

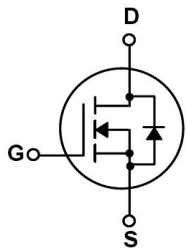
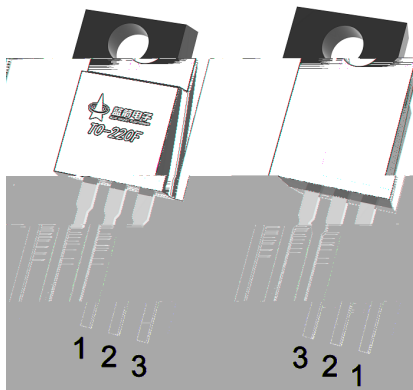
/ Descriptions

TO-220F N MOS

SiC N-CHANNEL MOSFET in a TO-220F Plastic Package.

/ Features $V_{DS}=650V$ $I_D=20A$ $R_{DS(on)}@15V \leq 208m\Omega$ (Type.160m Ω) $R_{DS(on)}@18V \leq 180m\Omega$ (Type.124m Ω)**/ Applications**

LED driver, PD charger, PC adapter, Air-conditioning, E-bike charger.

/ Equivalent Circuit**/ Pinning**

PIN1 G

PIN 2 D

PIN 3 S

/ Marking

See Marking Instructions.

/ Absolute Maximum Ratings(Tc=25)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	650	V
Continuous DC Drain Current for $R_{th(j-c,typ.)}$, Limited by $T_{VJ(max)}$	$I_D(Tc=25)$	20	A
	$I_D(Tc=100)$	14.4	A
Peak Drain Current, tp Limited by $T_{VJ(max)}$	I_{DM}	34.5	A
Gate-Source Max Voltage	$V_{GS,max}$	-10/+22	V
Gate-Source Operate Voltage	$V_{GS,op}$	0/+15	V
Single Pulse Avalanche Energy	E_{AS}	28	mJ
Power Dissipation or $R_{th(j-c,typ.)}$	$P_D(Tc=25)$	35	W
Operating and Storage Temperature Range	T_{VJ}, T_{STG}	-55 to 175	
MOSFET/Body Diode Junction-Case Thermal Resistance	$R_{th(j-c)}$	4.3	/W

