


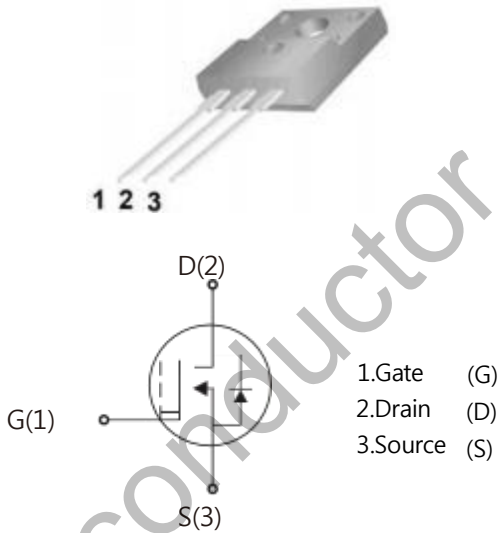
Features:

- Ultra Low RDS(ON) = 600mΩ @ VGS = 10V.
- Ultra Low Gate Charge, Qg=18.4nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved Design (*SnowMOS™ Gen.2*)
- VDSS=650 V, ID=7.3A
- 100% Avalanche Tested

Application

- TV Power
- High Performance Charger / Adapter
- LED Lighting Power

TO-220F 



1.Gate (G)
2.Drain (D)
3.Source (S)

Absolute Maximum Ratings

Drain-Source Voltage (Note2)		VDSS	650	V
Gate-Source Voltage		VGSS	±30	V
Continuous Drain Current	TC=25°C	ID	7.3	A
	TC=25°C (Note 3, D=75%)		8.4	
	TC=125°C		3.3	
Pulsed Drain Current (Note 4)		IDM	24.0	A
Avalanche Energy, Single Pulse (Note 5)		EAS	105	mJ
Avalanche Energy, Repetitive (Note 4)		EAR	0.15	mJ
Avalanche Current, Repetitive (Note 4)		IAR	1.3	A
Continuous Diode Forward Current		IS	7.3	A
Diode Pulse Current		IS.PULSE	24.0	A
Operating Junction Temperature		TJ	150	°C
Storage Temperature		TSTG	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)		TLEAD	260	°C

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. For voltage spike during switching.
3. Limited by TJ_MAX, Maximum duty cycle D=0.75
4. Repetitive Rating: Pulse width limited by maximum junction temperature
5. IAS = 1.3A, VDD = 60V, RG = 25Ω, Starting TJ = 25°C

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-252	RthJC			2.13	°C /W
Thermal resistance, Junction-to-Ambient	TO-252	RthJA			60	°C /W

Electrical Characteristics TJ = 25°C, unless otherwise specified.

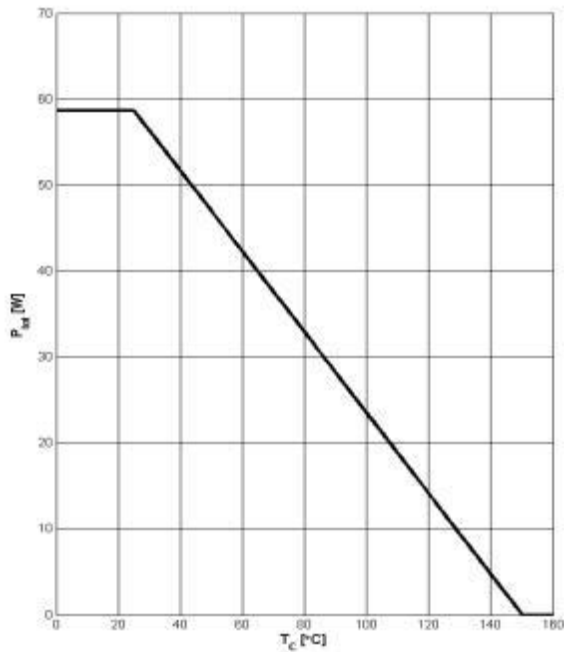
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BVDSS	VGS=0V, ID=250uA	650			V
Zero Gate Voltage Drain Current		IDSS	VDS=650V, VGS=0V			1	uA
Gate-Body Leakage Current	Forward	IGSSF	VGS=30V, VDS=0V			100	nA
	Reverse	IGSSR	VGS=-30V, VDS=0V			-100	
Gate Threshold Voltage		VGS(TH)	VDS=VGS, ID=250uA	2.7	3.6	4.5	V
Static Drain-Source On-Resistance		RDS(ON)	VGS=10V, ID=4.0A		510	600	mΩ
Gate Resistance		RG	f=1MHz, Open Drain		8.9		Ω
Dynamic Characteristics							
Input Capacitance		CISS	VDS=50V, VGS=0V, f=1MHz		356		pF
Output Capacitance		COSS			31.8		
Reverse Transfer Capacitance		CRSS			18.7		
Effective output capacitance, energy related NOTE6		CO(er)	VGS=0V, VDS=0...480V		16		pF
Effective output capacitance, time related NOTE7		CO(tr)			72		
Turn-on Delay Time		td(on)	VDD=400V, ID=4.0A RG=10Ω, VGS=10V		10		ns
Rise Time		tr			12		
Turn-off Delay Time		td(off)			36		
Fall Time		tf			14		
Gate Charge Characteristics							
Gate to Source Charge		Qgs	VDD=480V, ID=4.0A VGS=0 to 10V		4.2		nC
Gate to Drain Charge		Qgd			9.1		
Gate Charge Total		Qg			18.4		
Gate Plateau Voltage		Vplateau			5.9		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		VSD	VGS=0V, ISD=4.0A		0.84	1.1	V
Reverse Recovery Time		trr	VR=400V, IF=4.0A dIF/dt=100A/us		206		ns
Reverse Recovery Charge		Qrr			1.63		uC
Peak Reverse Recovery Current		Irrm			15.8		A

