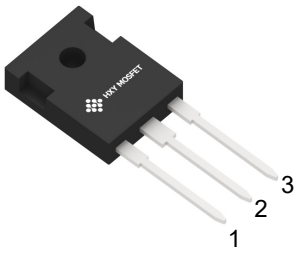
IMW120R220M1HXKSA1

SiC Power MOSFET N-Channel Enhancement Mode

Features

- 3rd generation SiC MOSFET technology
- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Halogen free, RoHS compliant



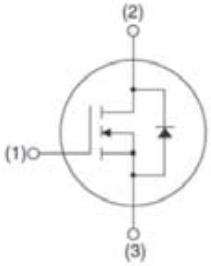
TO-247
(TO-247-3)

Benefits

- Reduce switching losses and minimize gate ringing
- Higher system effciency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

Applications

- Renewable energy
- EV battery chargers
- High voltage DC/DC converters
- Switch Mode Power Supplies

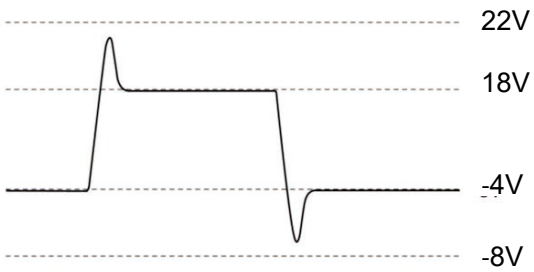


Ordering Part Number	Package	Qty(PCS)
IMW120R220M1HXKSA1	TO-247(TO-247-3)	30

Maximum Ratings (T_C = 25 °C unless otherwise specifed)

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current T_C = 25°C T_C = 100°C	I_D	 17 12	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\ pulse}$	34	A
Avalanche energy, single pulse (L=10mH)	E_{AS}	1000	mJ
Gate-Source voltage	V_{GS}	-4/+18	V
Gate-Source voltage（dynamic,Absolute maximum values）	V_{GSmax}	-8/+22	V
Power dissipation (T_C = 25°C)	P_{tot}	116	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+175	°C

- Example of acceptable V_{GS} waveform



Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R_{thJC}	1.29	°C/W
Thermal resistance, junction – ambient. Max	R_{thJA}	40	

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	1200	-	-	V	V_{GS}=0V, I_D=100uA
Gate threshold voltage	$V_{GS(th)}$	2	3.1	4	V	V_{DS}=V_{GS},I_D=2.3mA
Zero gate voltage drain current	I_{DSS}	- -	1 5	20 -	μA	V_{DS}=1200V,V_{GS}=0V T_j=25°C T_j=175°C
Gate-source leakage current	I_{GSS}	-		200	nA	V_{GS}=18V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	160 250	208 -	mΩ	V_{GS}=18V,I_D=8A, T_j=25°C T_j=175°C
Transconductance	g_{fs}	-	5	-	S	V_{DS}=20V,I_D=40A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	624	-	pF	V_{DS} = 1000V V_{GS} = 0V T_J = 25°C V_{AC} = 25mV f = 1MHz
Output Capacitance	C_{oss}	-	42	-		
Reverse Transfer Capacitance	C_{rss}	-	6	-		
Gate Total Charge	Q_G	-	37.4	-	nC	V_{DS} = 800V V_{GS} = -0/18V I_D =8A I_G =10mA
Gate-Source charge	Q_{gs}	-	5.3	-		
Gate-Drain charge	Q_{gd}	-	20.6	-		
Turn-On Switching Energy	E_{ON}	-	11	-	μJ	V_{DD} = 800V V_{GS} = -4/+18V I_D =8A R_G = 5Ω L = 120uH
Turn-Off Switching Energy-	E_{OFF}	-	230			
Turn-on delay time	$t_{d(on)}$	-	12.25	-	ns	
Rise time	t_r	-	18.68	-		
Turn-off delay time	$t_{d(off)}$	-	17.37	-		
Fall time	t_f	-	11.82	-		
Gate resistance	R_G	-	3.3	-	Ω	V_{AC} = 25mV, f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}		3.6		V	V_{GS}=0V,I_{SD}=40A, T_J=25°C
			3.2			V_{GS}=0V,I_{SD}=40A, T_J=175°C
Body Diode Reverse Recovery Time	t_{rr}	-	13.5	-	ns	V_R = 400V, I_D = 8A di/dt = 1000A/μS T_J=25°C
Body Diode Reverse Recovery Charge	Q_{rr}	-	36.8	-	nC	

