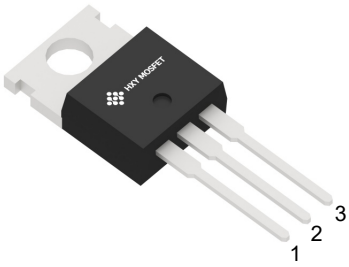
SPP20N65C3HKSA1

SiC Power MOSFET N-Channel Enhancement Mode

Features

- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery(Qrr)
- Halogen free, RoHs compliant



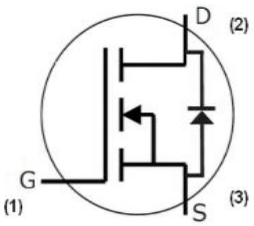
TO-220C

Benefits

- Reduce switching losses
- Increased system Switching Frequency
- Increased power density
- Reduction of heat sink reguirements

Applications

- Switch mode power supplies
- Renewable energy
- On Board Charger
- High Voltage DC/DC Converters



Ordering Part Number	Package	Brand
SPP20N65C3HKSA1	TO-220C	HXY MOSFET

Maximum Ratings (T_C = 25 ˚C unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit	Note
V_{DSmax}	Drain-Source Voltage	V_{GS} = 0V, I_D = 100μA	800	V	
V_{GSmax}	Gate-Source voltage	AC (f > 1 Hz)	-10/+25	V	
V_{GSop}	Recommend Gate-Source Voltage	Static	-4/+18 -4/+15	V	
EAS	Single pulse avalanche energy	V_{DS}=800V, V_{DD}=50V, V_{GS}=10V, L=10mH, T_C=25°C	205	mJ	
I_D	Continuous Drain current	V_{GS} = 18V, T_C = 25°C	20	A	Fig. 14
		V_{GS} = 18V, T_C = 100°C	11		
$I_{D,pulse}$	Pulsed Drain Current	Pulse with t_p limited by T_{jmax}	26	A	
P_D	Power Dissipation	T_C = 25°C, Tj = 175°C	83	W	Fig. 16
T_j	Operating junction temperature		-55~175	°C	
T_{stg}	Storage temperature		-55~175	°C	

Thermal Characteristics

Symbol	Parameter	Value			Unit	Note
		Min.	Typ.	Max.		
$R_{th(jc)}$	Thermal resistance from Junction to Case		1.8		K/W	Fig. 15
$R_{th(ja)}$	Thermal resistance from Junction to Ambient		40		K/W	

Electrical Characteristics (T_C = 25°C unless other wise specified)

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-Source Breakdown voltage	V_{GS} = 0V, I_D = 100μA	800			V	
$V_{GS(th)}$	Gate Threshold voltage	V_{GS} = V_{DS}, I_D =2.2mA		3.0		V	Fig. 9
		V_{GS} = V_{DS}, I_D =2.2mA, T_j=175°C		2.1			
I_{GSS}	Gate-Source Leakage current	V_{GS} = 18V, V_{DS} = 0V			250	nA	
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =800V, V_{GS} = 0V, T_j = 25°C		1	50	μA	
$R_{DS(on)}$	Drain-Source On-state Resistance	V_{GS} = 15V, I_D =5A V_{GS} = 18V, I_D =5A		212 165	240	mΩ	Fig. 3, 4 , 5
		V_{GS} = 15V, I_D =5A, T_j = 175°C V_{GS} = 18V, I_D =5A, T_j = 175°C		227 205			
g_{fs}	Transconductance	V_{DS} = 18V, I_D =5A		5		S	Fig. 6
		V_{DS} = 18V, I_D =5A, T_j = 175°C		4			

Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
Q_{GS}	Gate to Source Charge	V_{DS} = 400V I_D =5A V_{GS} = -4V/18V		3.7		nC	Fig. 10
Q_{GD}	Gate to Drain Charge			7			
Q_G	Total Gate Charge			17.6			

AC Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 600V f =1 MHz V_{AC} = 25mV		361		pF	Fig. 13
C_{oss}	Output Capacitance			34		pF	
C_{rss}	Reverse Transfer Capacitance			3.5		pF	
$R_{G(int)}$	Internal Gate Resistance	f=1 MHz, V_{AC} = 25mV		3.5		Ω	

