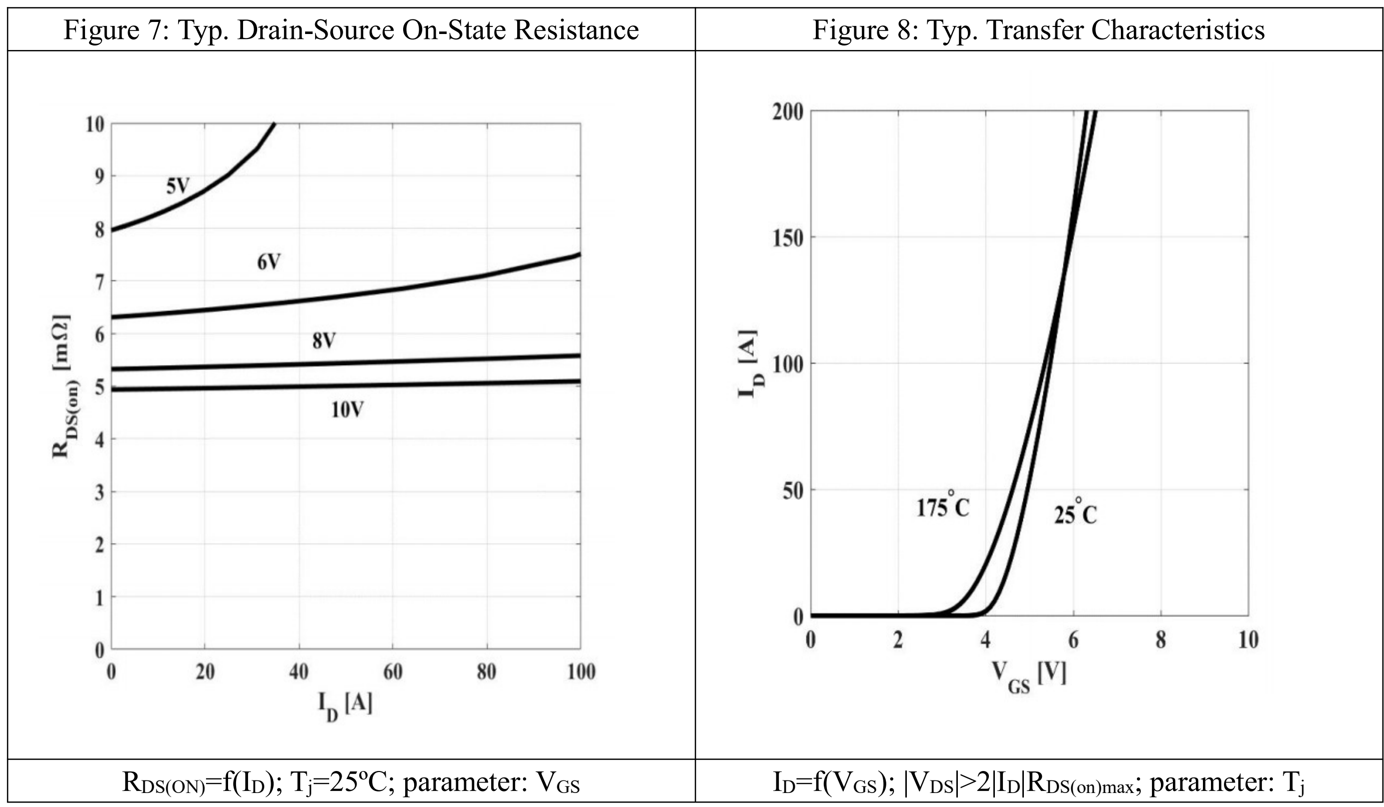


Figure 7: Typ. Drain-Source On-State Resistance

$R_{DS(ON)}=f(I_D)$; $T_j=25°C$; parameter: V_{GS}

Figure 8: Typ. Transfer Characteristics