Typical Performance Characteristics

Fig 1. Output Characteristic (T_J=-55℃)

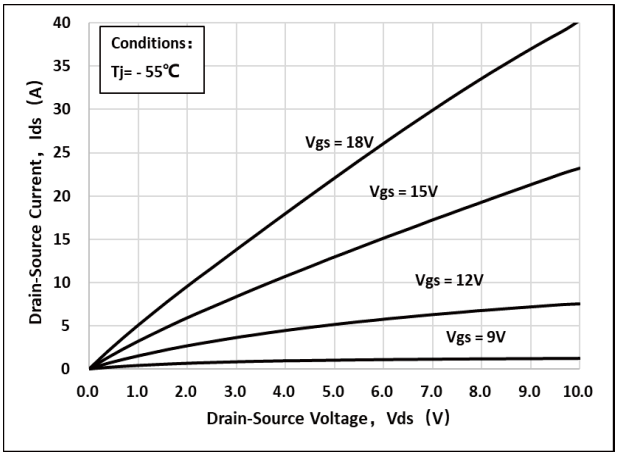


Fig 2. Output Characteristic (T_J=25℃)

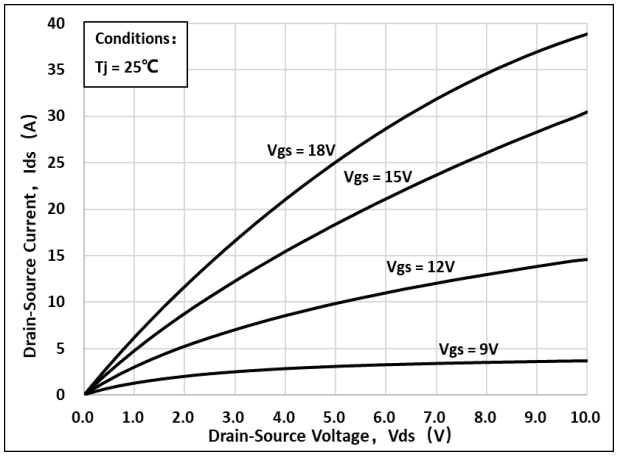


Fig 3. Output Characteristic (T_J=175℃)