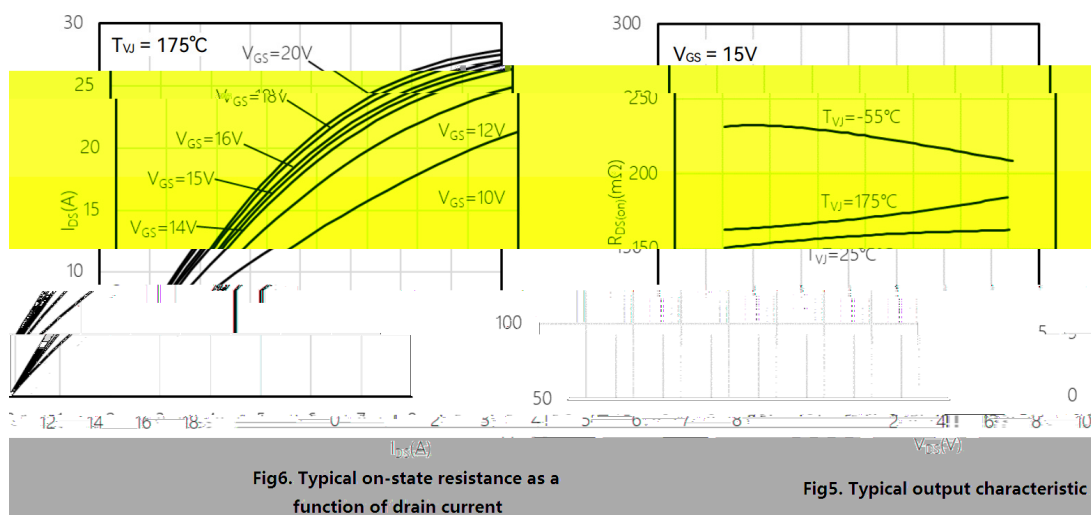
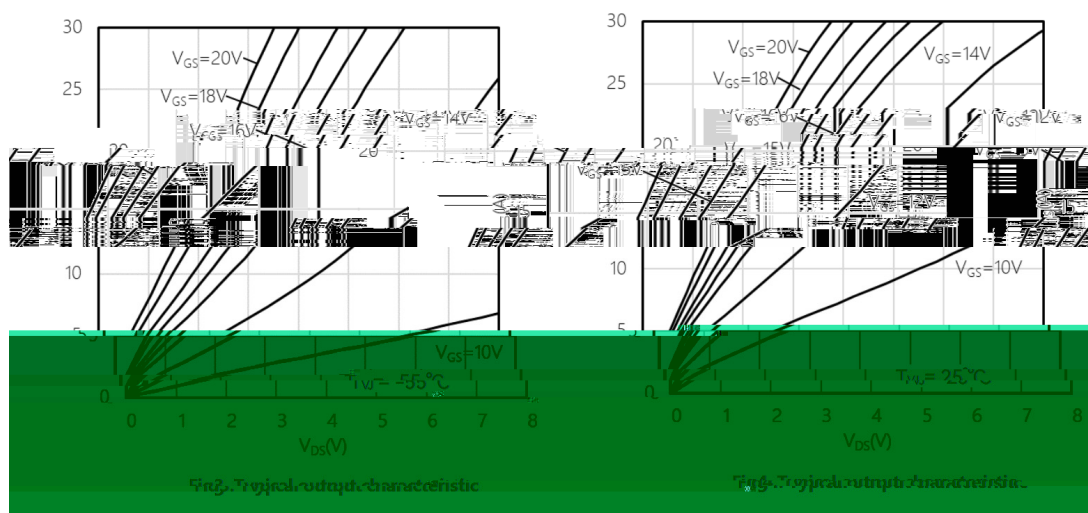
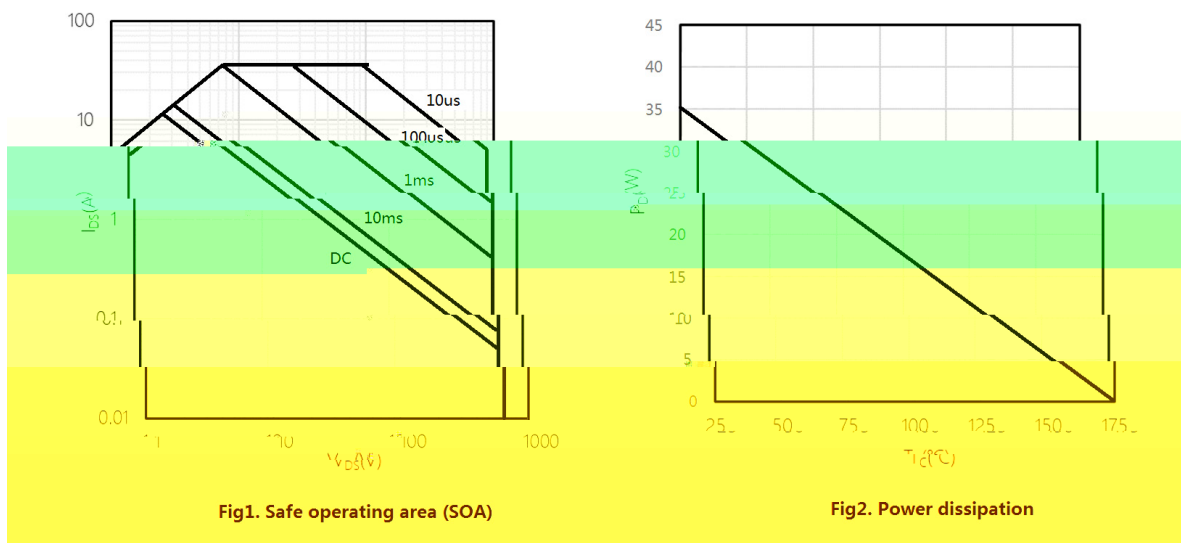
/ Electrical Characteristics(Tc=25)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$ $I_D=100\mu A$	650			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ $I_D=3.5mA$	3		5	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V$ $V_{GS}=0V$		0.1	20	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=22V$ $V_{DS}=0V$			250	nA
Source-Gate Leakage Current	I_{SGS}	$V_{GS}=-10V$ $V_{DS}=0V$			250	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=15V$ $I_D=10A$		160	208	m Ω
		$V_{GS}=15V$ $I_D=10A$ $T_{VJ}=175$		164		
		$V_{GS}=18V$ $I_D=10A$		124	180	
		$V_{GS}=18V$ $I_D=10A$ $T_{VJ}=175$		150		
Body Diode Forward Voltage	V_{SD}	$V_{GS}=0V$ $I_S=5A$		3.5		V
Continuous DC Source Current	I_S			17		A
Peak Reverse Drain Current,	I_{SM}			32		A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V$, $I_{SD}=10A$, $V_R=400V$, $di/dt=1.5kA/us$		6.9		ns
Reverse Recovery Charge	Q_{rr}			26		nC
Peak Reverse Recovery Current	I_{rrm}			4.8		A
Reverse Recovery Energy	E_{rr}			0.24		μJ