Note:

- CO(er) is a fixed capacitance that gives the same stored energy as COSS while VDS is rising from 0 to 480V
- CO(tr) is a fixed capacitance that gives the same charging time as COSS while VDS is rising from 0 to 480 V

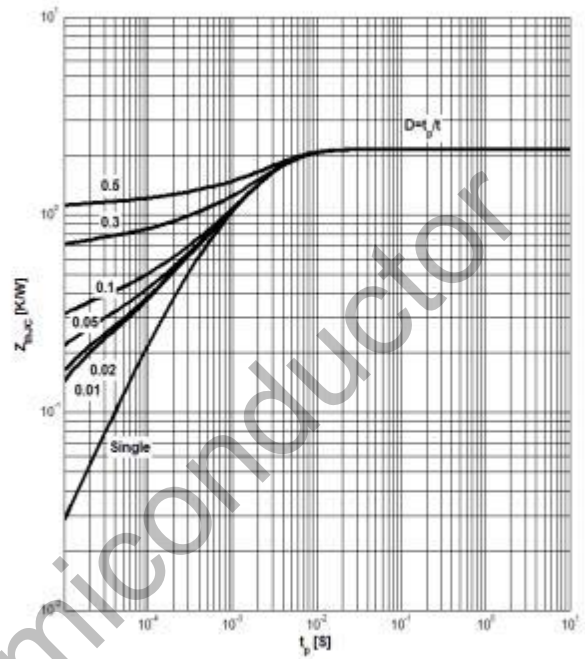
Typical Performance Characteristics

Figure 3: Power Dissipation



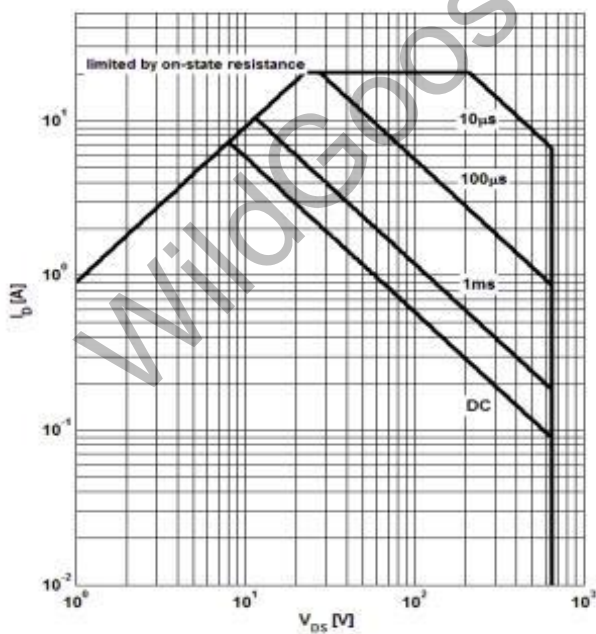
$P_{tot} = f(T_c)$

Figure 4: Max. Transient Thermal Impedance



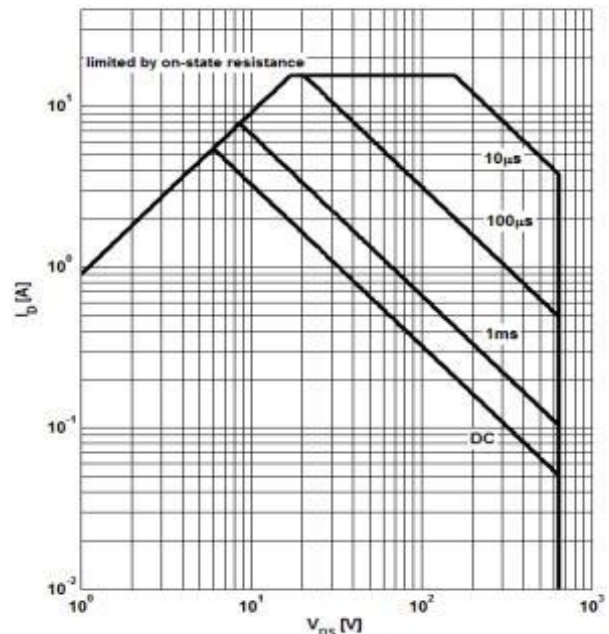
$Z_{thJC} = f(t_p)$; parameter: $D = t_p/T$

