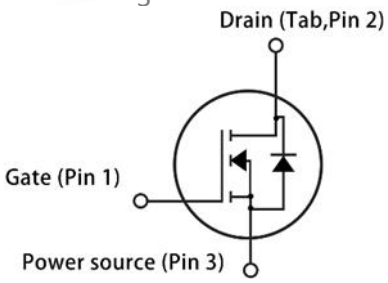
Description：

This N-Channel SiC uses advanced Planar technology and design to provide excellent $R_{DS(on)}$ with low gate charge.

It can be used in a wide variety of applications.



Features：

1) V_{DS}=650V,I_D=20A,$R_{DS(ON)}$<160m Ω @V_{GS}=18V（Typ：120m Ω）
2) Low gate charge.
3) Green device available.
4) Advanced high cell denity Planar technology for ultra low $R_{DS(ON)}$.
5) Excellent package for good heat dissipation.

Package Marking and Ordering Information：

Part NO.	Marking	Package	Packing
P3C160N65F3A	C160N65F3A	TO- 220F	50 pcs/Tube

Absolute Maximum Ratings：（T_C=25℃ unless otherwise noted）

Symbol	Parameter	Ratings	Units
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	-10/+22	V
V_{GSOP}	Recommended Operation Value	0/+15	
I_D	Continuous Drain Current[1]	20	A
	Continuous Drain Current-T_C=100℃[1]	14	
I_{DM}	Pulsed Drain Current [2]	40	
E_{AS}	Single pulse avalanche energy [3]	28	mJ
P_D	Power Dissipation	82	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55-+175	℃

Thermal Characteristics：

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Thermal Resistance,Junction to Case	1.83	℃/W

Electrical Characteristics: (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Sourtce Breakdown Voltage	V_{GS}=0V,I_D=100μA	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS}=0V, V_{DS}=650V	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=-10/+22V, V_{DS}=0A	---	---	±250	nA
On Characteristics						
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{GS}=V_{DS}, I_D=250μA	2.5	3.3	4	V
$R_{DS(ON)}$	Drain-Source On Resistance [4]	V_{GS}=18V,I_D=4.5A	---	120	160	mΩ
		V_{GS}=15V,I_D=4.5A	---	160	208	mΩ
g_{fs}	Transconductance	V_{DS}=20V,I_D=10A	---	6.9	---	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=400V, V_{GS}=0V, f=1MHz	---	440	---	pF
C_{oss}	Output Capacitance		---	31.5	--	
C_{rss}	Reverse Transfer Capacitance		---	2.8	---	
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=400V, I_D=10A, R_{ENG}=2.2Ω ,V_{GS}=0/15V L=600μH	---	22.2	---	ns
t_r	Rise Time		---	15.1	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	28.3	---	ns
t_f	Fall Time		---	14.9	---	ns
E_{on}	Turn-on Switching Energy		---	111	---	μJ
E_{off}	Turn-off Switching Energy		---	25.2	---	μJ
E_{tot}	Total Switching Energy		---	136	---	μJ
Q_g	Total Gate Charge	V_{GS}=15V, V_{DS}=400V, I_D=10A	---	14.5	---	nC
Q_{gs}	Gate-Source Charge		---	5.7	---	nC
Q_{gd}	Gate-Drain “Miller” Charge		---	2.3	---	nC
R_G	Internal Gate Resistance	f=1MHz,V_{AC}=25mV	---	28.5	---	Ω

Drain-Source Diode Characteristics						
V_{SD}	Diode Forward Voltage	V_{GS}=-0V, I_{SD}=5A	---	3.5	---	V
I_S	Continuous Drain Curren	V_D=V_G=0V	---	---	17	A
I_{SM}	Pulsed Drain Current		---	---	32	A
Trr	Reverse Recovery Time	I_{SD}=10A,V_{DD}=400A dI/dt=1500A/us,Includes Q_{oss}	---	6.9	---	ns
Qrr	Reverse Recovery Charge		---	26	---	nC
Trmm	Peak Reverse Recovery Current		---	4.8	---	A

Notes:

1. Computed continuous current assumes the condition of $T_{j,Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board design
2. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
3. EAS condition : TJ=25℃,VDD=325V,V_G=18V,L=0.5mH
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

Typical Characteristics: (T_C=25℃ unless otherwise noted)

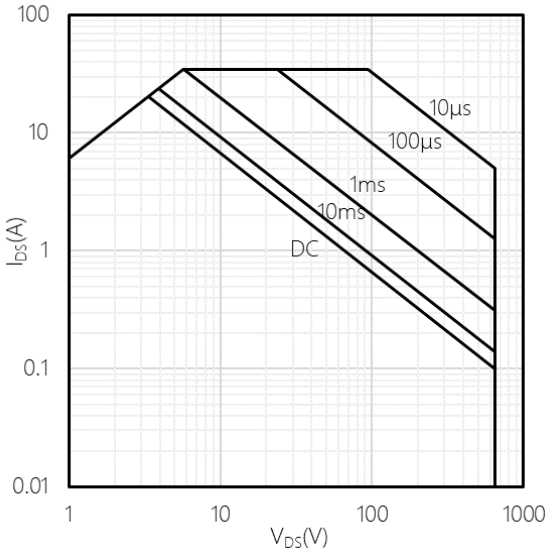


Figure1: Safe operating area (SOA)