$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

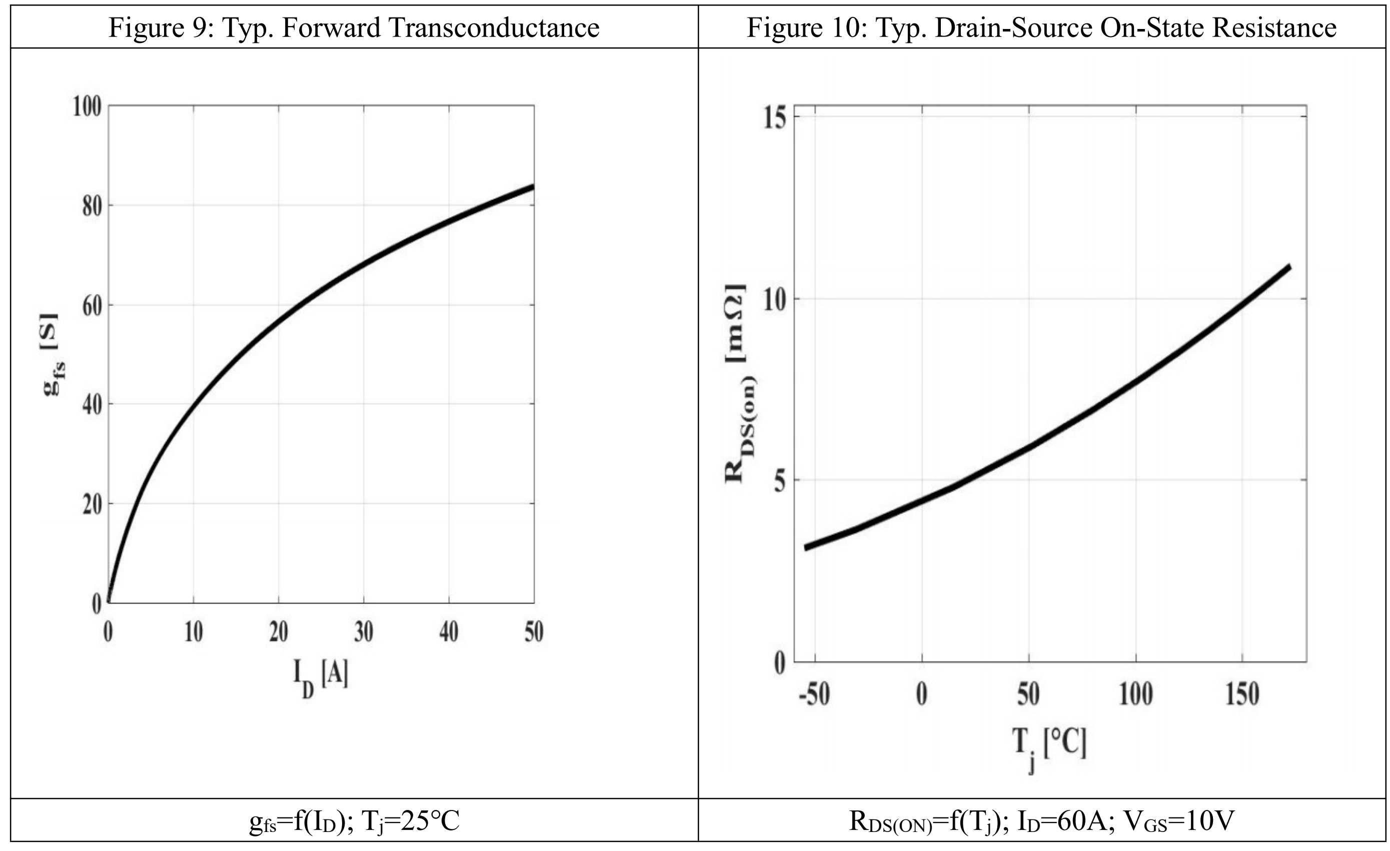


Figure 9: Typ. Forward Transconductance

$g_{fs}=f(I_D)$; $T_j=25°C$