Figure 5: Safe Operating Area



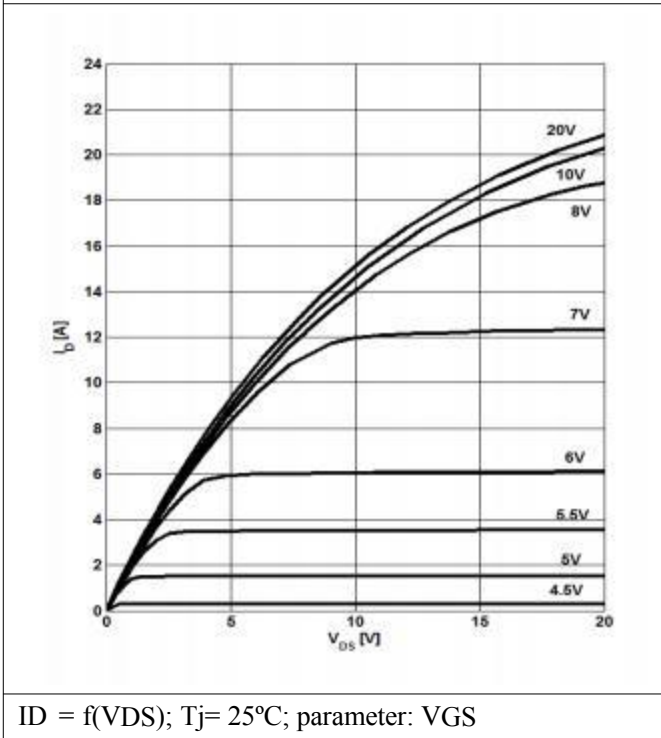
$I_D = f(V_{DS})$; $T_c = 25^\circ\text{C}$; $V_{GS} > 7\text{V}$; parameter t_p

Figure 6: Safe Operating Area



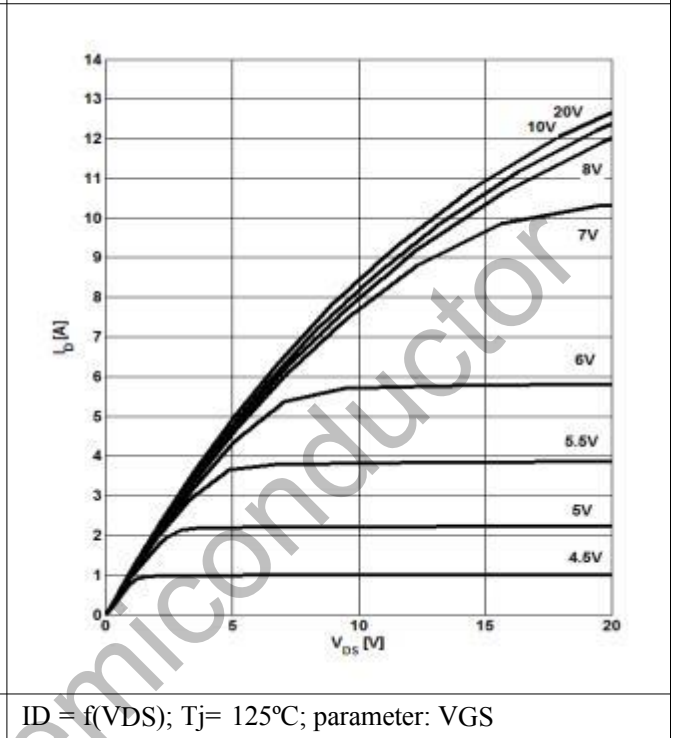
$I_D = f(V_{DS})$; $T_c = 80^\circ\text{C}$; $V_{GS} > 7\text{V}$; parameter t_p