$R_{th(j-c)}$ =2.2 °C/W, Single Pulse, T_{VJ} = 25°C

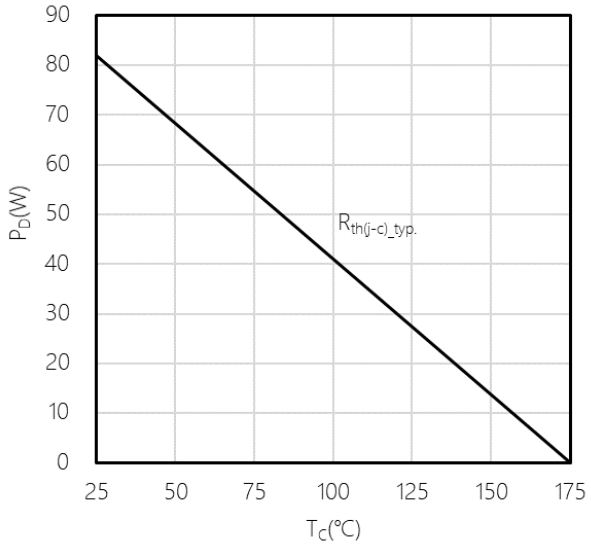


Figure 2: Power dissipation as a function of case temperature limited by bond wire

P_D = f(T_C)

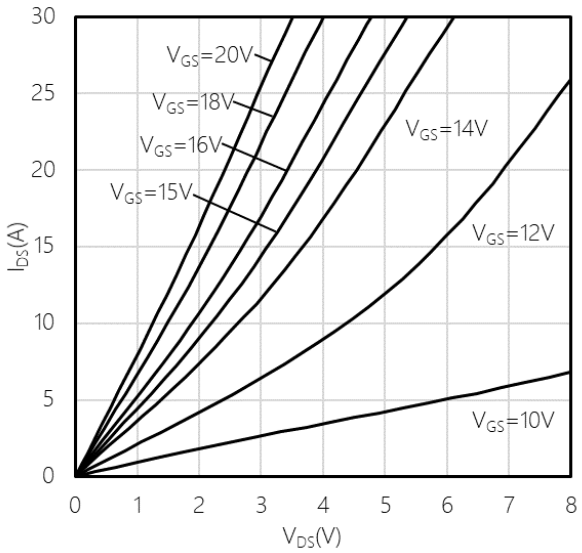


Figure 3: Typical output characteristic, V_{GS} as parameter

I_{DS}= f(V_{DS})

T_{VJ} = -55 ℃

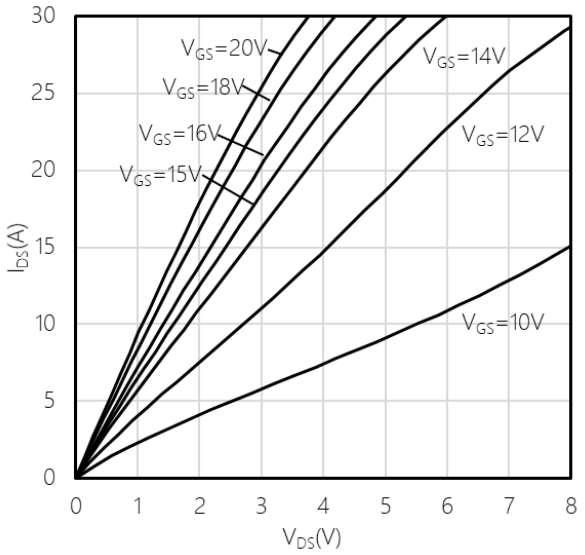


Figure 4: Typical output characteristic, V_{GS} as parameter

I_{DS} = f(V_{DS})

T_{VJ} = 25 ℃

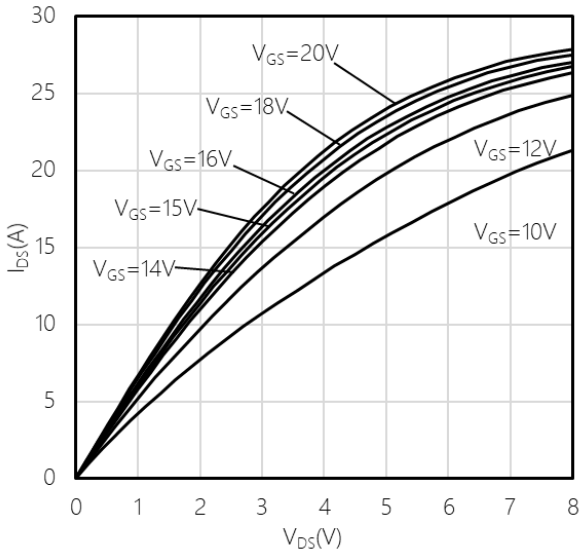


Figure 5 Typical output characteristic, V_{GS} as parameter

I_{DS} = f(V_{DS})