Figure 10: Typ. Drain-Source On-State Resistance

$R_{DS(ON)}=f(T_j)$; $I_D=60A$; $V_{GS}=10V$

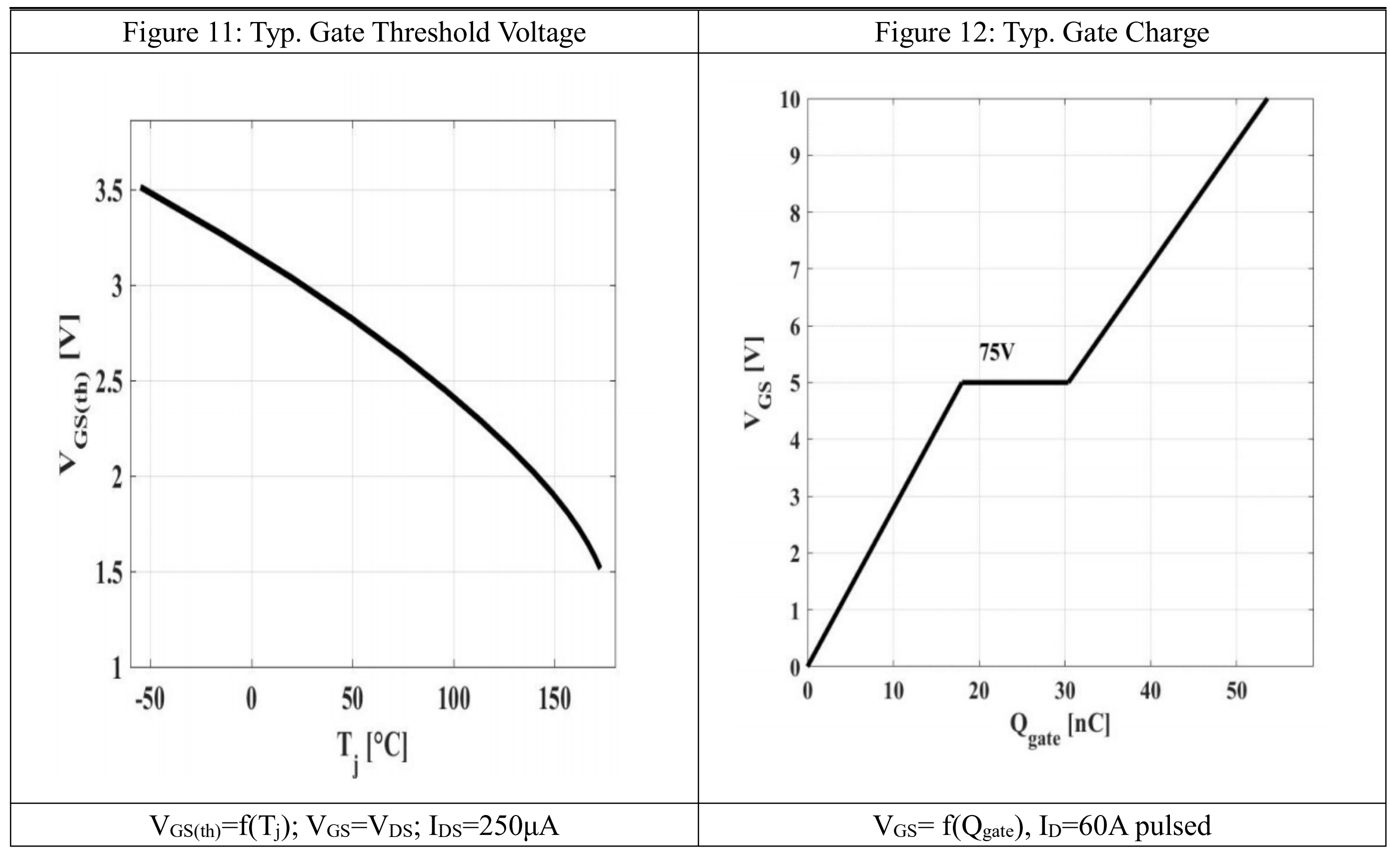