Figure 7: Typ. Output Characteristics



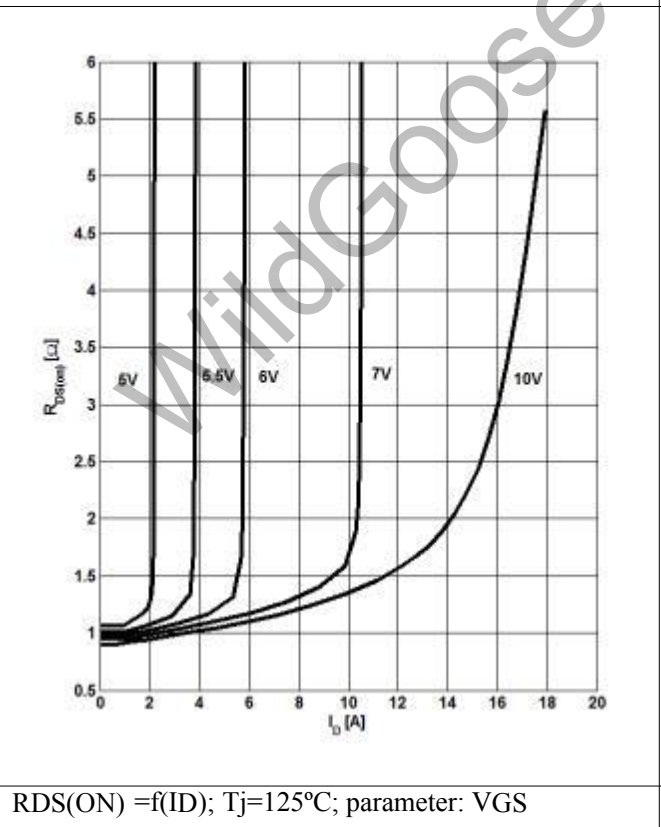
$I_D = f(V_{DS})$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Figure 8: Typ. Output Characteristics



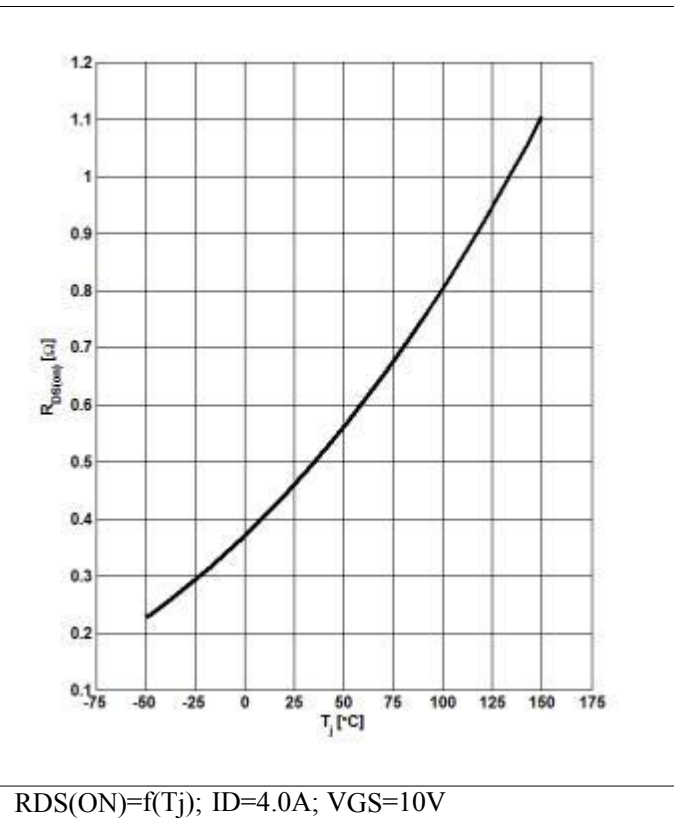
$I_D = f(V_{DS})$; $T_j = 125^\circ\text{C}$; parameter: V_{GS}

Figure 9: Typ. Drain-Source On-State Resistance



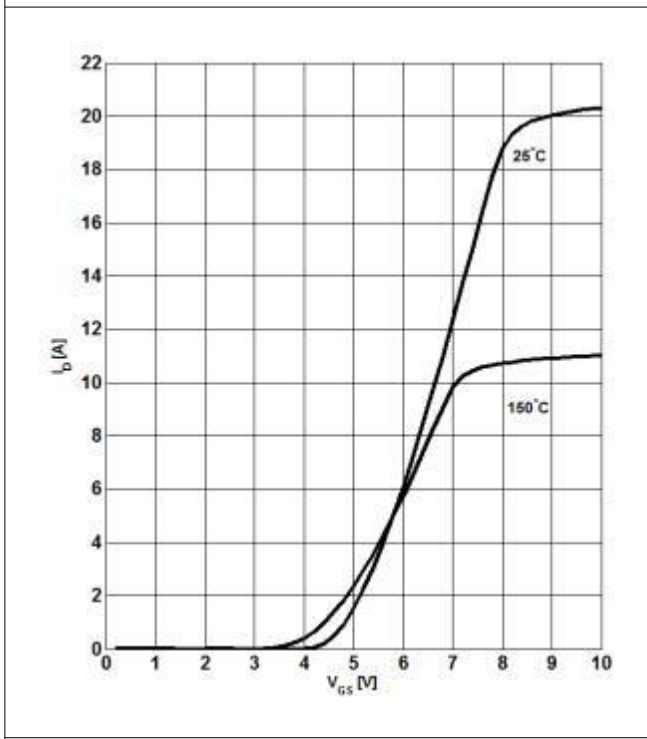
$R_{DS(ON)} = f(I_D)$; $T_j = 125^\circ\text{C}$; parameter: V_{GS}