T_{VJ} = 175℃

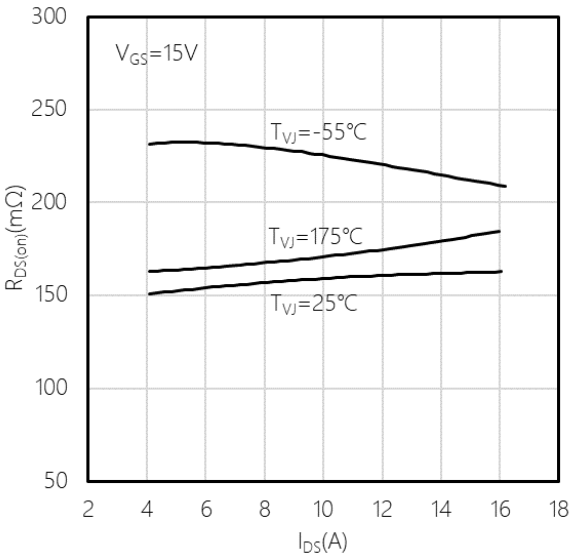


Figure 6: Typical on-state resistance as a function of drain current

$R_{DS(on)}$ = f(I_{DS}) V_{GS} = 15V

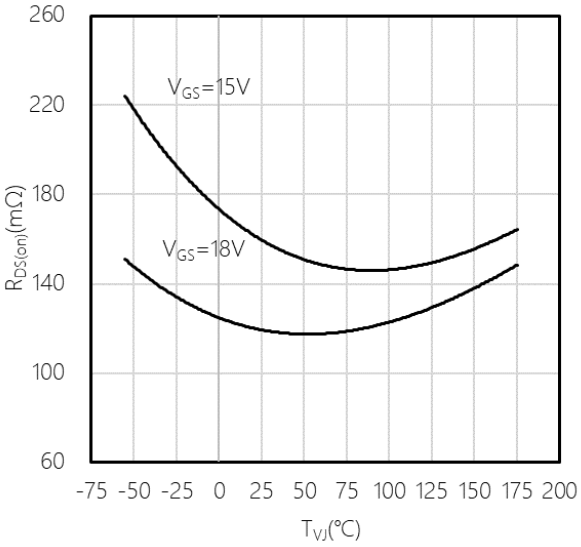


Figure 7: Typical on-state resistance as a function of temperature

$R_{DS(on)}$ = f(T_{VJ}), I_{DS} =10 A

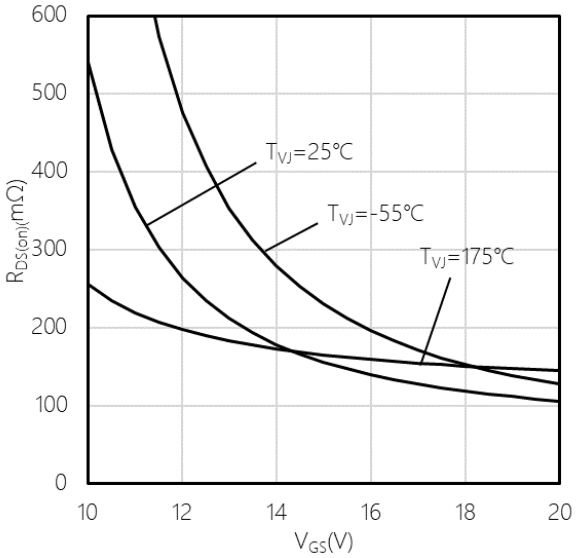


Figure 8: Typical on-state resistance as a function of V_{GS}

$R_{DS(on)}$ = f(V_{GS})

I_{DS} =10 A

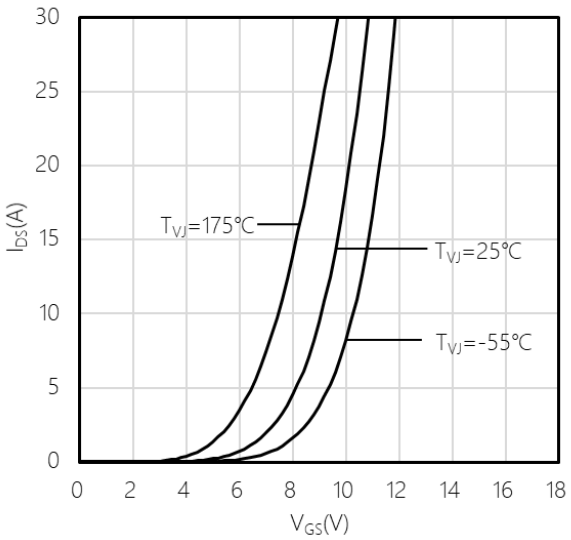


Figure 9: Typical transfer characteristic

I_{DS} = f(V_{GS})