/ Electrical Characteristics(Tc=25)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-On Delay Time	$t_{d(on)}$	$V_{GS}=0/15V$ $L=600\mu H$ $V_{DD}=400V$ $I_D=10A$ $R_g=2.2\Omega$		21.2		ns
Turn-On Rise Time	t_r			14.4		
Turn-Off Delay Time	$t_{d(off)}$			27.0		
Turn-Off Fall Time	t_f			14.2		
Turn-On Switching Loss	E_{on}			106		μJ
Turn-Off Switching Loss	E_{off}			24		
Total Switching Energy	E_{tot}			130		
Gate resistance	R_g	$V_{AC}=25mV$ $f=1MHz$		28.5		Ω
Input Capacitance	C_{iss}	$V_{DS}=400V$ $V_{GS}=0V$ $f=1MHz$		438		pF
Output Capacitance	C_{oss}			30		
Reverse Transfer Capacitance	C_{rss}			2.7		
Total Gate Charge	Q_g	$V_{GS}=0/15V,$ $V_{DS}=400V,$ $I_D=10A$		14.5		nC
Gate Source Charge	Q_{gs}			5.5		
Gate Drain Charge	Q_{gd}			2.2		

/ Electrical Characteristic Curve



/ Electrical Characteristic Curve

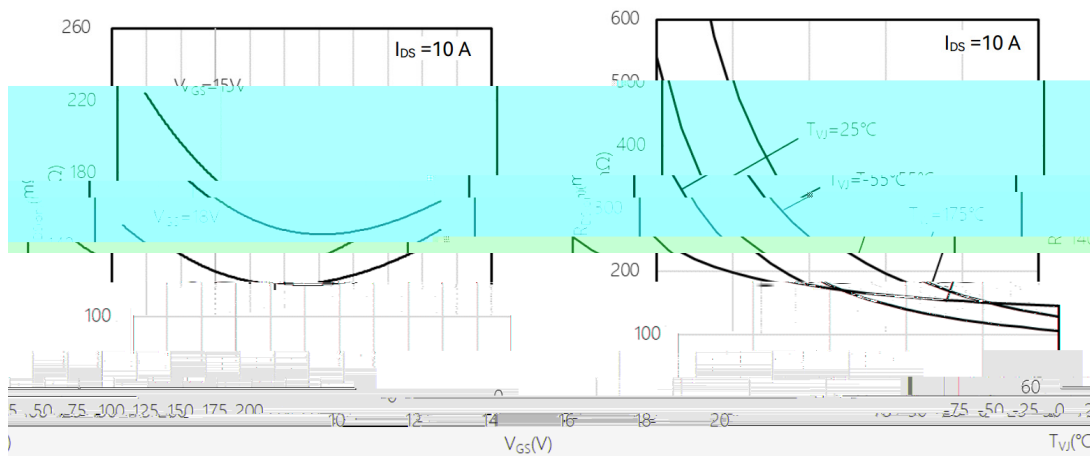


Fig8. Typical on-state resistance as a function of V_{GS}

Fig7. Typical on-state resistance as a function of T_{vj}

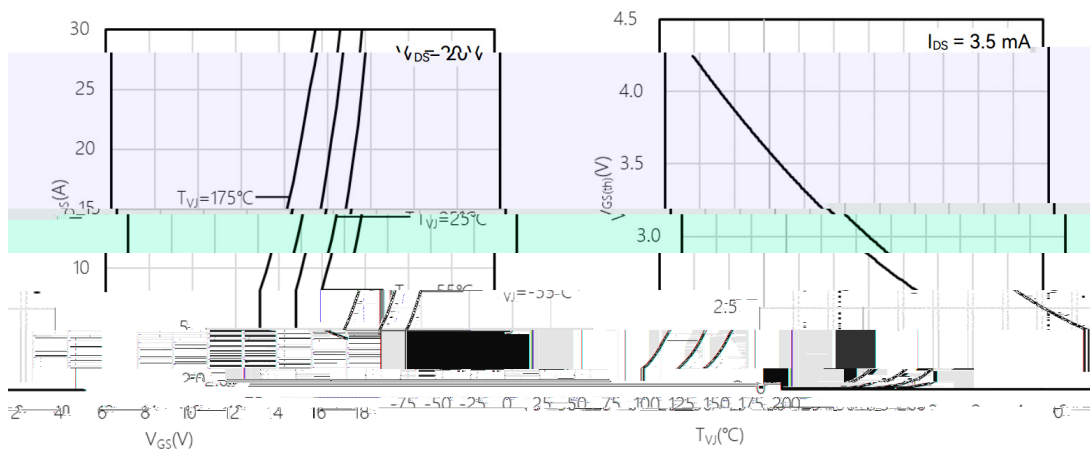


Fig9. Typical transfer characteristic

Fig10. Typical gate-source threshold voltage as a function of junction temperature

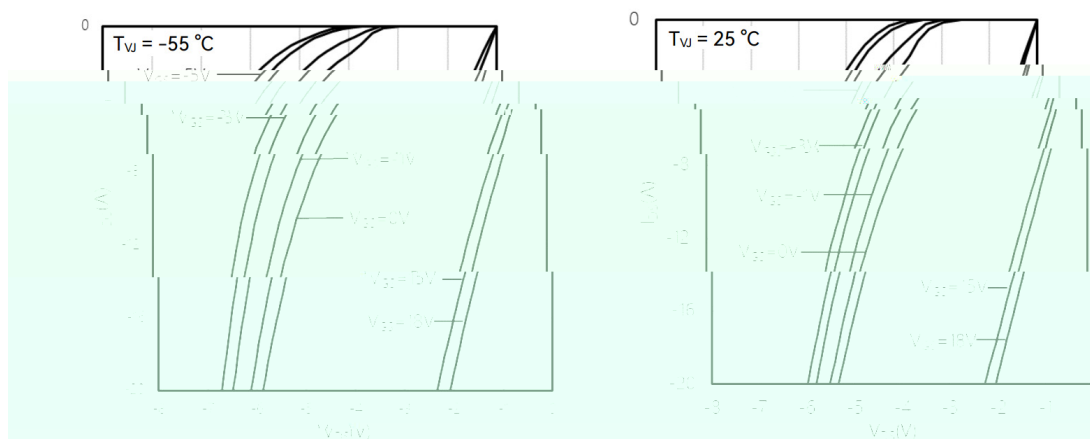


Fig11. Typical reverse drain current as a function of reverse drain voltage

Fig12. Typical reverse drain current as a function of reverse drain voltage

/ Electrical Characteristic Curve

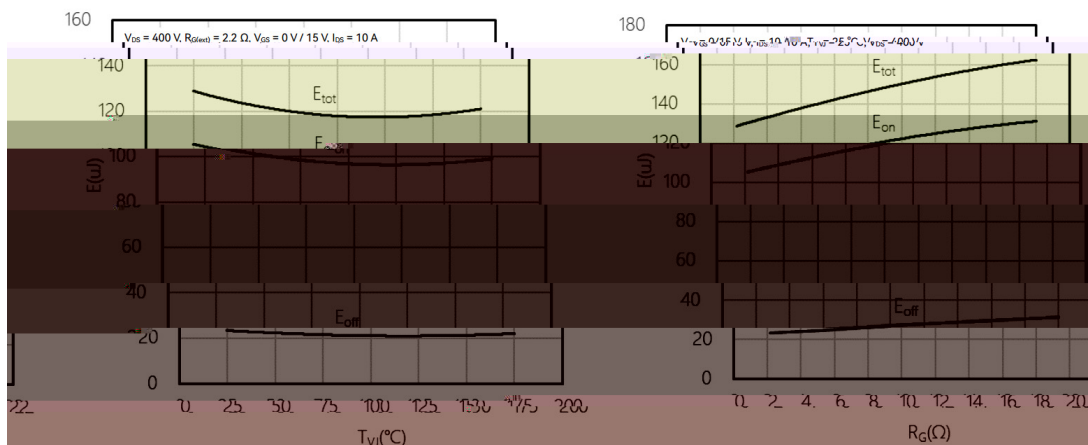
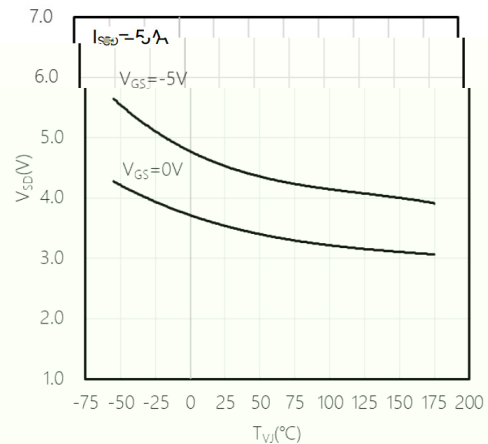
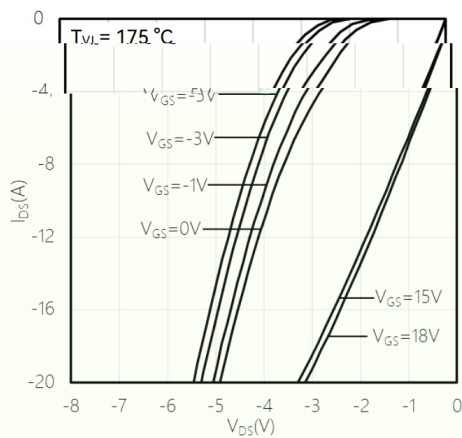