Figure 10: Typ. Drain-Source On-State Resistance



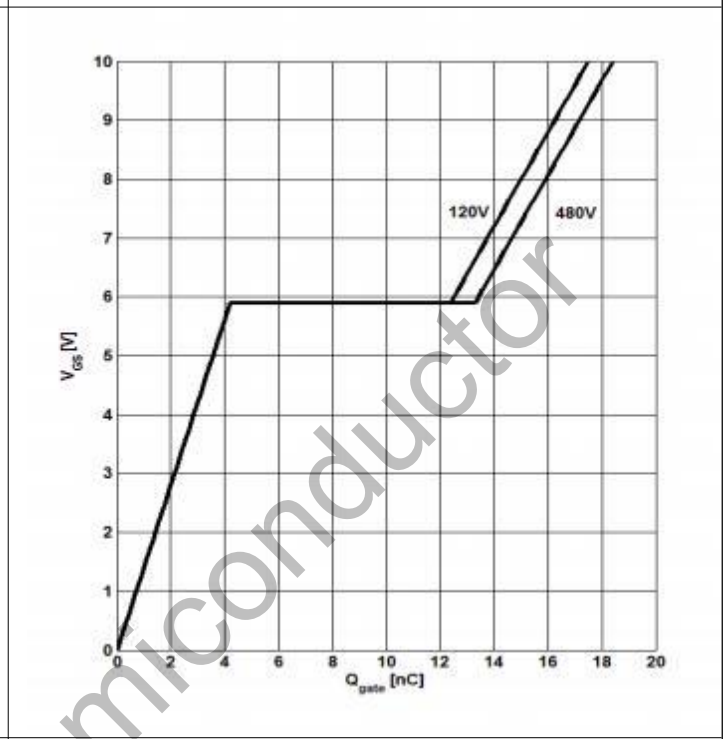
$R_{DS(ON)} = f(T_j)$; $I_D = 4.0\text{A}$; $V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics



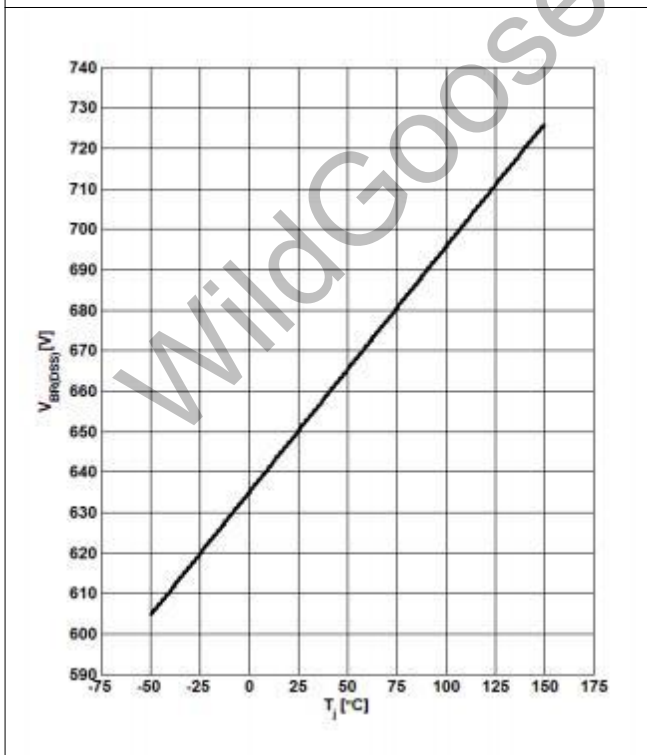
$I_D = f(V_{GS}); V_{DS} = 20V$

Figure 12: Typ. Gate Charge



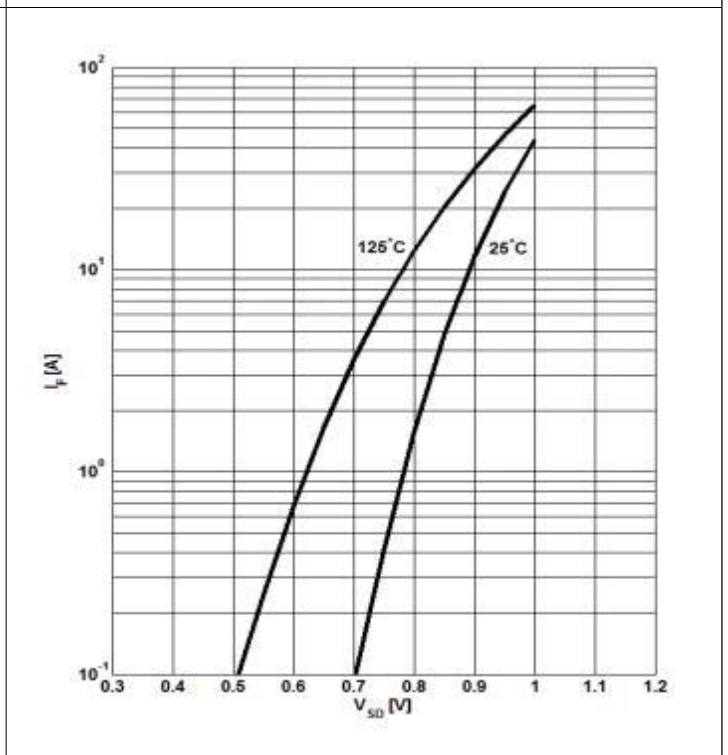
$V_{GS} = f(Q_{gate}), I_D = 4.0A$ pulsed