V_{DS}= 20 V

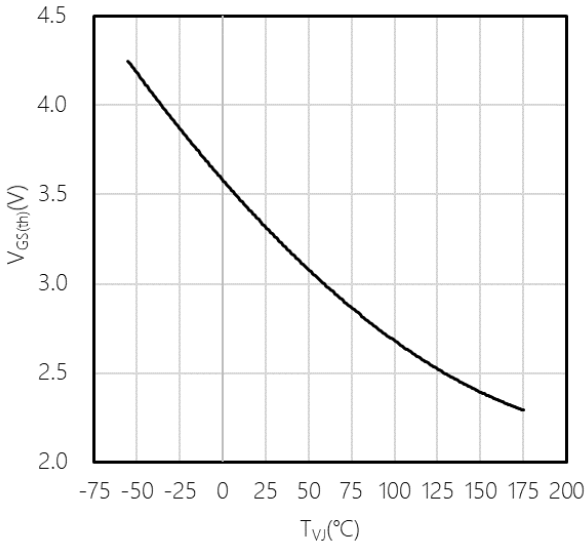


Figure 10: Typical gate-source threshold voltage as a function of junction temperature

$V_{GS(th)}$ = f(T_{VJ}), I_{DS} = 3.5 mA

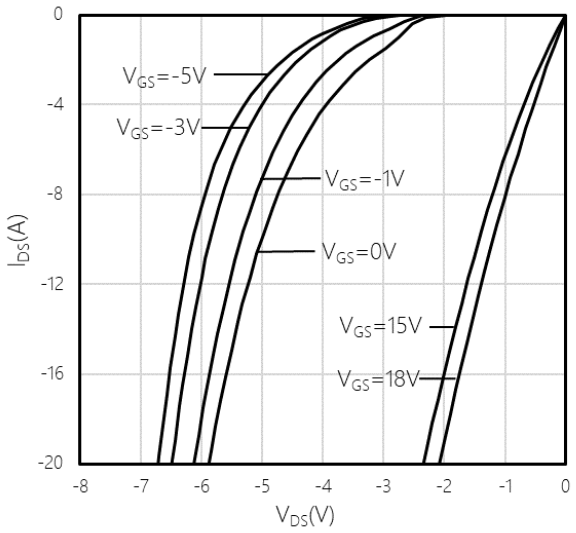


Figure.11: Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

$I_{DS} = f(V_{DS})$, T_{VJ} = -55 °C

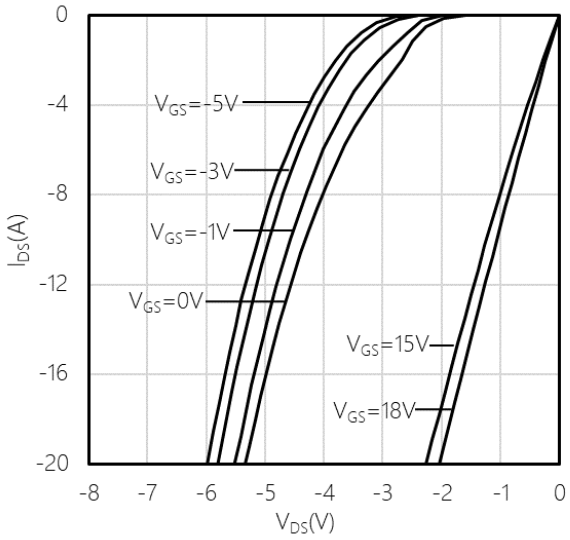


Figure 12 Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

$I_{DS} = f(V_{DS})$, T_{VJ} = 25 °C

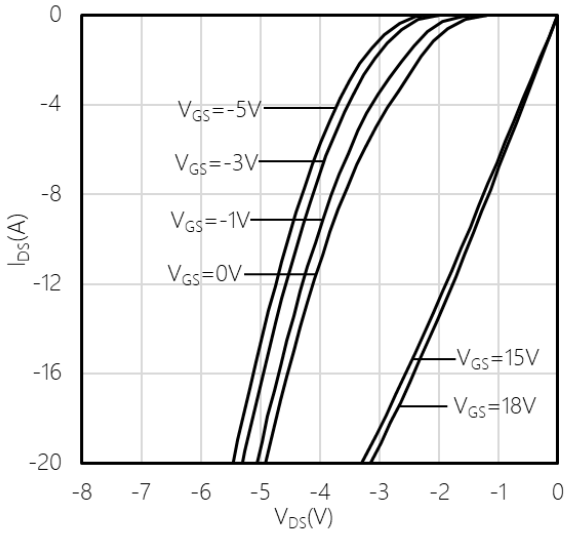


Figure 13 Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

$I_{DS} = f(V_{DS})$ T_{VJ} = 175 °C

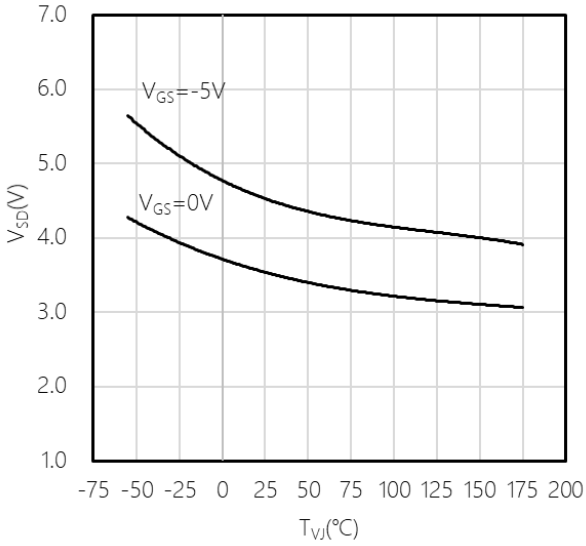


Figure 14 Typical reverse drain voltage as function of junction temperature