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
V_{SD}	Diode Forward Voltage	V_{GS} =-4V, I_{SD} =2.5A		3.8		V	Fig. 7,8
		V_{GS} =-4V, I_{SD} =2.5A, T_j = 175°C		3.4			
I_S	Continuous Diode Forward Current	V_{GS} =-4V , T_C = 25°C		17		A	
$I_{S,\ pulse}$	Diode pulse Current	V_{GS} =-4V,pulse width t_p limited by T_{jmax}		26		A	

Typical Performance

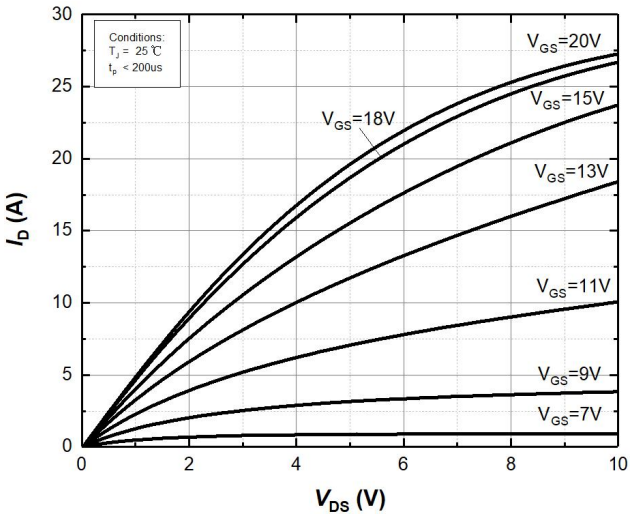