Figure 13: Drain-Source Breakdown Voltage



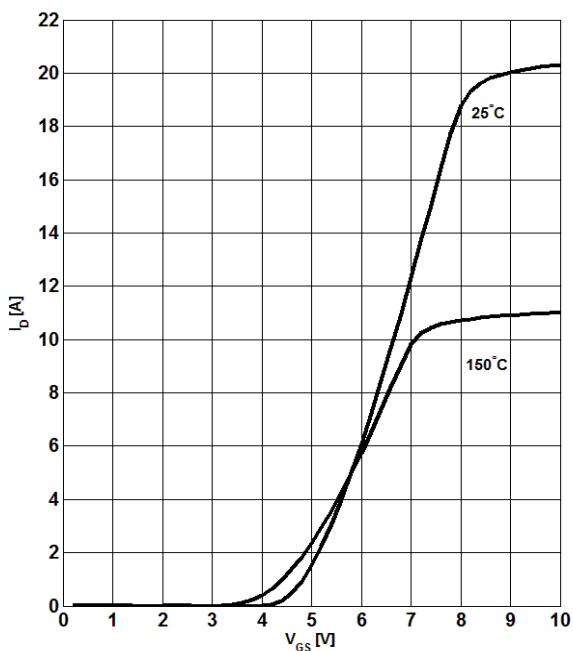
$V_{BR}(DSS) = f(T_j); I_D = 1mA$

Figure 14: Forward Characteristics of Reverse Diode



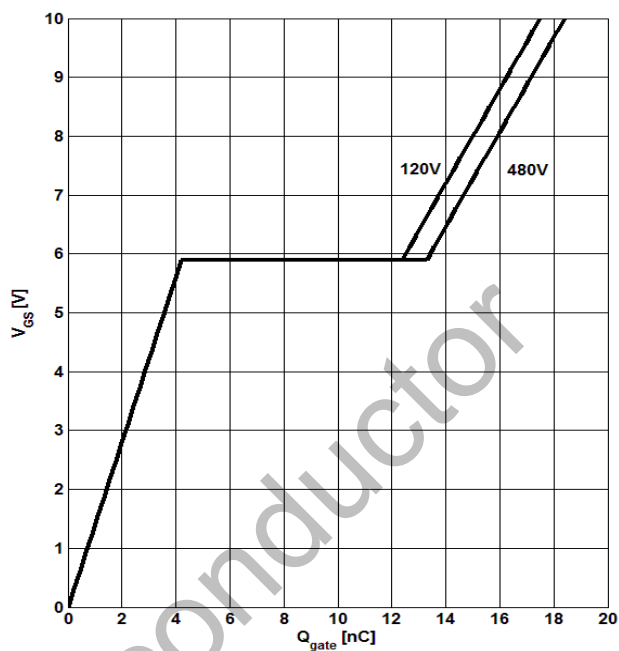
$I_F = f(V_{SD});$ parameter: T_j

Figure 11: Typ. Transfer Characteristics



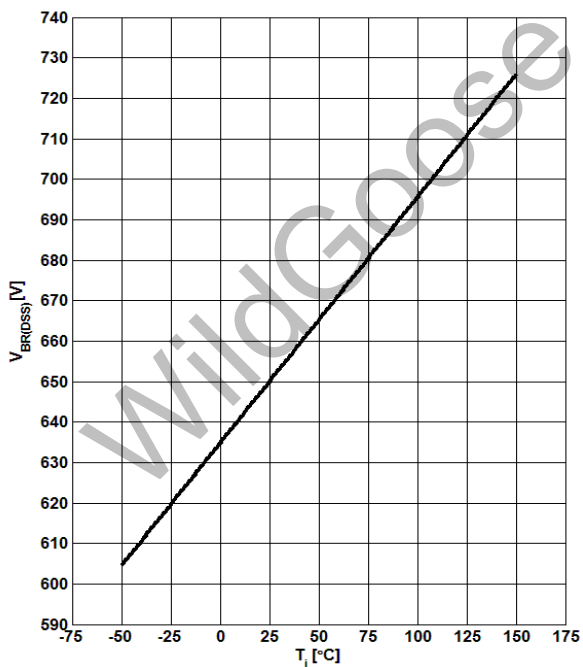
$I_D = f(V_{GS}); V_{DS} = 20V$