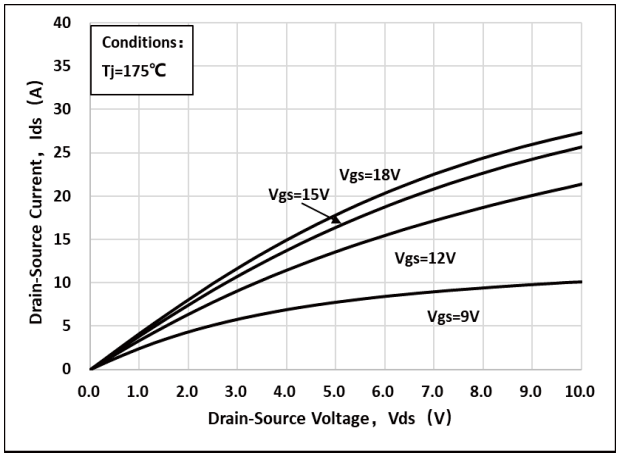


Fig 4: Rdson Vs Ids Characteristic

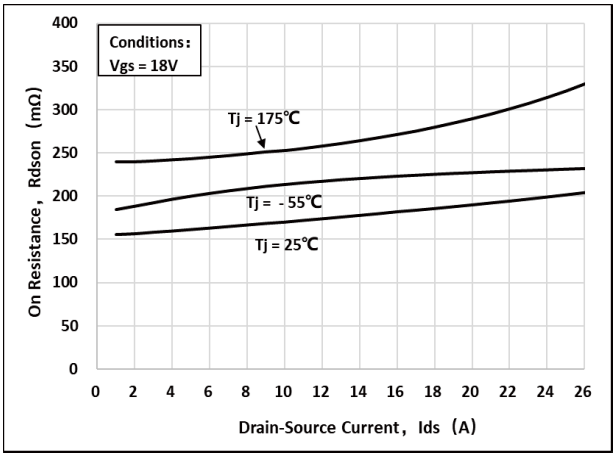


Fig 5: Rds(on) vs. Temperature

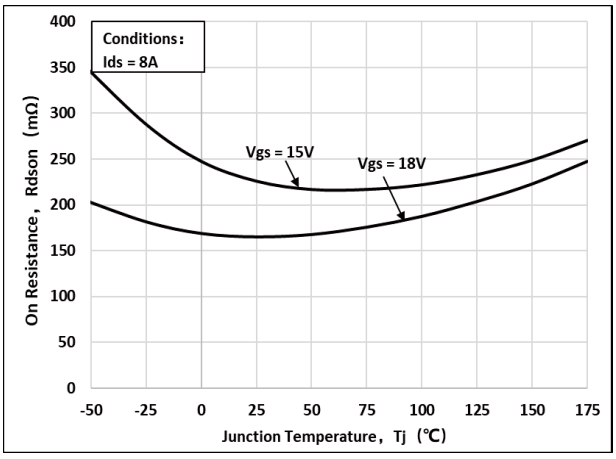


Fig 6: Transfer Characteristic

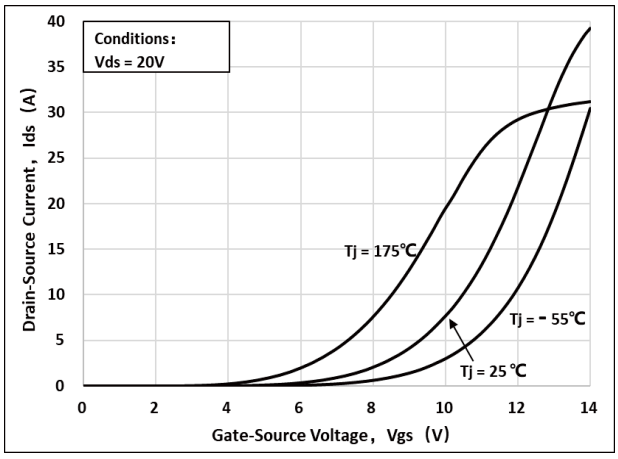


Fig 7: Body-diode Characteristic (T_J=-55℃)

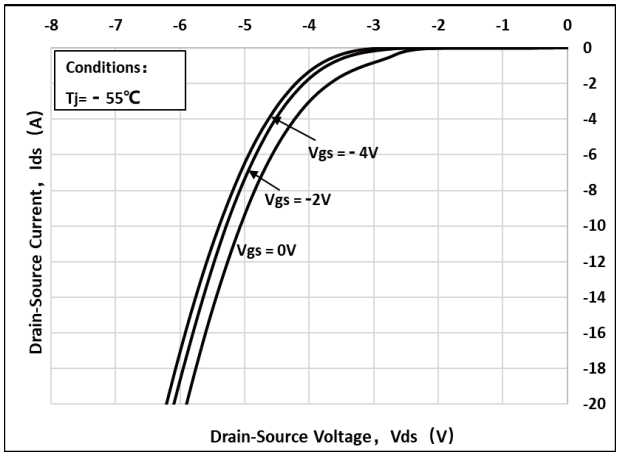


Fig 8: Body-diode Characteristic (T_J=25℃)