Fig15: Typical switching energy as function of junction temperature. The typical values are enclosed in own body diode: $V_{GS} = -5V$. The temperature is 175 °C. The test device is BRSC65R180ZFA.



/ Electrical Characteristic Curve

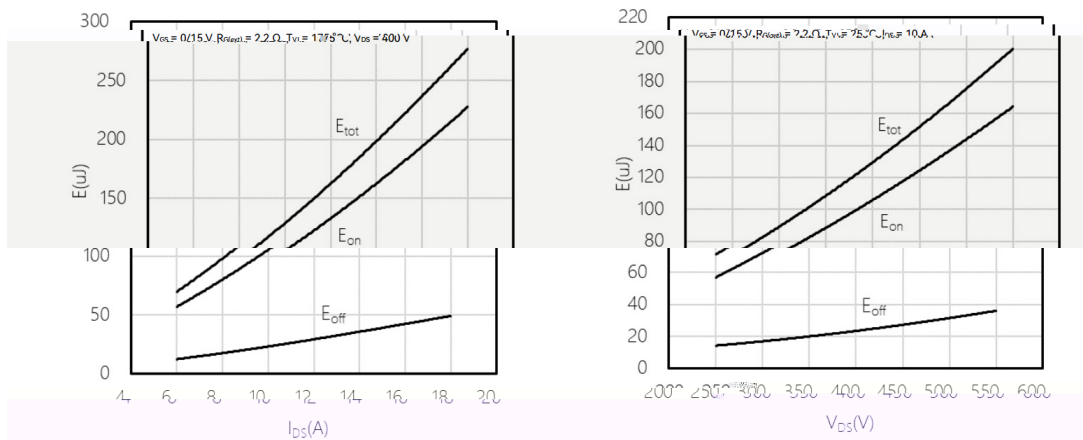


Fig19: Typical switching energy losses as a function

of I_{DS} , 2nd device own body diode: $V_{GS} = -5V$

Fig20: Typical switching energy losses as a function

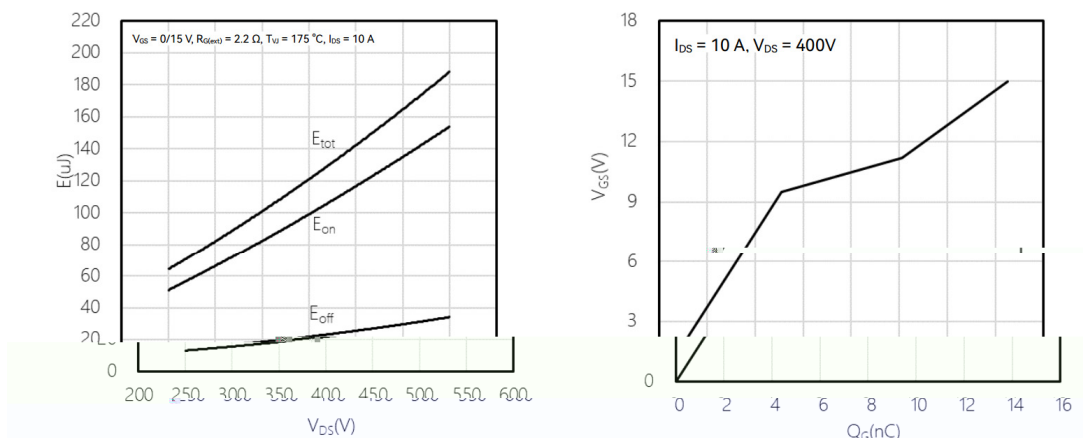
of V_{DS} , 2nd device own body diode: $V_{GS} = -5V$ 