Figure 12: Typ. Gate Charge



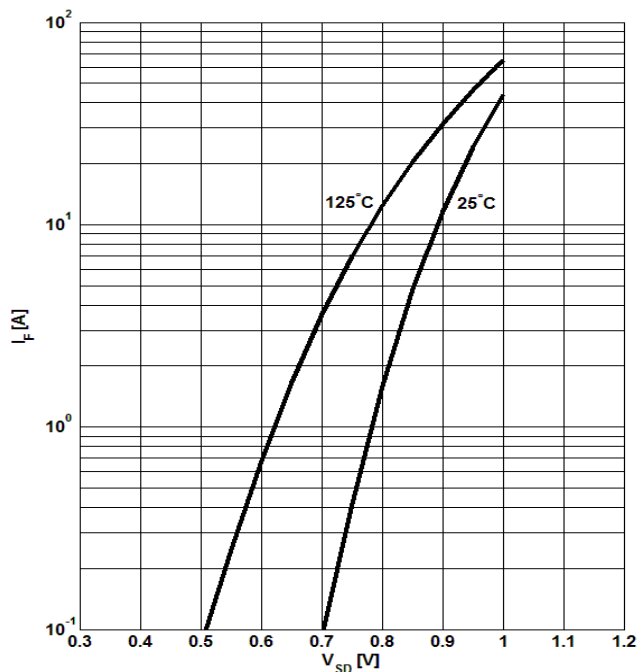
$V_{GS} = f(Q_{gate}), I_D = 4.0A \text{ pulsed}$

Figure 13: Drain-Source Breakdown Voltage



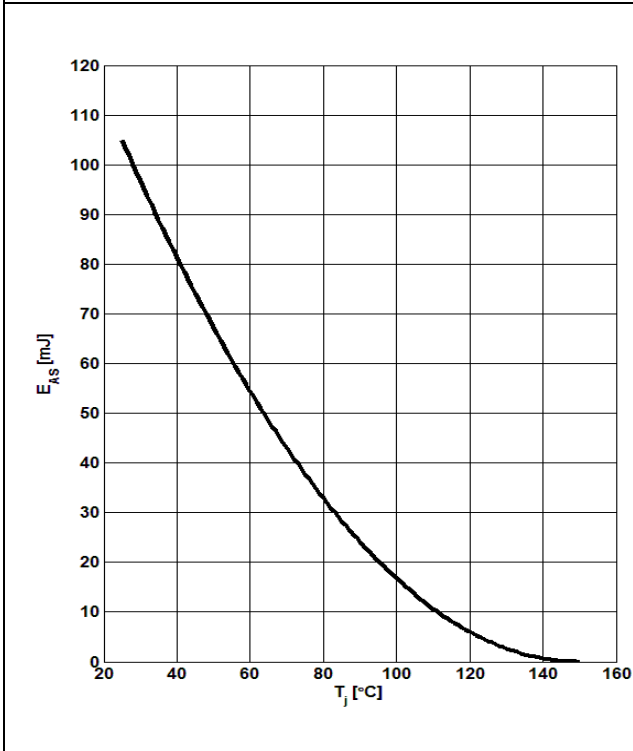
$V_{BR(DSS)} = f(T_j); I_D = 1mA$

Figure 14: Forward Characteristics of Reverse Diode



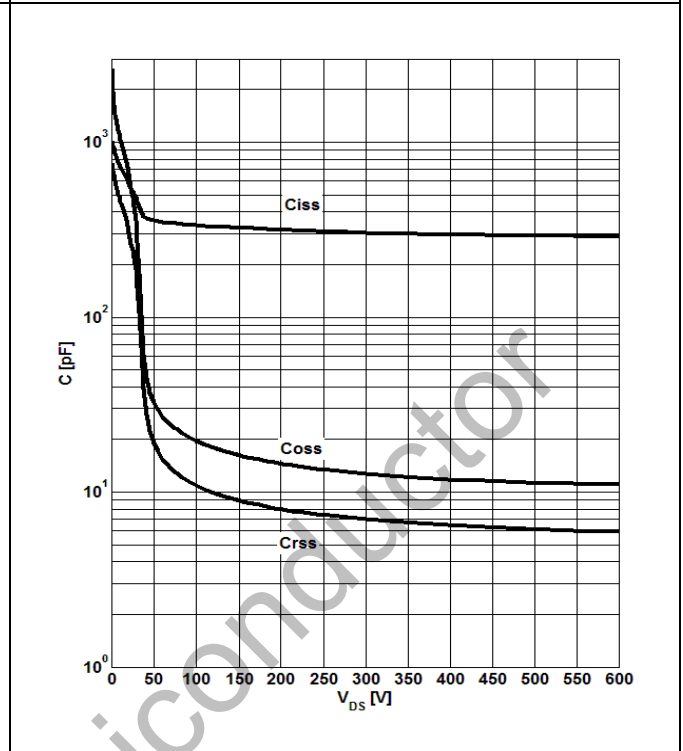
$I_F = f(V_{SD}); \text{parameter: } T_j$