Figure 11: Typ. Gate Threshold Voltage

$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_{DS}=250\mu A$

Figure 12: Typ. Gate Charge

$V_{GS}= f(Q_{gate})$, $I_D=60A$ pulsed

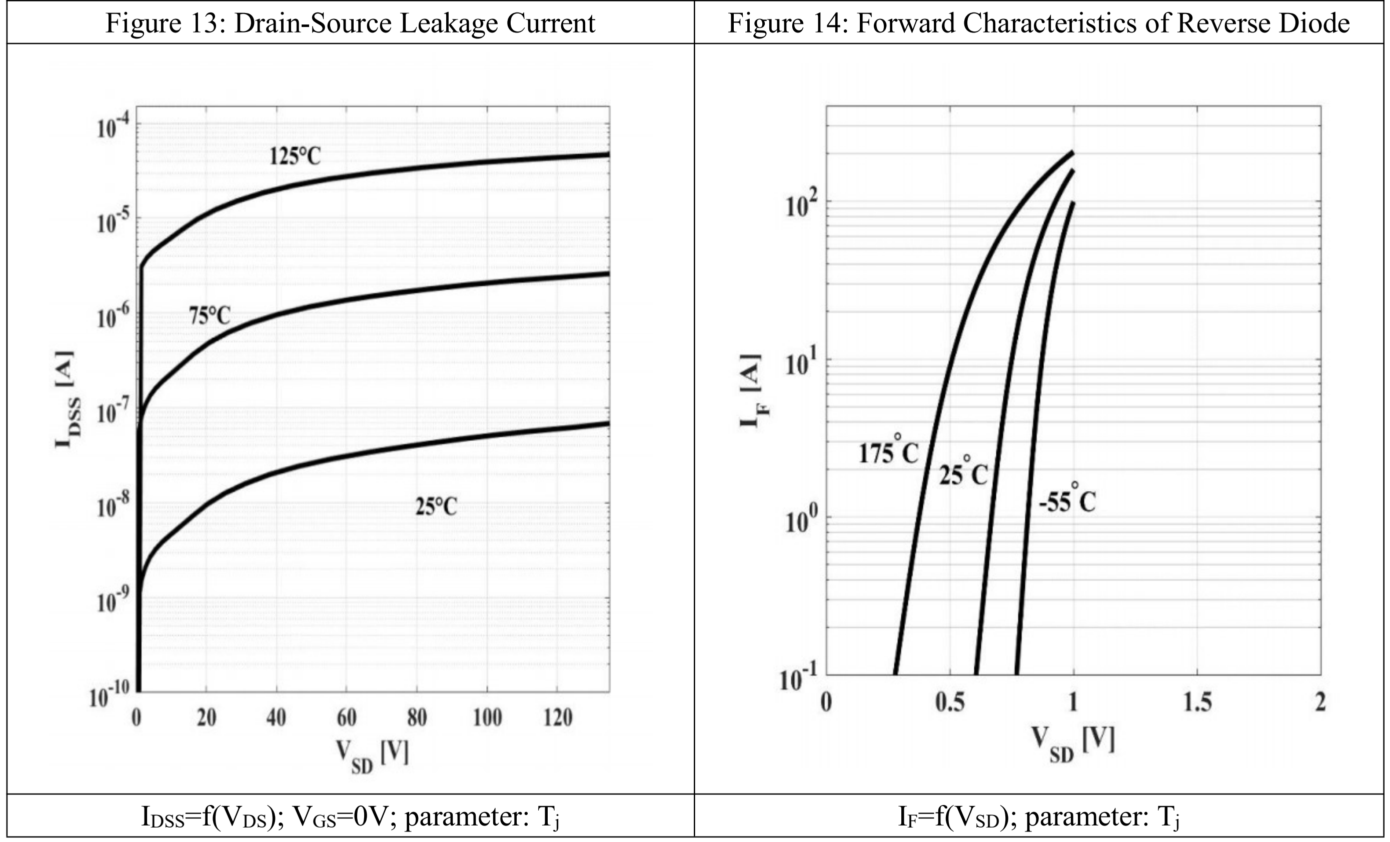


Figure 13: Drain-Source Leakage Current

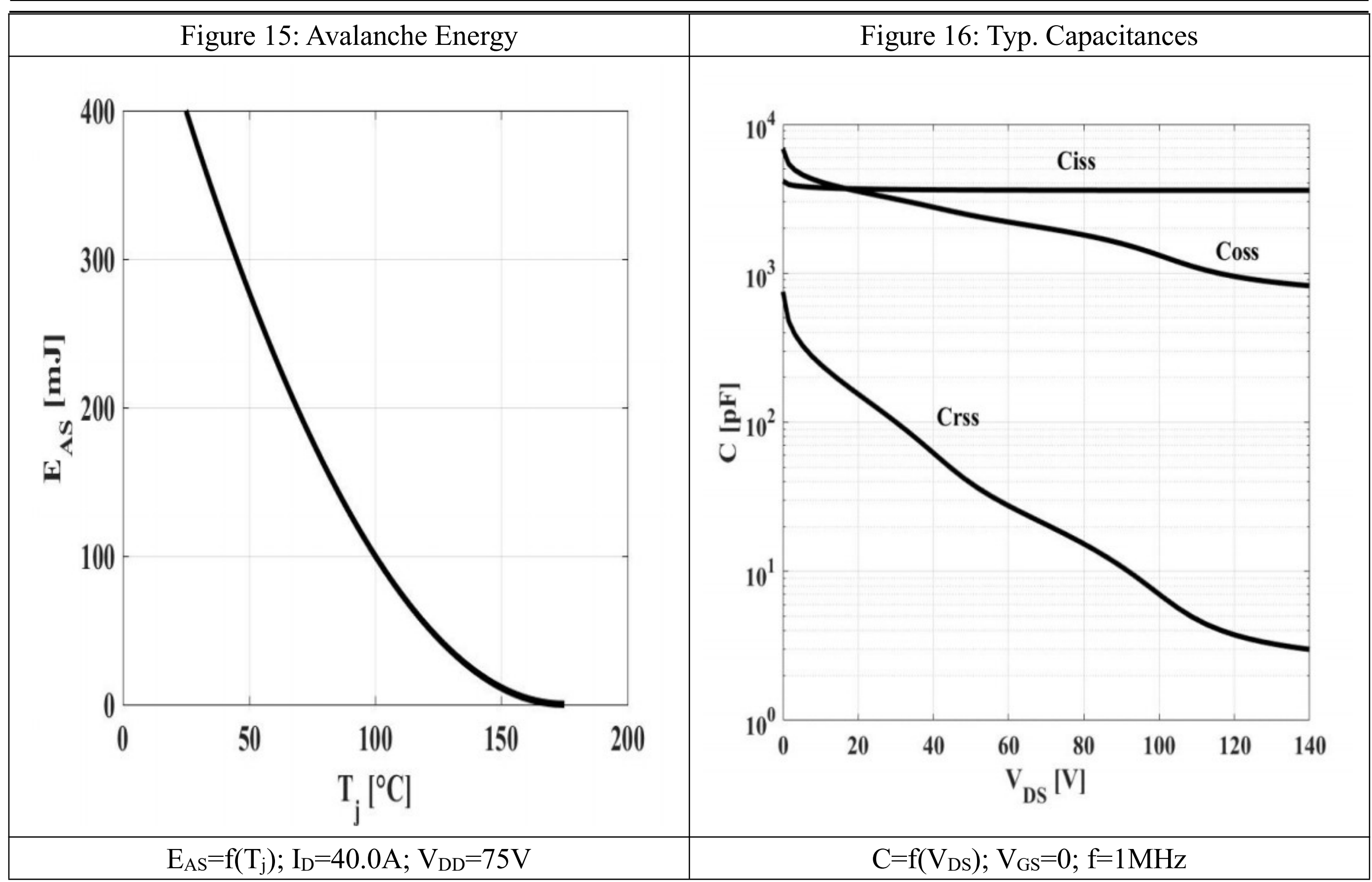
$I_{DSS}=f(V_{DS})$; $V_{GS}=0V$; parameter: T_j