Fig 20a: Typical switching energy losses as a function

of V_{DS} , 2nd device own body diode: $V_{GS} = -5V$

Fig 20b: Typical switching energy losses as a function

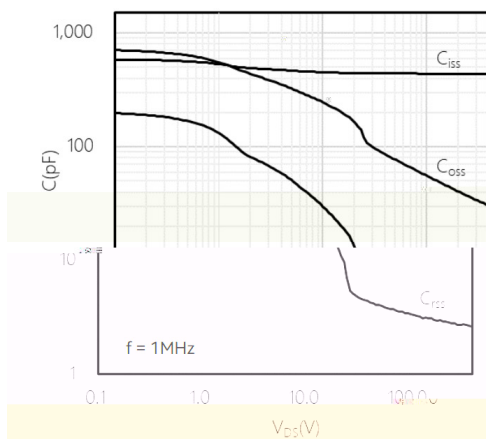
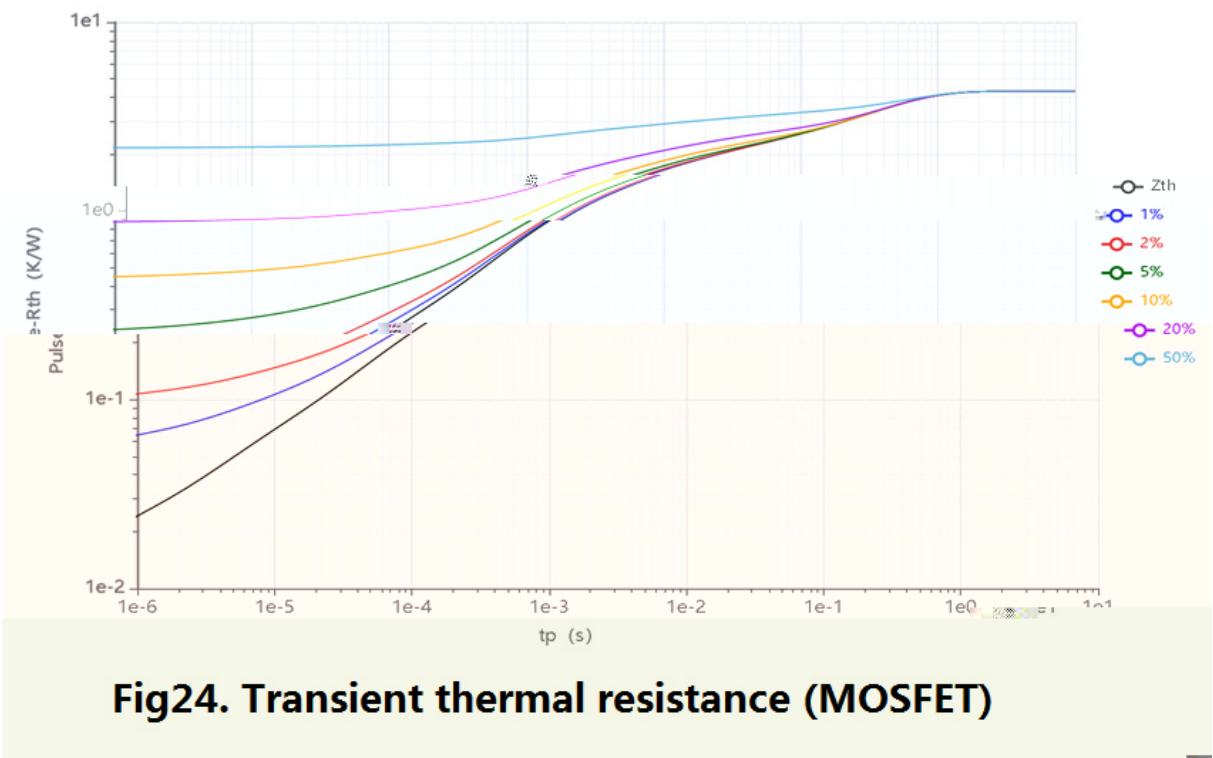
of Q_{GS} , 2nd device own body diode: $V_{GS} = -5V$ 