Figure 1. Output characteristics at Tj=25°C

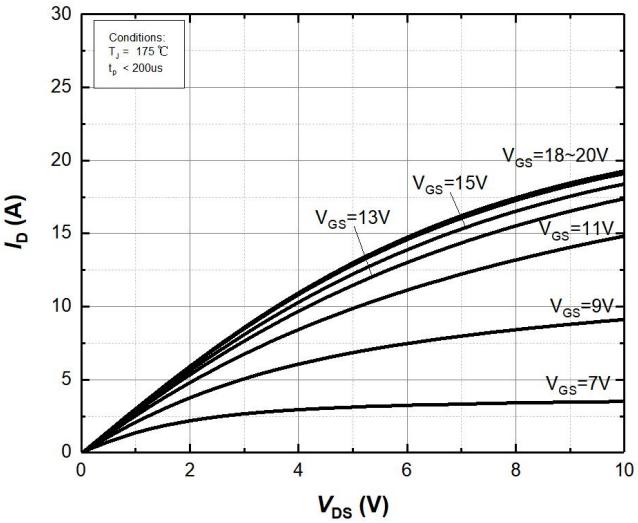


Figure 2. Output characteristics at Tj=175°C

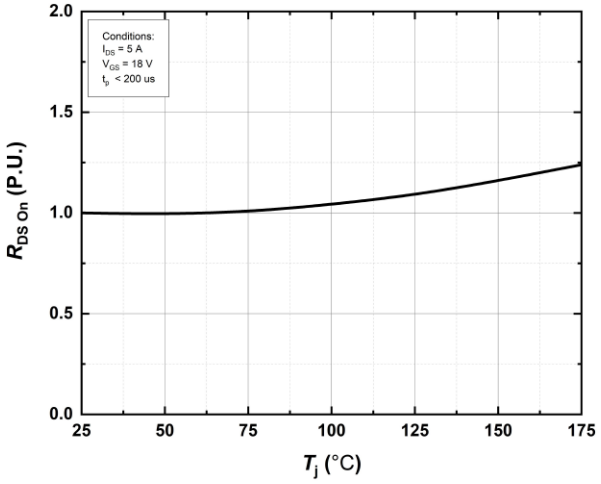


Figure 3. Normalized On-Resistance vs. Temperature

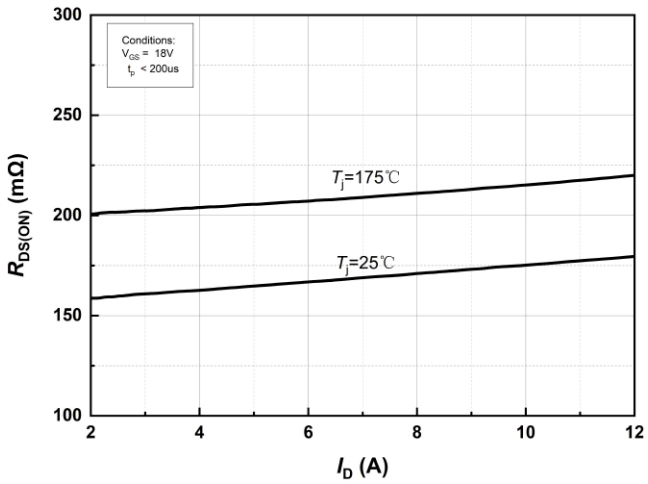


Figure 4. On-Resistance vs. Drain current for Various Temperature

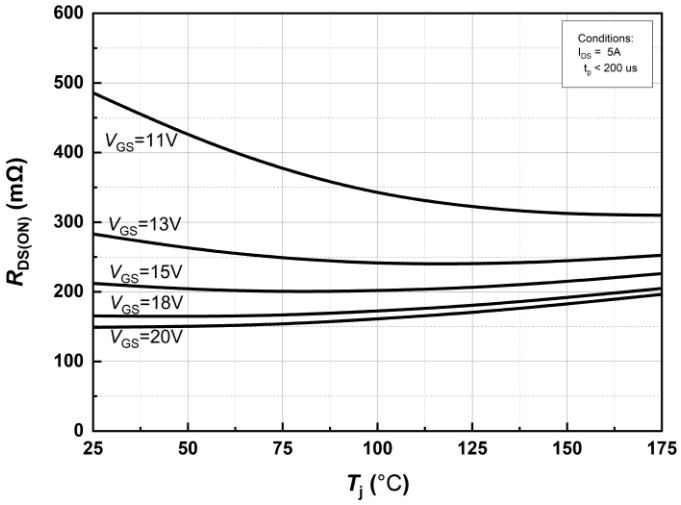


