

/ Descriptions

TO-220FL N

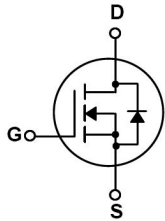
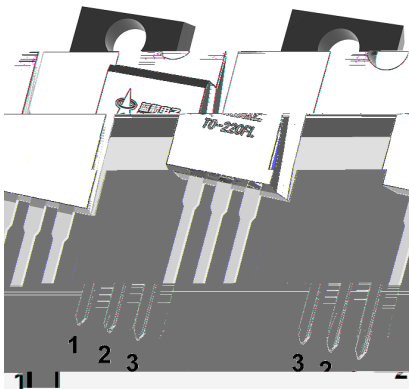
N-CHANNEL 650V Super-Junction Power MOSFET in a TO-220FL Plastic Package.

/ Features $R_{DS(on)} \times Q_g$ 100%

ROHS

Very low $R_{DS(on)} \times Q_g$, 100% avalanche tested, RoHS compliant, HF Product.**/ Applications**

For switch mode power supply, uninterruptible power supply, power factor correction.

/ Equivalent Circuit**/ Pinning**

PIN1 G

PIN 2 D

PIN 3 S

/ Marking

See Marking Instructions.

/ Absolute Maximum Ratings(Ta=25)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	650	V
Drain Current	$I_D(T_c=25^\circ\text{C})$	20	A
Drain Current - Pulsed	I_{DM}	60	A
Gate-Source Voltage	V_{GS}	± 30	V
Single Pulsed Avalanche Energy	E_{AS}	488	mJ
Avalanche Current	I_{AS}	9.5	A
Power Dissipation	$P_D(T_c=25^\circ\text{C})$	34	W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	
Junction-to-Case	$R_{\theta JC}$	3.6	/W
Junction-to-Ambient	$R_{\theta JA}$	80	/W

/ Electrical Characteristics(Ta=25)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DS}	$V_{GS}=0V$ $I_D=250\mu A$	650			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=650V$ $V_{GS}=0V$ $T_J=25^\circ\text{C}$			1.0	μA
Gate-Body Leakage Current, Forward	I_{GSS}	$V_{GS}=\pm 30V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ $I_D=250\mu A$	2.5		4.5	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V$ $I_D=10A$		150	180	m Ω
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V$ $I_{SD}=1A$ $T_J=25^\circ\text{C}$			1.2	V
Gate Resistance	R_g	$V_{GS}=0V$ $f=1.0\text{MHz}$		3.5		Ω
Input Capacitance	C_{iss}	$V_{DS}=100V$ $V_{GS}=0V$ $f=1.0\text{MHz}$		1500		pF
Output Capacitance	C_{oss}			1000		pF
Reverse Transfer Capacitance	C_{rss}			20		pF
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=400V$ $I_D=10A$ $R_G=25\Omega$ $V_{GS}=10V$		63.9		ns
Turn-On Rise Time	t_r			26.4		
Turn-Off Delay Time	$t_{d(off)}$			90.3		
Turn-Off Fall Time	t_f			12.5		

/ Electrical Characteristics(Ta=25)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Continuous Diode Forward Current	I_S			20		A
Total Gate Charge	Q_g	$V_{DS}=480V \quad I_D=10A$ $V_{GS}=10V$		28.1		nC
Gate-Source Charge	Q_{gs}			8.1		nC
Gate-Drain Charge	Q_{gd}			2.1		nC
Reverse recovery time	t_{rr}	$V_R=400V, \quad I_F=10A,$ $dI_F/dt=100A/\mu s$		283		ns
Reverse recovery charge	Q_{rr}			3.3		uC