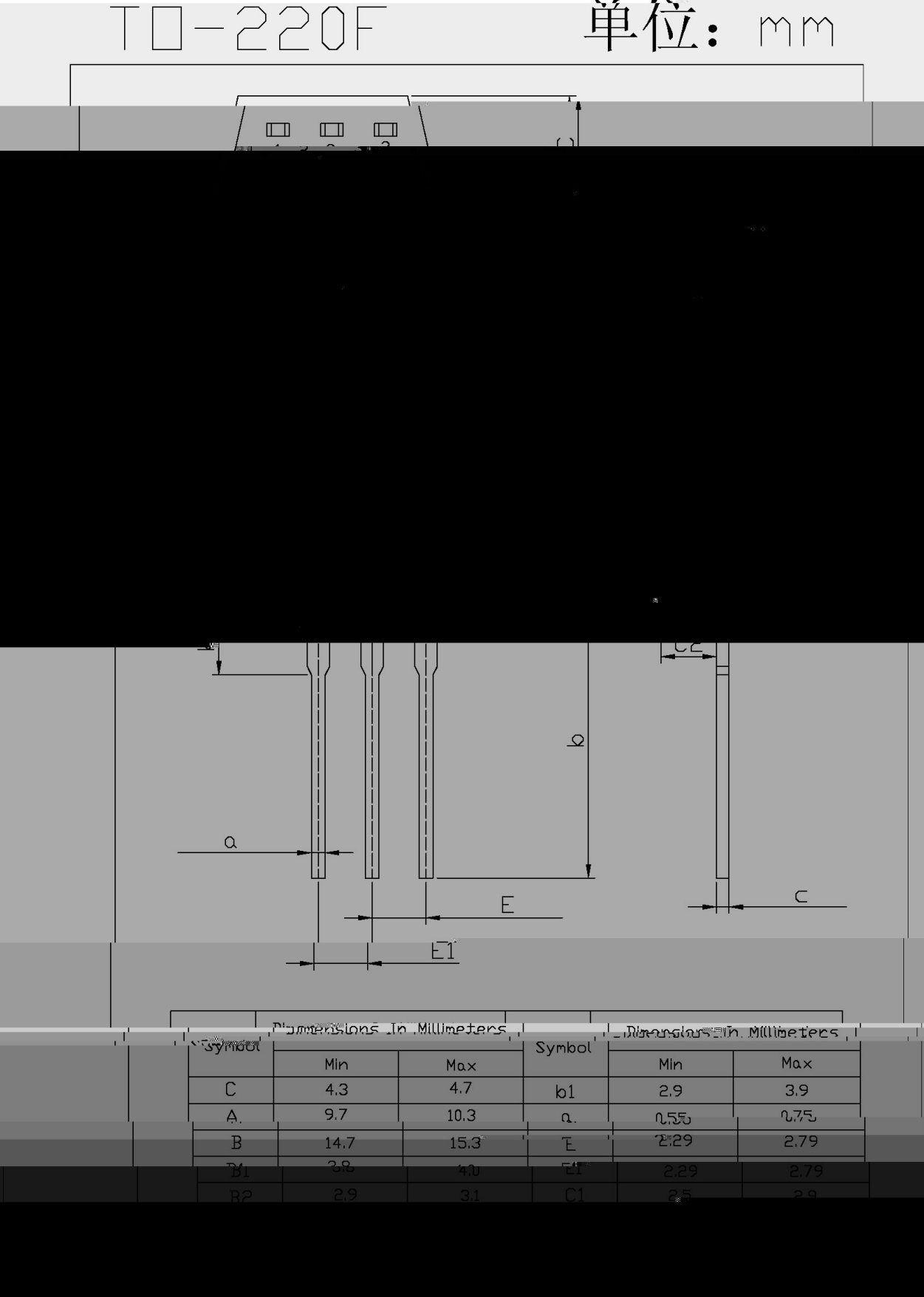
Fig23: Typical capacitance as a function