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

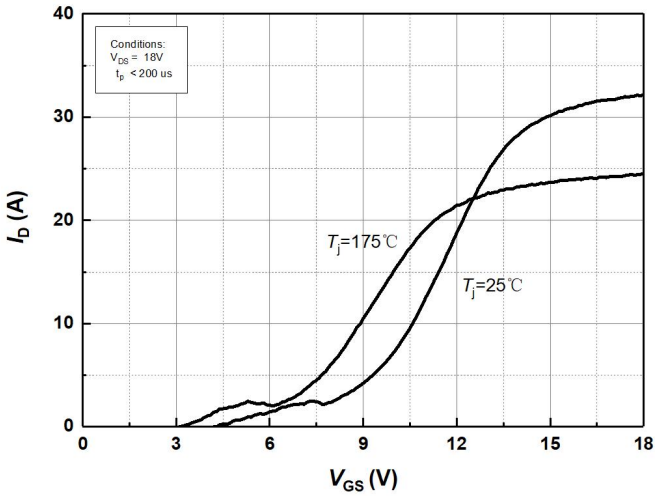


Figure 6. Transfer Characteristics for Various Junction Temperatures

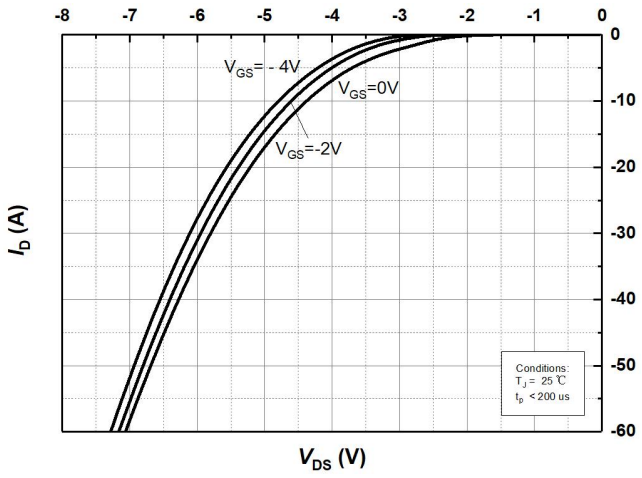


Figure 7. Body Diode Characteristics at Tj=25°C

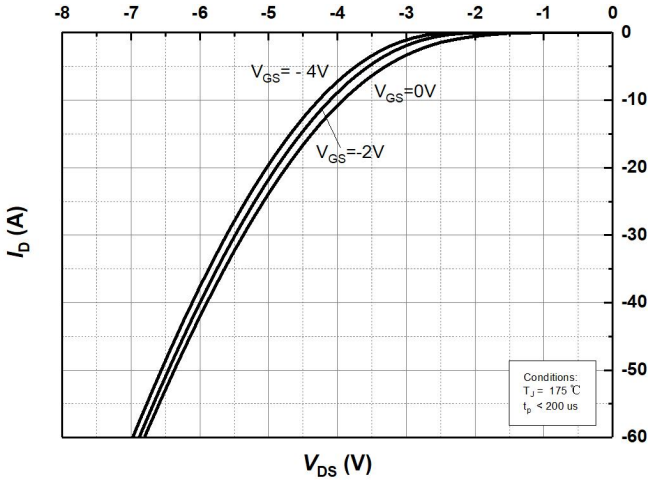


Figure 8. Body Diode Characteristics at Tj=175°C

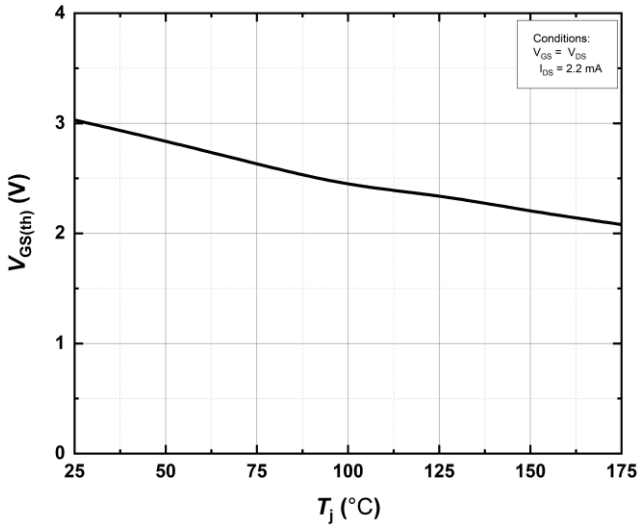