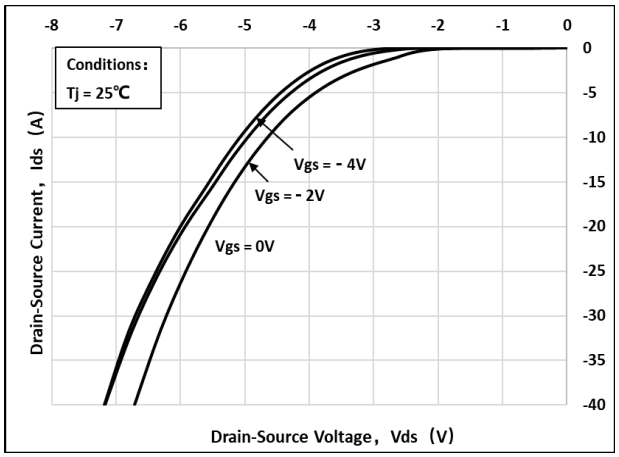


Fig 9: Body-diode Characteristic (T_J=175℃)

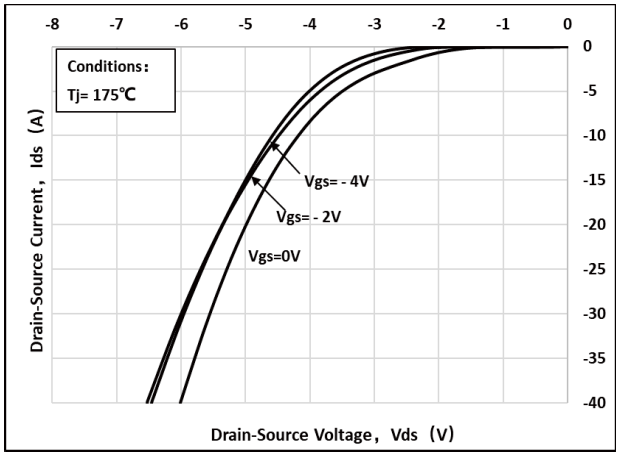


Fig 10: V_{TH} Vs T_J Temperature Characteristic

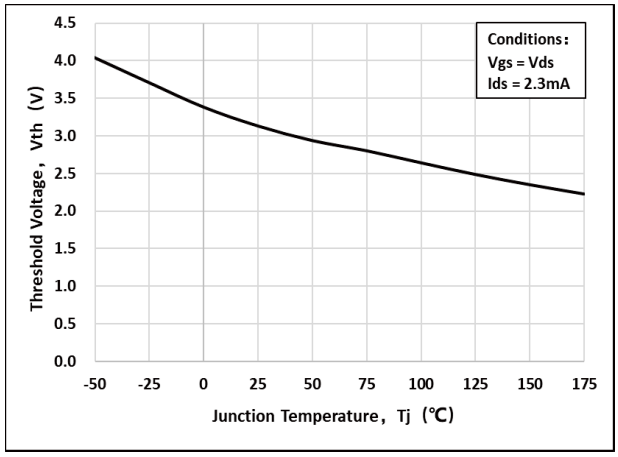


Fig 11: Gate Charge Characteristics

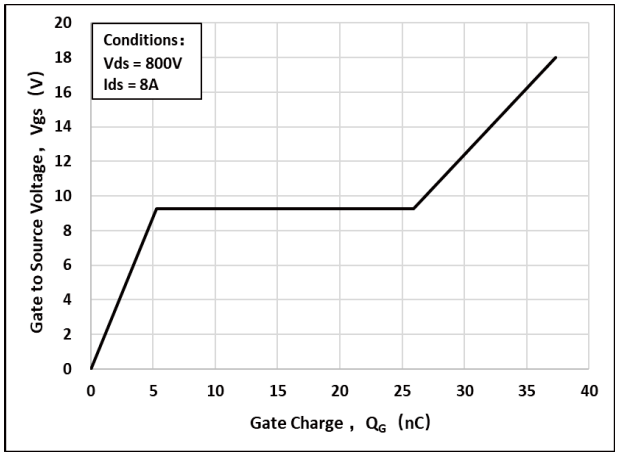


Fig 12: 3rd Quadrant Characteristic(T_J=-55℃)