of drain-source voltage

/ Electrical Characteristic Curve

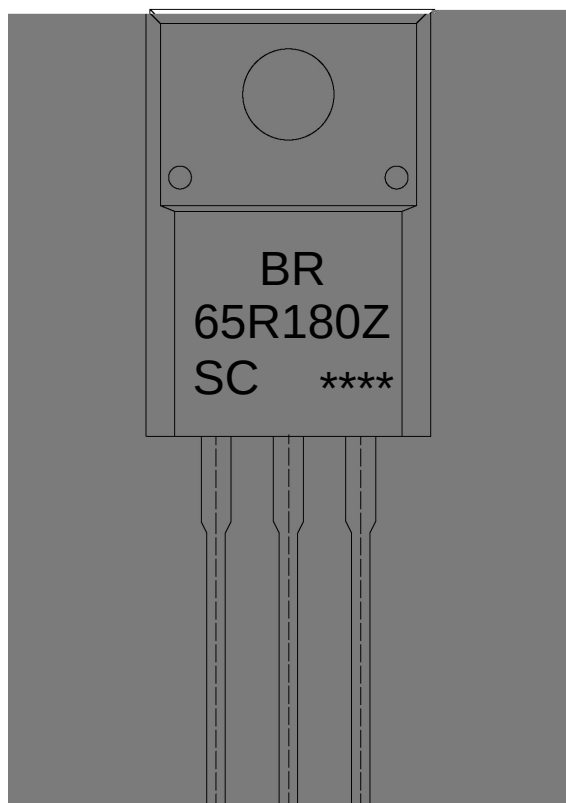


/ Package Dimensions





/ Marking Instructions



BR

65R180Z

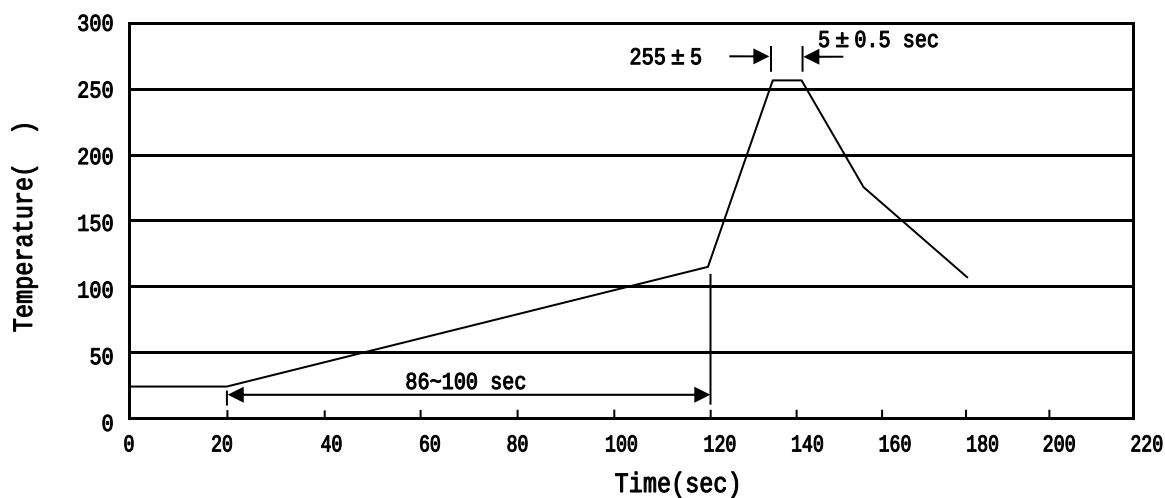
Note:

BR: Company Code

65R180Z: Product Type Code

SC: SiC

****: Lot No. Code, code change with Lot No.


() / Temperature Profile for Dip Soldering(Pb-Free)


Note:

- | | | | | | |
|---|-----|-----|----|----------|---|
| 1 | 25 | 150 | 60 | 90sec; | 1.Preheating:25~150 , Time:60~90sec. |
| 2 | 255 | 5 | 5 | 0.5sec; | 2.Peak Temp.:255 5 , Duration:5 0.5sec. |
| 3 | | | 2 | 10 /sec. | 3. Cooling Speed: 2~10 /sec. |

/ In-line Package Resistance to Soldering Heat Test Conditions

270 5 10 1 sec. Temp.:270±5℃ Time:10±1 sec

/ Packaging SPEC.
/ BULK

Package Type	Units					Dimension (unit mm ³)		
	Units/Bag /	Bags/Inner Box /	Units/Inner Box /	Inner Boxes/Outer Box /	Units/Outer Box /	Bag	Inner Box	Outer Box
TO-220/F	200	10	2,000	5	10,000	135×190	237×172×102	560×245×195

/ TUBE

Package Type	Units					Dimension (unit mm ³)		
	Units/Tube /	Tubes/Inner Box /	Units/Inner Box /	Inner Boxes/Outer Box /	Units/Outer Box /	Tube	Inner Box	Outer Box
TO-220/F	50	20	1,000	5	5,000	532×31.4×5.5	555×164×50	575×290×180

/ Notices

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