Figure 14: Forward Characteristics of Reverse Diode

$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy

Figure 16: Typ. Capacitances

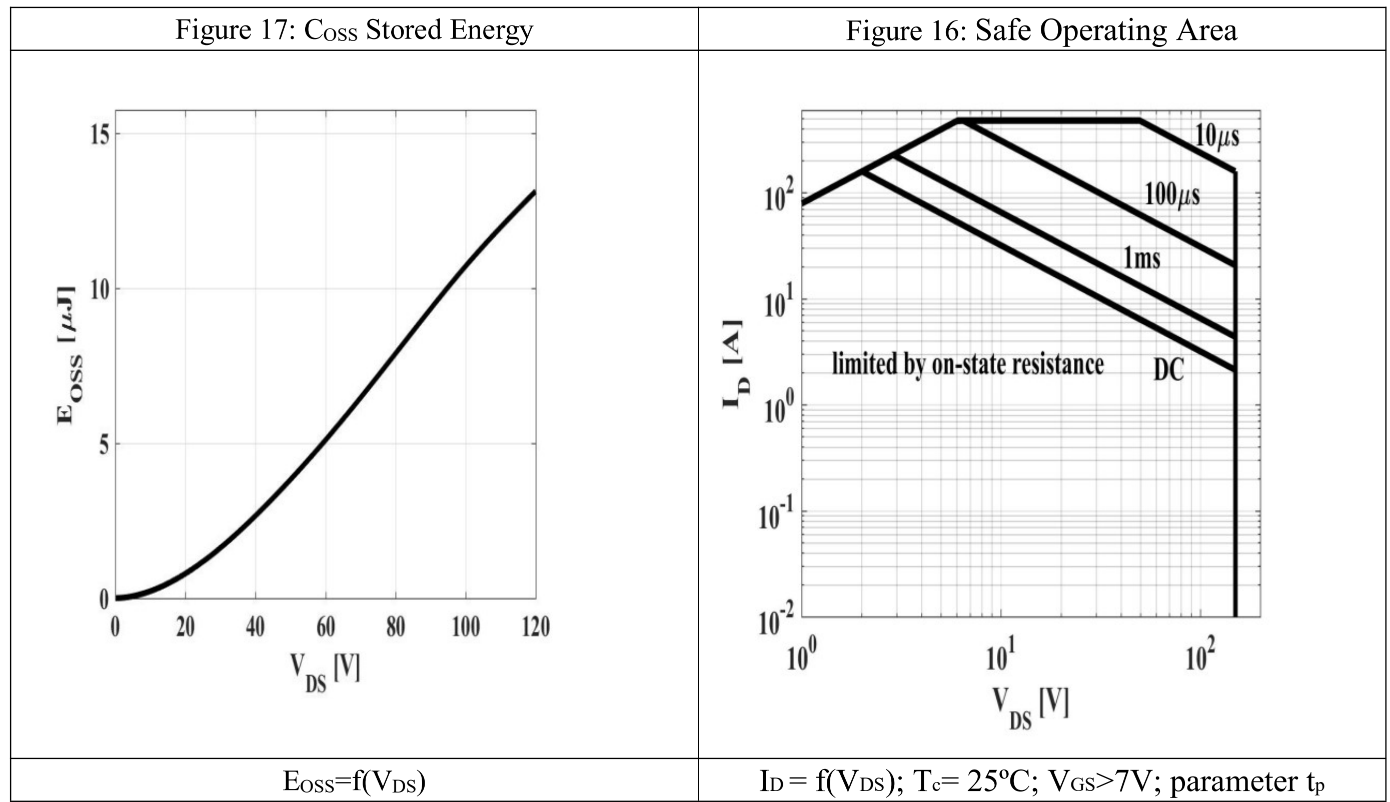


E_{AS}=f(T_j); I_D=40.0A; V_{DD}=75V

C=f(V_{DS}); V_{GS}=0; f=1MHz

Figure 17: C_{OSS} Stored Energy

Figure 16: Safe Operating Area

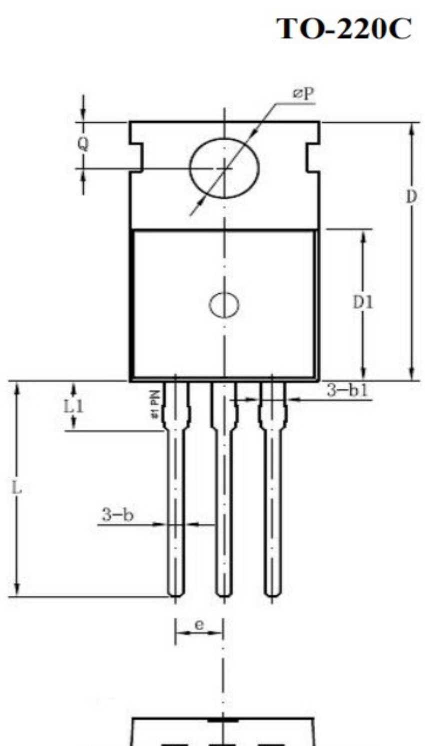


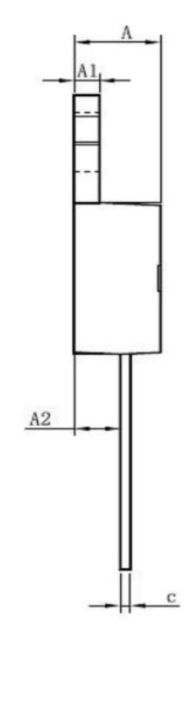
E_{OSS}=f(V_{DS})