$V_{SD} = f(T_{VJ})$, I_{SD} = 5 A

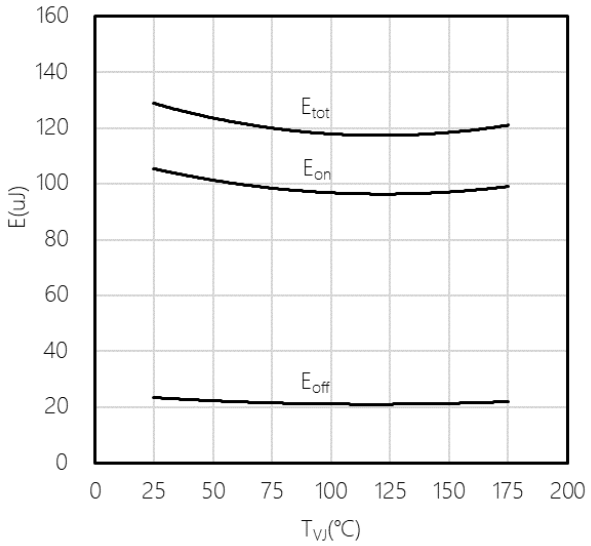


Figure 15 **Typical switching energy as a function of junction temperature, 2nd device own body diode: V_{GS} = -5 V**

E = f(T_{VJ})

V_{DS} = 400 V, $R_{G(ext)}$ = 2.2 Ω, V_{GS} = 0 V / 15 V, I_{DS} = 10 A

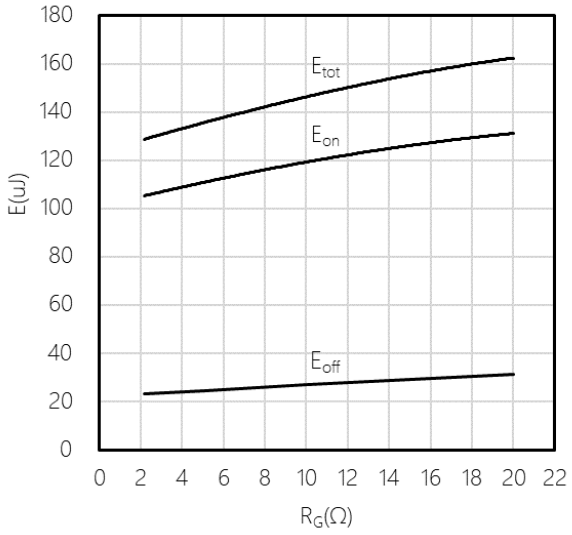


Figure 16 **Typical switching energy losses as a function of gate resistance, 2nd device own body diode: V_{GS} = -5 V**

E = f($R_{G(ext)}$)

V_{GS} = 0/15 V, I_{DS} = 10 A, T_{VJ} = 25 °C, V_{DS} = 400 V

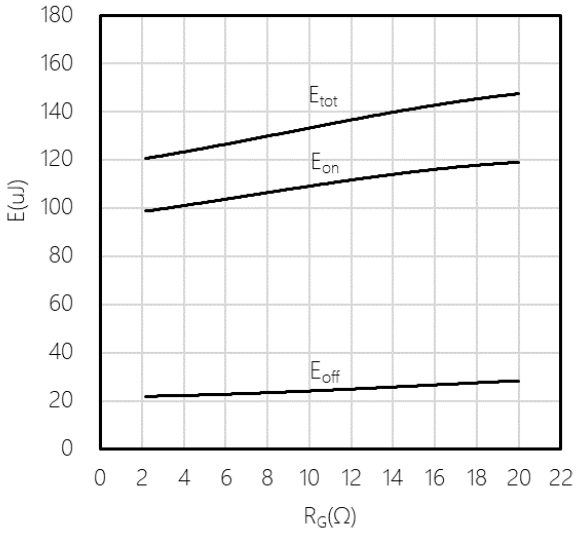


Figure 17 **Typical switching energy losses as a function of gate resistance, 2nd device own body diode: V_{GS} = -5 V**

E = f($R_{G(ext)}$)