Figure 9. Threshold Voltage vs. Temperature

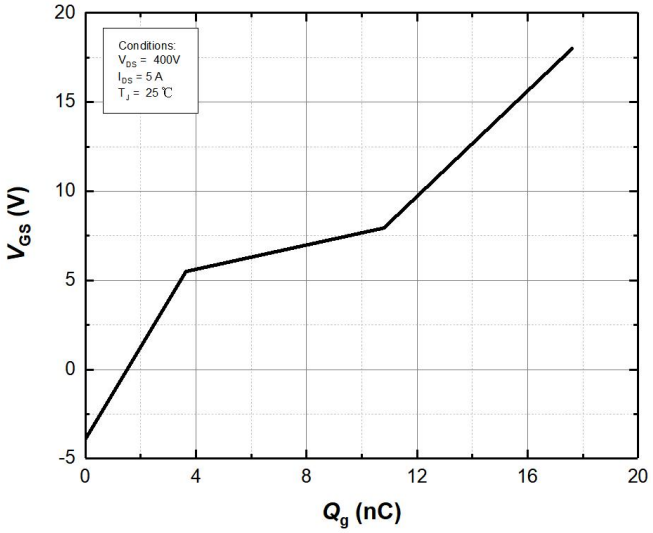


Figure 10 Gate Charge Characteristics

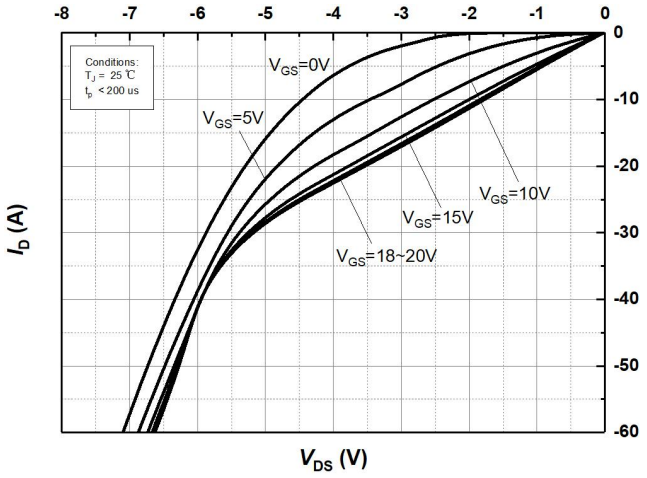


Figure 11. 3rd Quadrant Characteristic at Tj=25°C

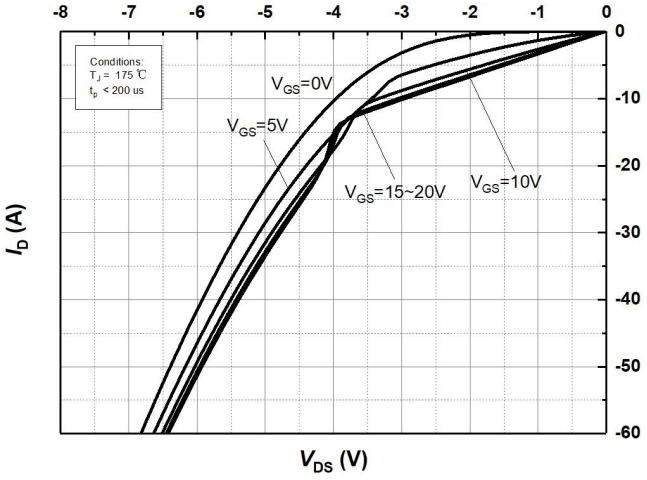


Figure 12. 3rd Quadrant Characteristic at Tj=175°C

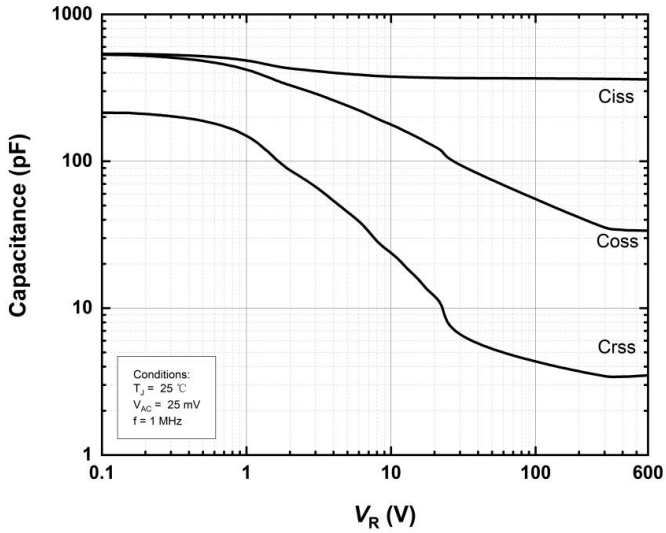


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 600V)