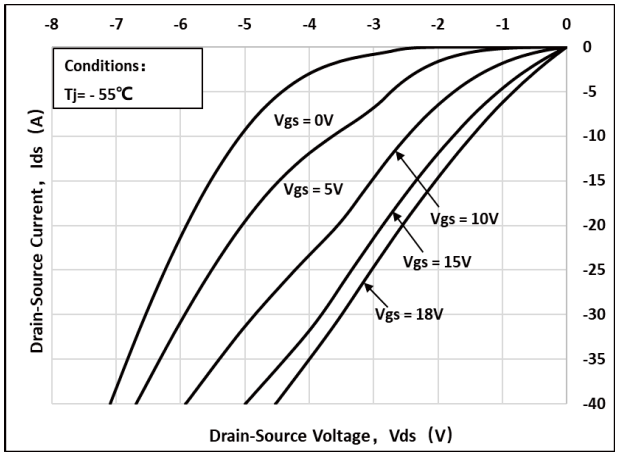


Fig 13: 3rd Quadrant Characteristic(T_J=25℃)

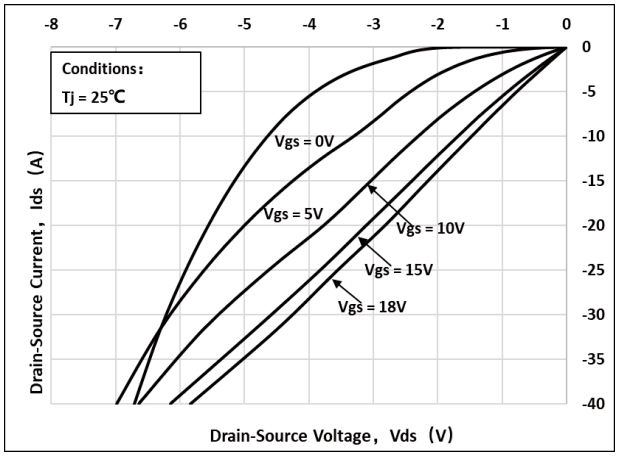


Fig 14: 3rd Quadrant Characteristic(T_J=175℃)