V_{GS} = 0/15 V, I_{DS} = 10 A, T_{VJ} = 175 °C, V_{DS} = 400 V

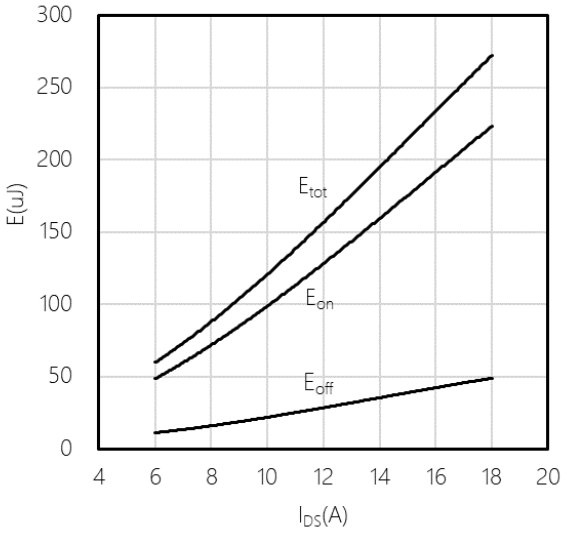


Figure 18 **Typical switching energy losses as a function of I_{DS}, 2nd device own body diode: V_{GS} = -5 V**

E = f(I_{DS})

V_{GS} = 0/15 V, $R_{G(ext)}$ = 2.2 Ω, T_{VJ} = 25 °C, V_{DS} = 400 V

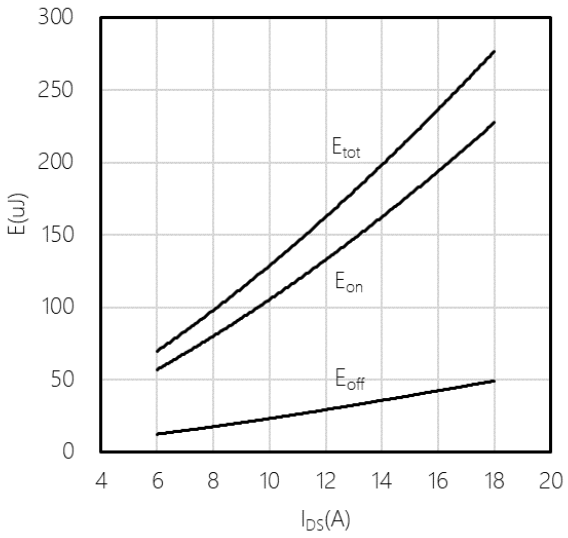


Figure 19 Typical switching energy losses as a function of I_{DS}, 2nd device own body diode: V_{GS} = -5 V

E = f(I_{DS})

V_{GS} = 0/15 V, $R_{G(ext)}$ = 2.2 Ω, T_{VJ} = 175 °C, V_{DS} = 400 V

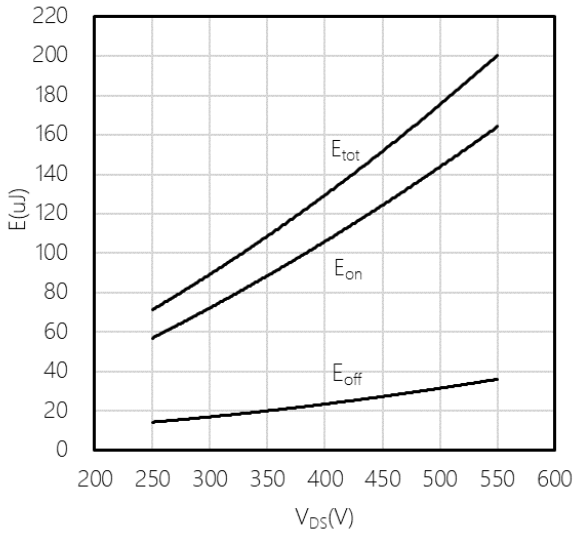


Figure 20 Typical switching energy losses as a function of V_{DS}, 2nd device own body diode: V_{GS} = -5 V

E = f(V_{DS})

V_{GS} = 0/15 V, $R_{G(ext)}$ = 2.2 Ω, T_{VJ} = 25 °C, I_{DS} = 10 A

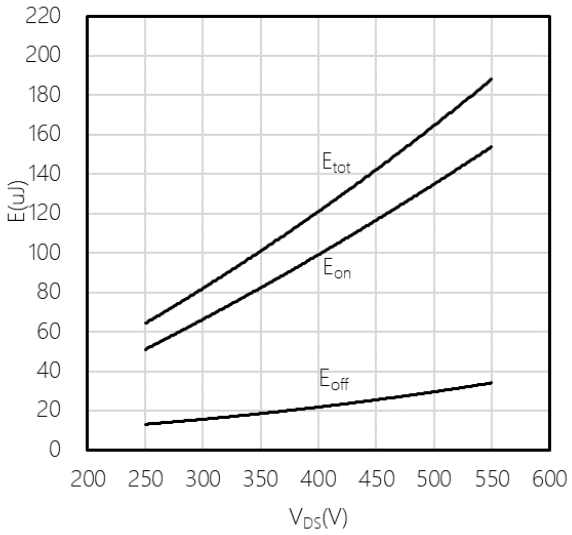


Figure 21 Typical switching energy losses as a function of V_{DS}, 2nd device own body diode: V_{GS} = -5 V