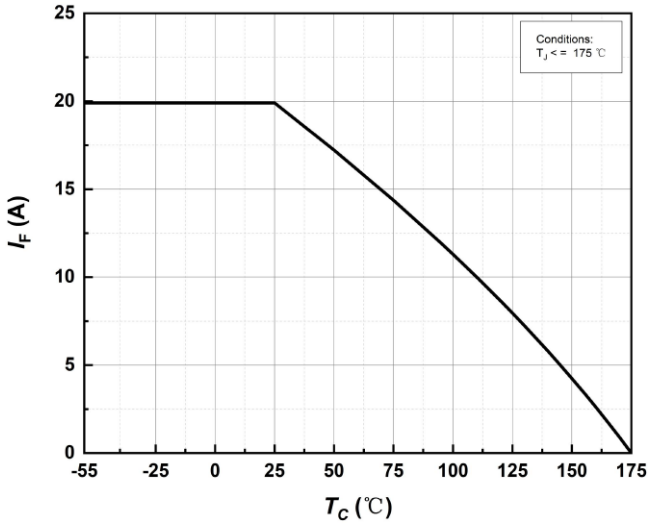


Figure 14. Continuous Drain Current Derating vs Case Temperature

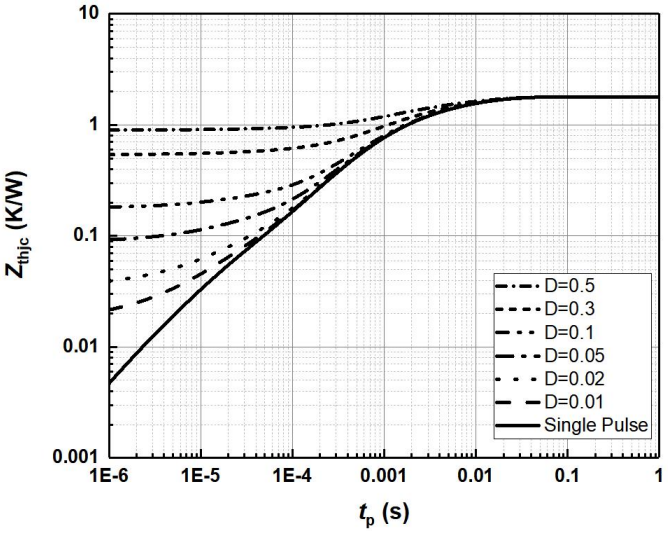


Figure 15.Transient Thermal Impedance (Junction – Case)