/ Electrical Characteristic Curve

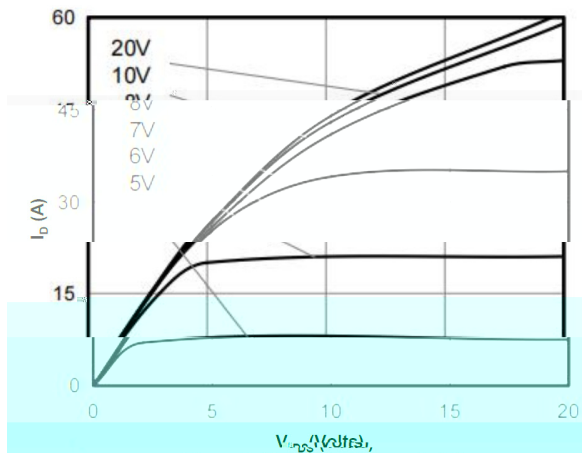


Figure 1: On-Region Characteristics

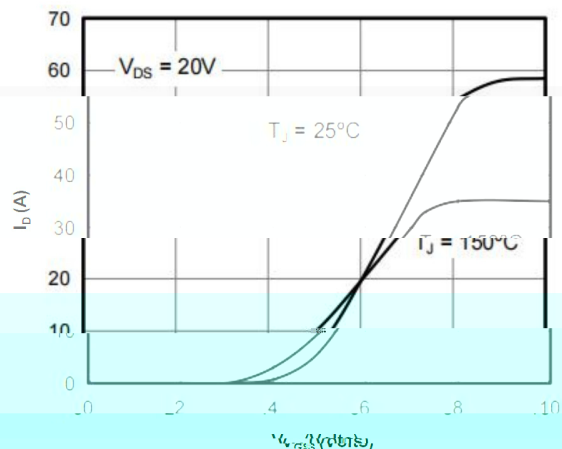


Figure 2: Transfer Characteristics

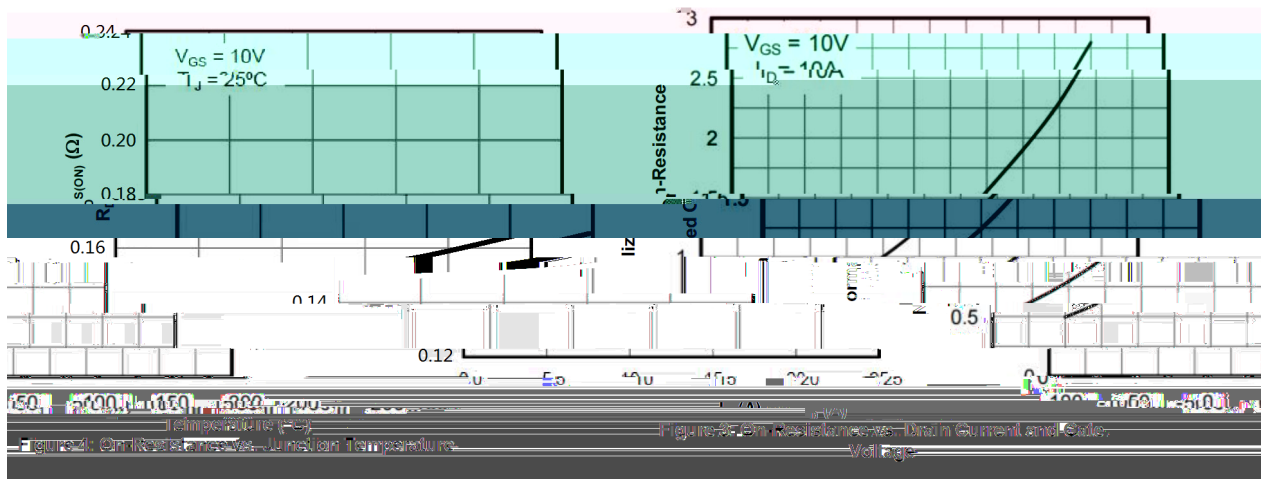


Figure 3: On-Resistance vs. Drain Current and Gate-Source Voltage

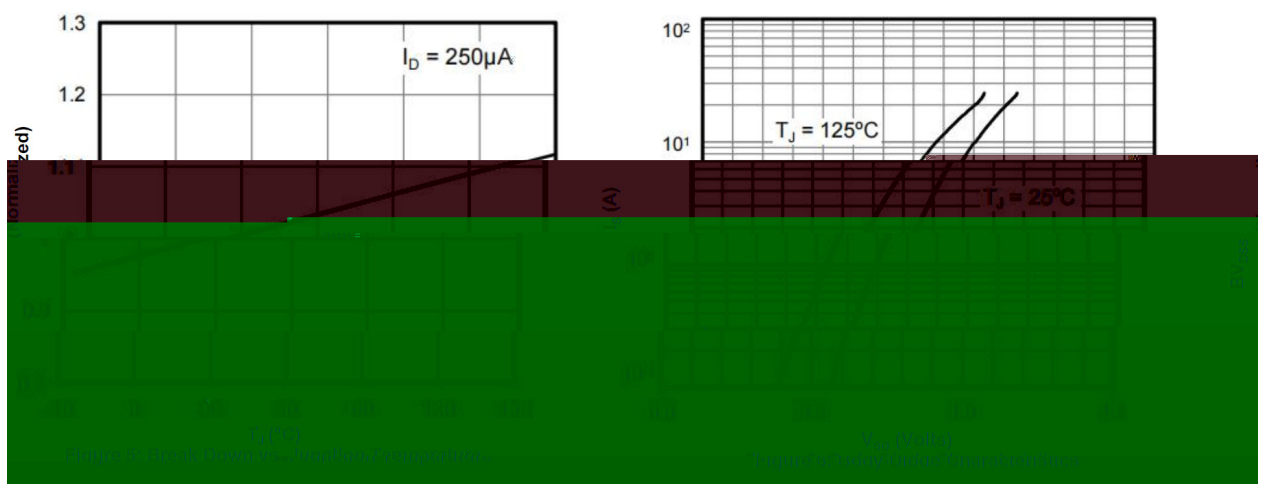


Figure 4: Thermal Resistance vs. Power Dissipation

Figure 5: Thermal Resistance vs. Power Dissipation