E = f(V_{DS})

V_{GS} = 0/15 V, $R_{G(ext)}$ = 2.2 Ω T_{VJ} = 175 °C, I_{DS} = 10 A

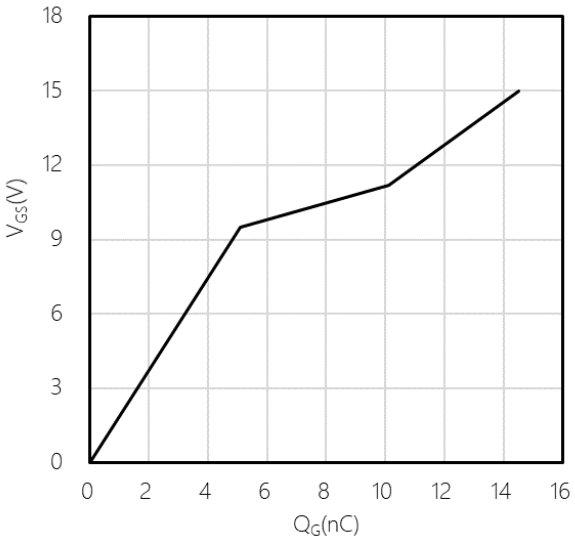


Figure 22 Typical gate charge

V_{GS} =f(Q_G), I_{DS} = 10 A, V_{DS} = 400V

turn-on pulse

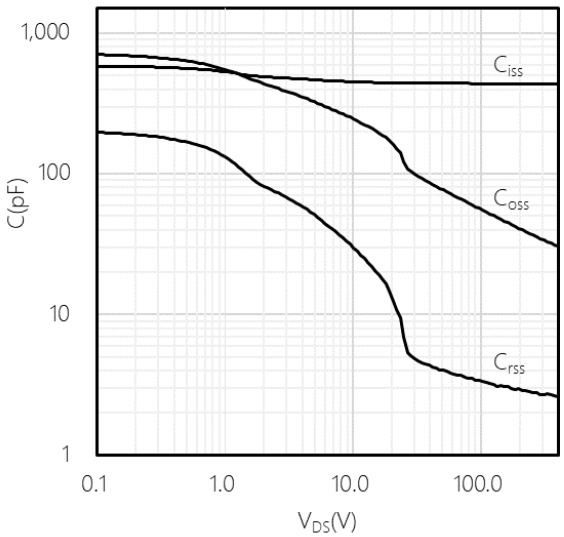


Figure 23 Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$, V_{GS} = 0V, f = 1MHz

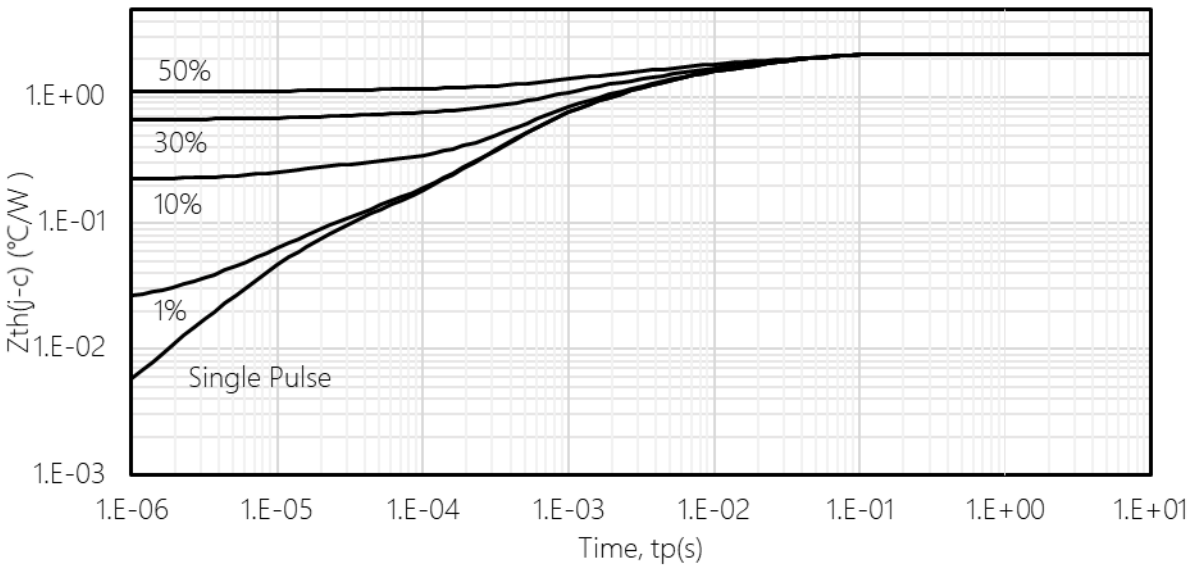
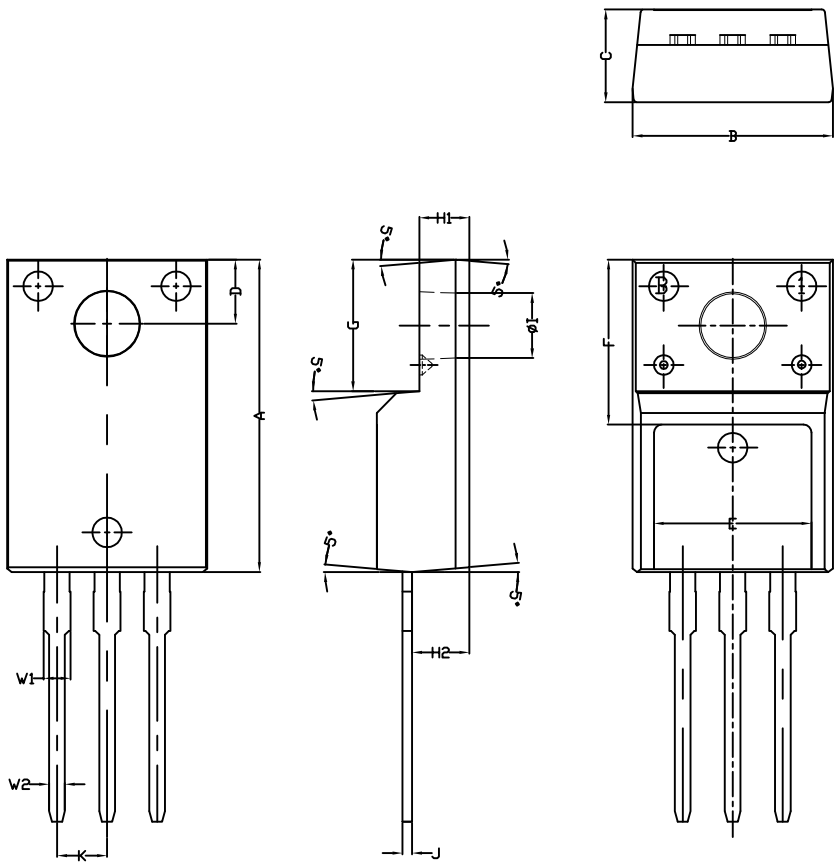