I_D = f(V_{DS}); T_c= 25ºC; V_{GS}>7V; parameter t_p

Mechanical Dimensions(Continued)

TO-220C **Unit: mm**

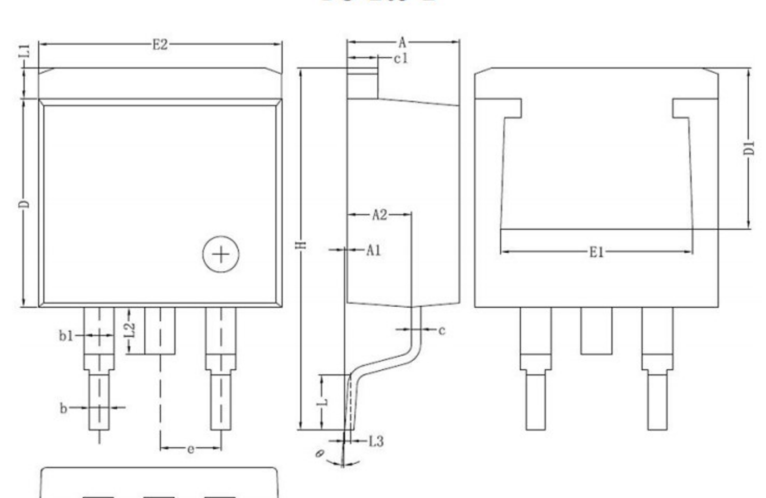




Symbol	Dimensions(mm)		
	Min.	**Typ.**	**Max.**
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e	2.54(BSC)		
L	12.60	13.08	13.60
L1	-	3.00	-
ΦP	3.50	3.60	3.80
Q	2.60	2.80	3.00

Mechanical Dimensions(Continued)