/ Electrical Characteristic Curve

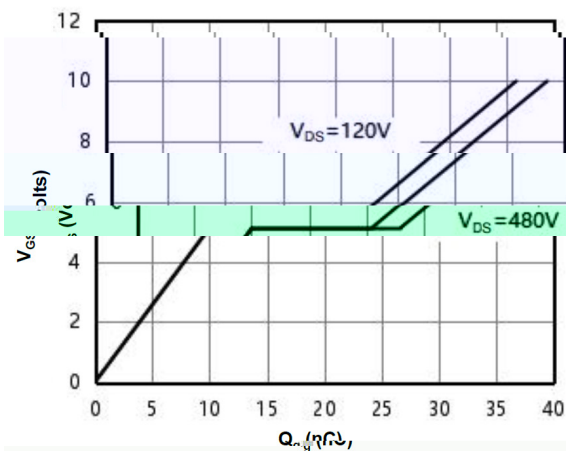


Figure 7: Gate Charge Characteristics

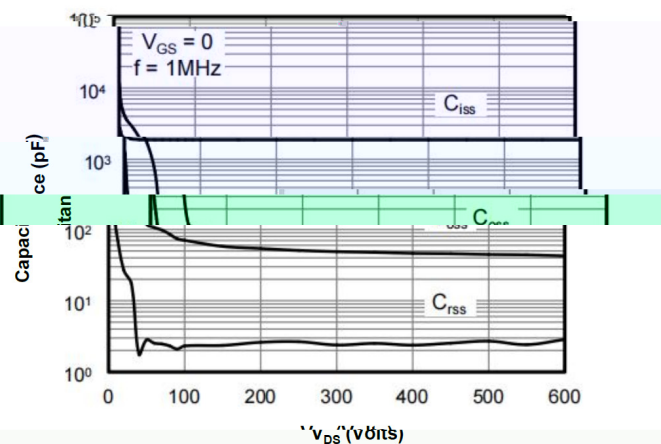


Figure 8: Capacitance Characteristics

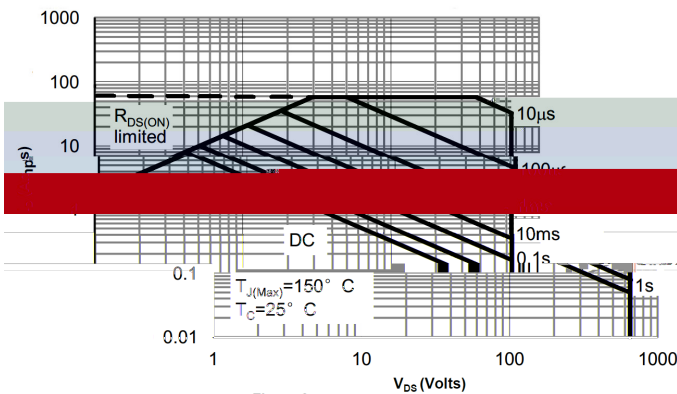


Figure 9: Maximum Forward Biased Safe Operating Area

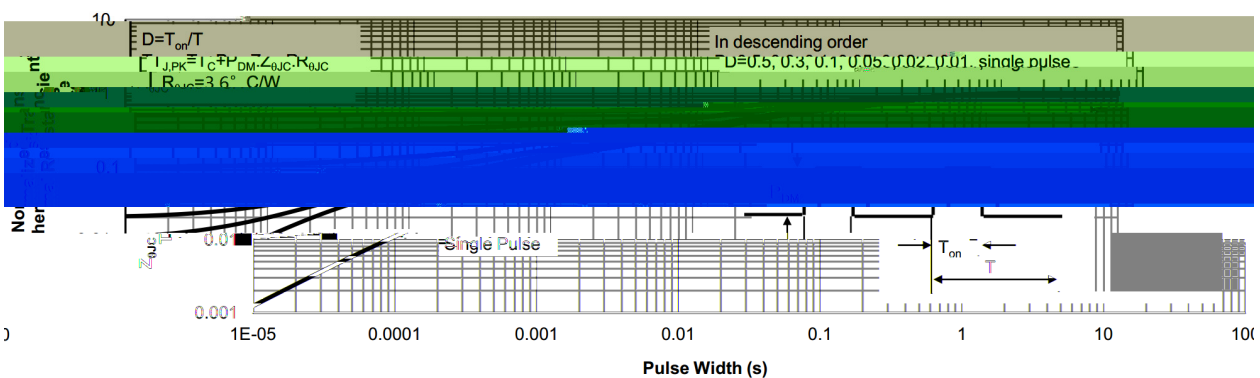


Figure 10: Normalized Maximum Transient Thermal Impedance