Figure 24 Transient thermal resistance (MOSFET)

($Z_{th(j-c,max)} = f(t_p)$, Parameter $D = t_p/T$

TO-220F Package Information：



	MM			Inch		
Symbol	Min	Mim	Max	Min	Mim	Max
A	15.67	15,87	16.07	0.6169	0.6248	0.6328
B	9.86	10.16	10.46	0.3882	0.4000	0.4118
C	4.50	4.70	4.90	0.1772	0.1850	0.1929
D	3.15	3.35	3.55	0.1240	0.1319	0.1398
E	7.80	8.00	8.20	0.3071	0.3150	0.3228
F	8.18	8.38	8.58	0.3220	0.3299	0.3378
H1	2.34	2.54	2.84	0.0921	0.1000	0.1118
H2	2.40	2.90	3.40	0.0945	0.1141	0.1339
I	3.10	3.30	3.50	0.1220	0.1299	0.1378
W1	1.08	1.28	1.48	0.0425	0.0504	0.0583
W2	0.70	0.80	0.90	0.0276	0.0315	0.0354
K	2.44	2.54	2.64	0.0961	0.1000	0.1039
G	6.48	6.68	6.88	0.2551	0.2630	0.2709
J	0.45	0.50	0.6	0.0177	0.0197	0.0236

Marking Information：

①. Doingter LOGO

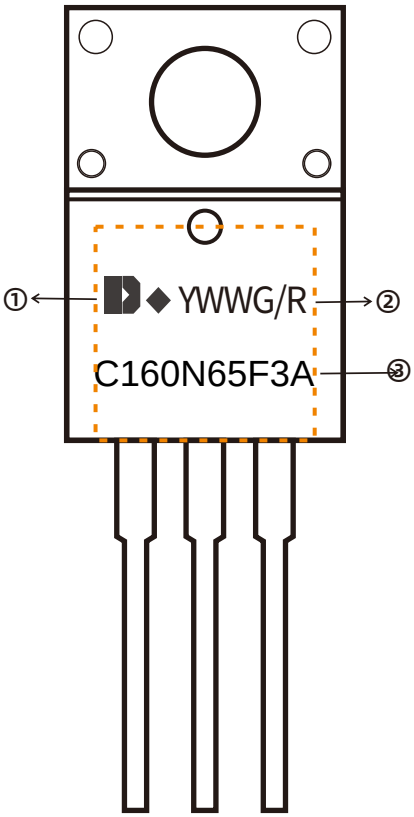
②. Date Code(YWWG / R)

Y : Year Code , last digit of the year

WW : Week Code(01-53)

G/R : G(Green) /R(Lead Free)

③. Part NO.



Previous Version

Version	Date	Subjects (major changes since last revision)
1.0	2026-03-07	Release of final version

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