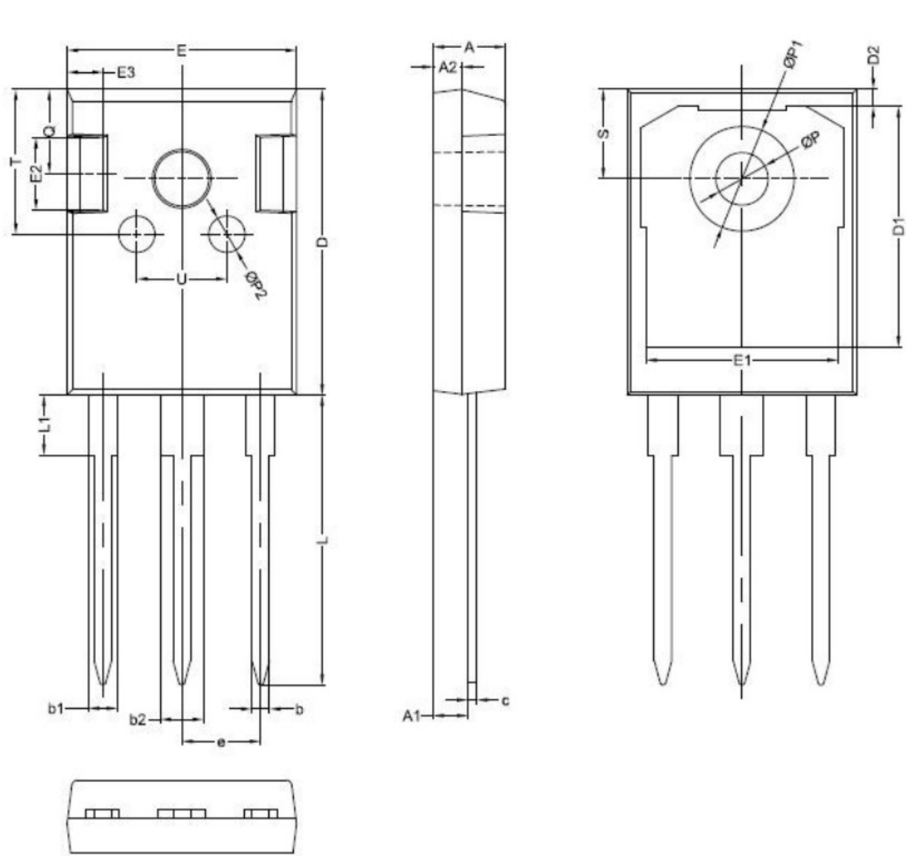
TO-263-2 Unit: mm



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.60	4.85
A1	0.00	0.10	0.25
A2	2.59	2.69	2.89
b	0.70	0.81	0.96
b1	-	1.27	-
c	0.36	0.40	0.61
c1	1.15	1.27	1.40
D	8.55	-	9.40
D1	6.40	-	-
E	9.80	10.10	10.31
E1	7.60	-	-
E2	9.80	10.00	10.20
e	2.54(BSC)		
H	14.70	15.20	16.00
L	2.00	2.30	2.84
L1	1.00	1.27	1.40
L2	-	-	2.20
L3	-	0.25	-
θ	0°	-	8°

Mechanical Dimensions(Continued)

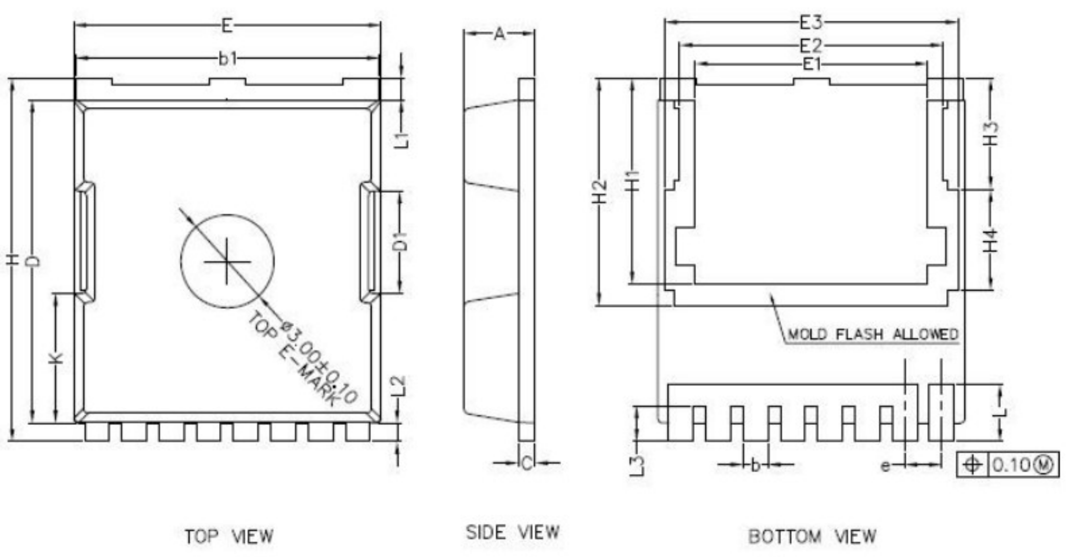
TO-247 **Unit: mm**

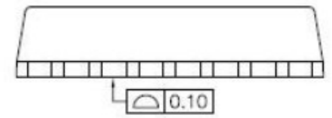


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E2	-	5.00	-
A1	2.21	2.41	2.61	E3	-	2.50	-
A2	1.90	2.00	2.10	e	5.44(BSC)		
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	-	7.40
D	20.80	21.00	21.20	P2	-	2.50	-
D1	-	16.55	-	Q	-	2.80	-
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	-

Mechanical Dimensions(Continued)

TO-Leadless





Symbol	Dimensions(mm)				Symbol	Dimensions(mm)		
	Min.	Typ.	Max.			Min.	Typ.	Max.
A	2.20	2.30	2.40		H	11.48	11.73	11.88
b	0.70	0.80	0.90		H1	6.55	6.65	6.75
b1	9.70	9.80	9.90		H2	7.20	7.35	7.50
c	0.40	0.50	0.60		H3	3.44	3.59	3.74
D	10.28	10.43	10.58		H4	3.11	3.26	3.41
D1	3.15	3.30	3.45		K	4.03	4.18	4.33
E	9.70	9.90	10.10		L	1.60	1.85	2.10
E1	7.35	7.50	7.65		L1	0.55	0.70	0.85
E2	8.35	8.50	8.65		L2	0.45	0.60	0.75
E3	9.31	9.46	9.61		L3	1.00	1.15	1.30
e	1.10	1.20	1.30					

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