/ Marking Instructions



BR

65R180T

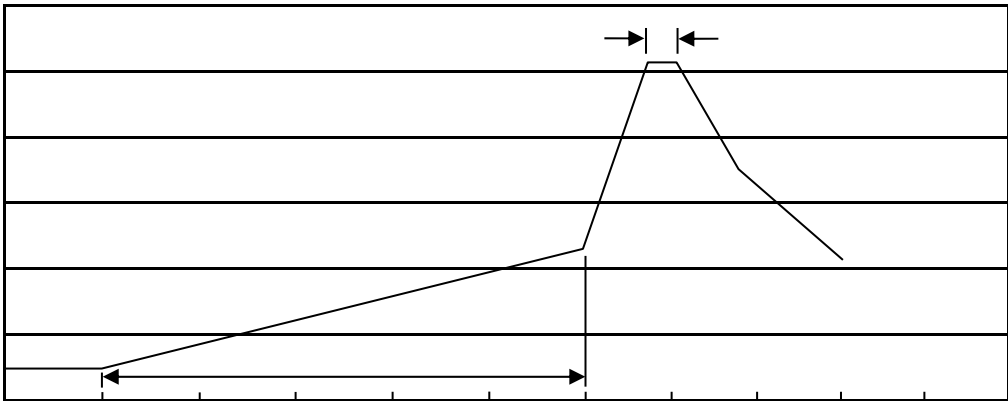
Note:

BR: Company Code

65R180T: Product Type Code

***: 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.

/ Resistance to Soldering Heat Test Conditions

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

/ Packaging SPEC.

/ 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-220FL	50	20	1,000	5	5,000	532×33×7.0	555×164×50	575×290×180

/ Notices