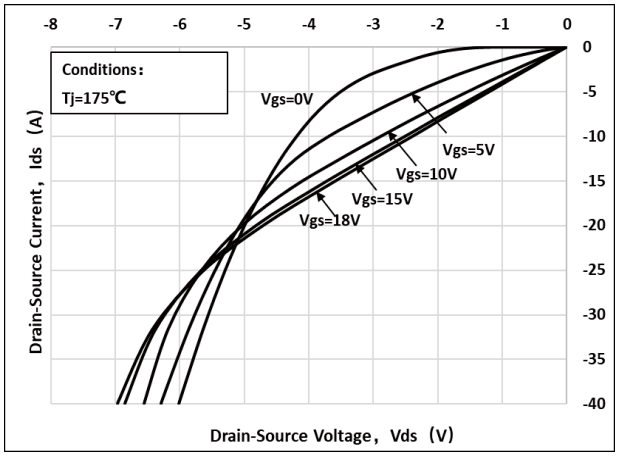


Fig 15: Capacitance Characteristic

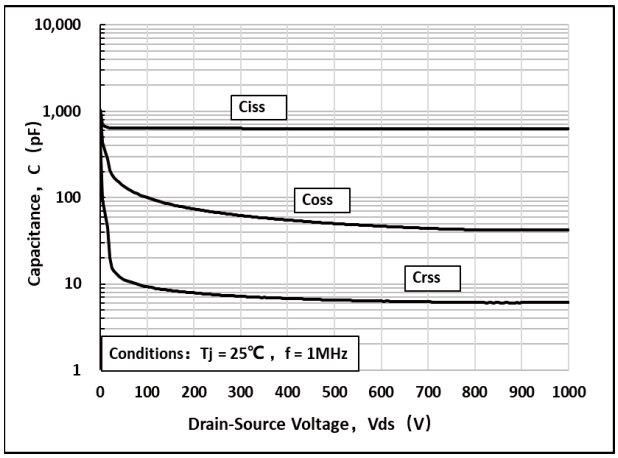


Fig 16: Safe Operating Area

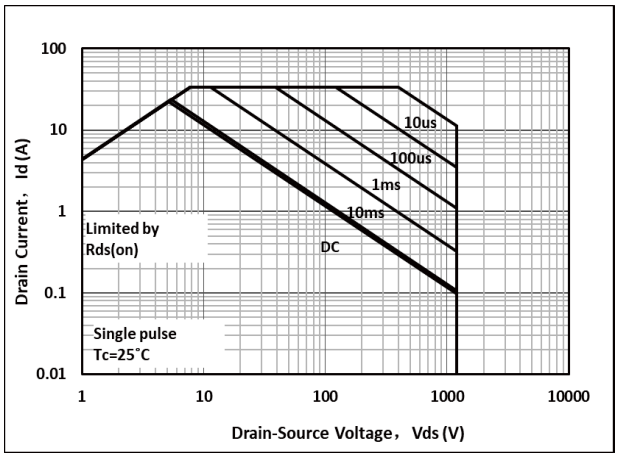
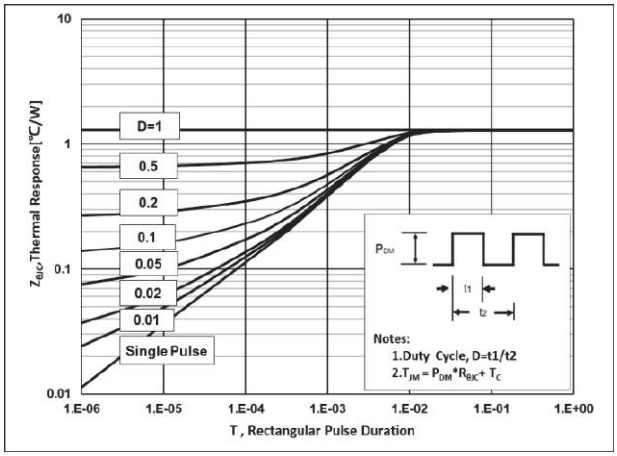