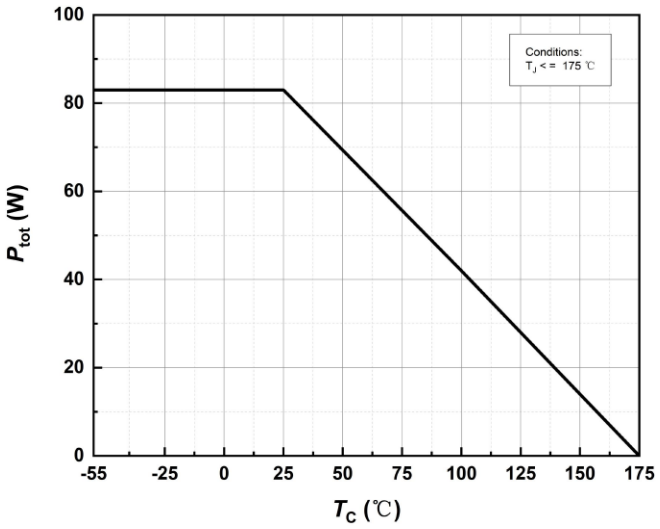


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

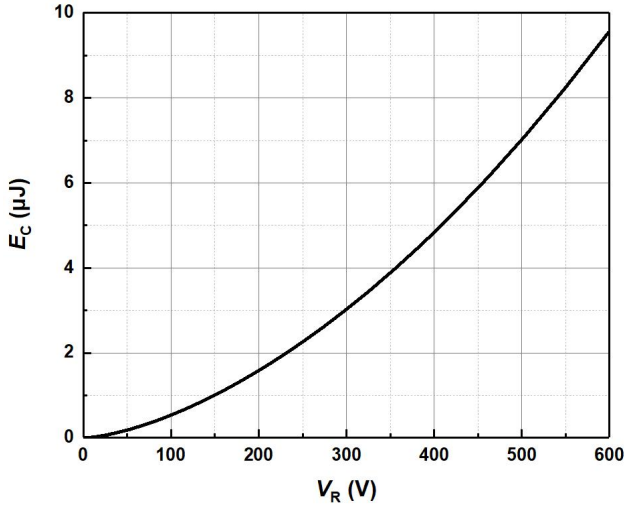


Figure 17. Output Capacitor Stored Energy

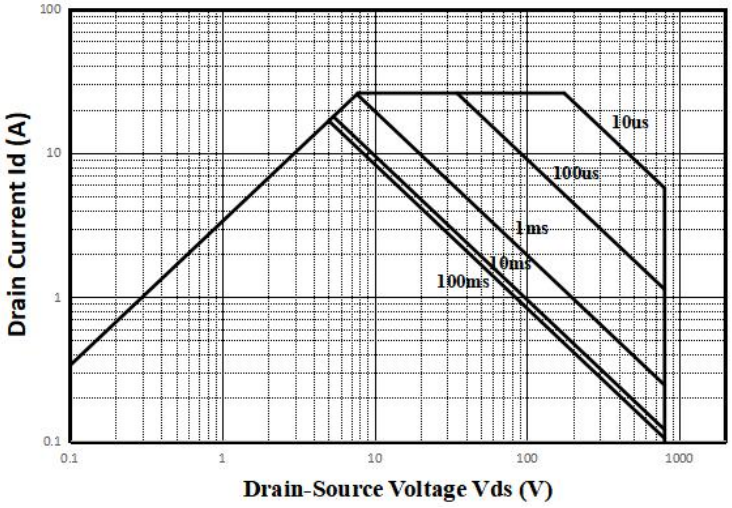
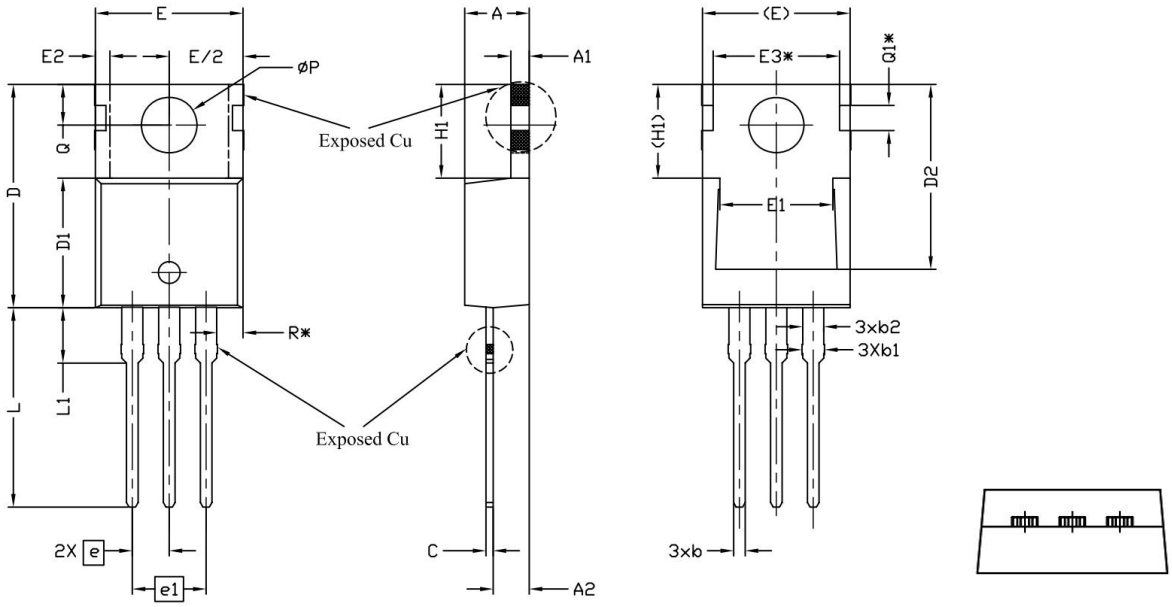


Figure 18. Safe Operating Area

Package Dimensions

Package TO-220C



SYMBOL	DIMENSIONS			NOTES
	MIN.	NOM.	MAX.	
A	4.24	4.44	4.64	
A1	1.15	1.27	1.40	
A2	2.30	2.48	2.70	
b	0.70	0.80	0.90	
b1	1.20	1.55	1.75	
b2	1.20	1.45	1.70	
c	0.40	0.50	0.60	
D	14.70	15.37	16.00	4
D1	8.82	8.92	9.02	
D2	12.43	12.73	12.83	5
E	9.96	10.16	10.36	4,5
E1	6.86	7.77	8.89	5
E2	-	-	0.76	6
E3*	8.70REF.			
e	2.54BSC			
e1	5.08BSC			
H1	6.30	6.45	6.60	5,6
L	13.47	13.72	13.97	
L1	3.60	3.80	4.00	
∅P	3.75	3.84	3.93	
Q	2.60	2.80	3.00	
Q1*	1.73REF.			
R*	1.82REF.			

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