Fig 17: Transient Thermal Impedance



Test Circuit Schematic

Figure A. Definition of switching times

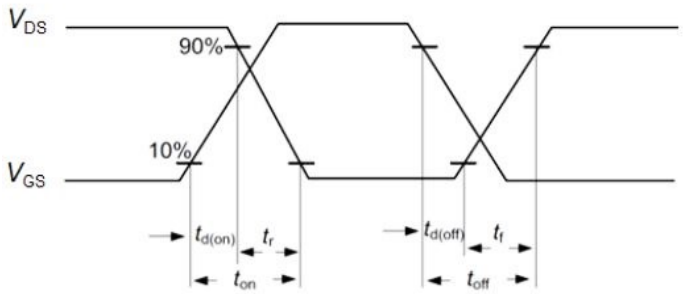


Figure B. Dynamic test circuit

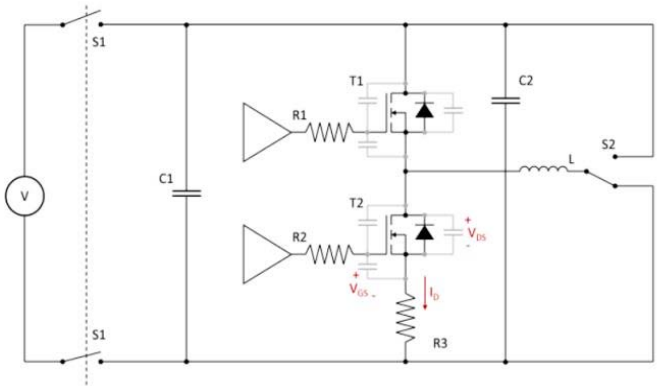


Figure C. Definition of body diodeswitching characteristics

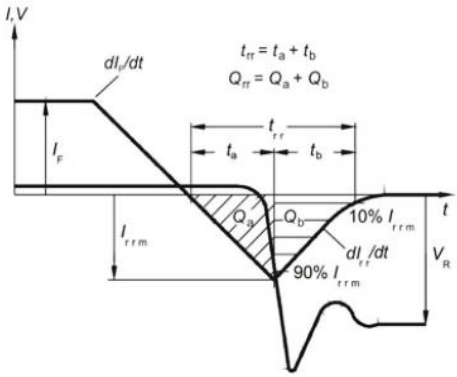
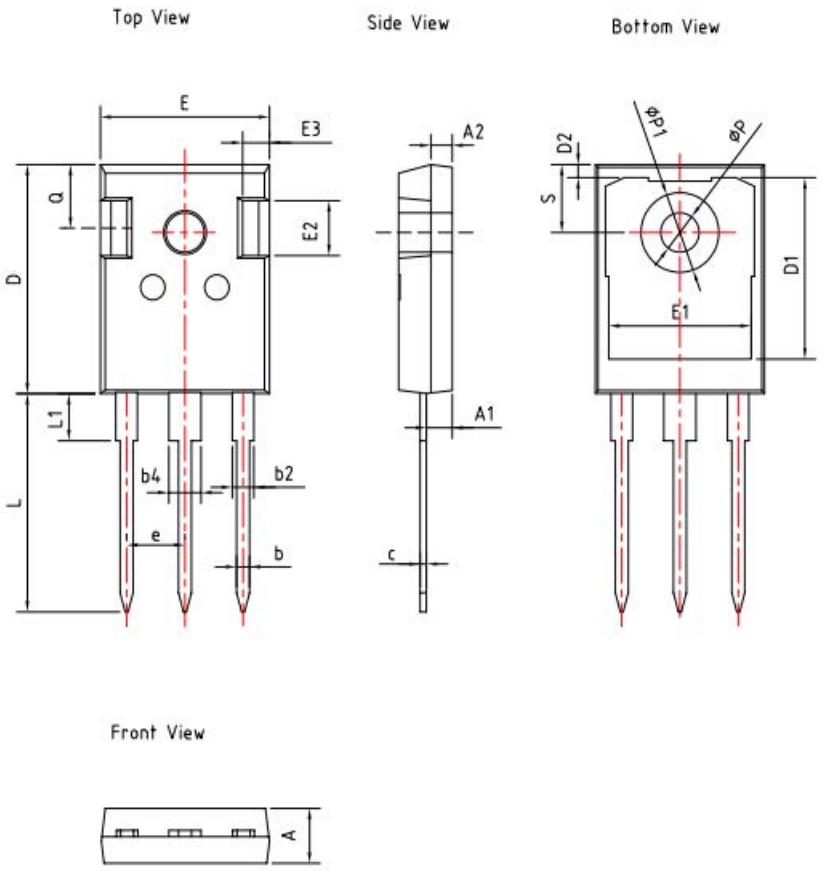


Figure C. **Definition of diode switching characteristics**

Package Dimensions

Package TO-247(TO-247-3)



Dimension unit:[mm]			
SYMBOL	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.60	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
D2	1.00	1.20	1.35
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e		5.44 BSC	
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
Q	5.40	5.80	6.20
S		6.20 BSC	

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