Figure 15: Avalanche Energy



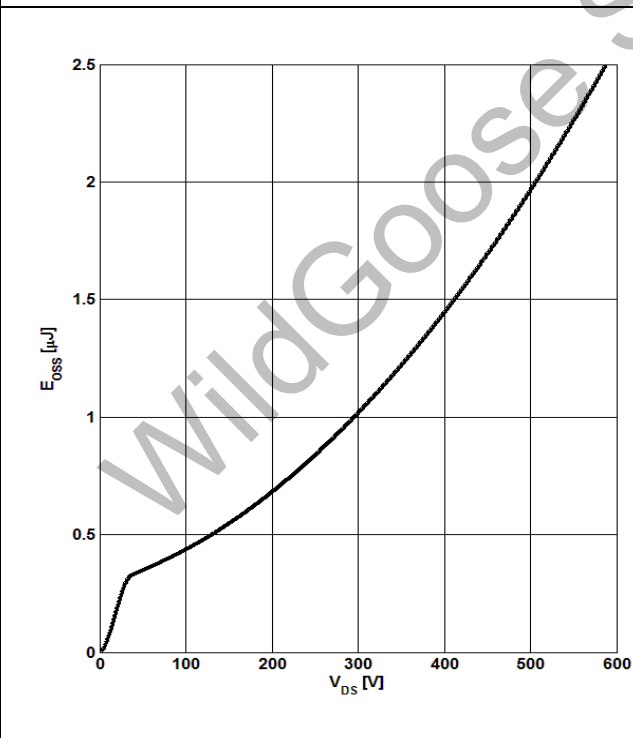
$E_{AS}=f(T_j)$; $I_D=1.3A$; $V_{DD}=60V$

Figure 16: Typ. Capacitances



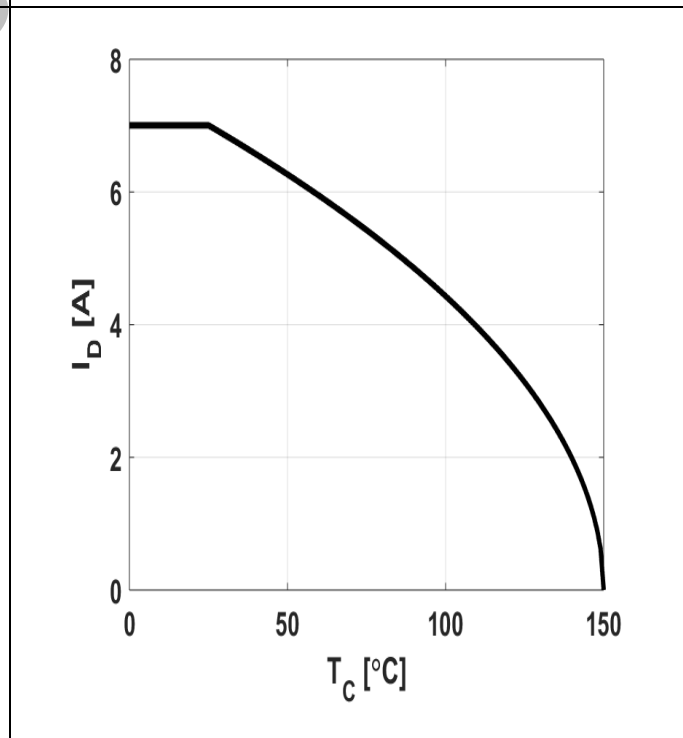
$C=f(V_{DS})$; $V_{GS}=0$; $f=1MHz$

Figure 17: C_{OSS} Stored Energy



$E_{OSS}=f(V_{DS})$

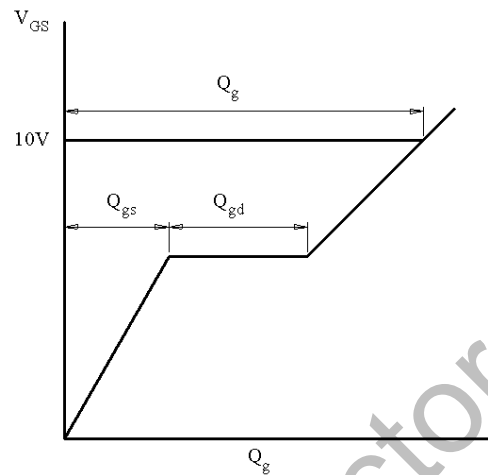
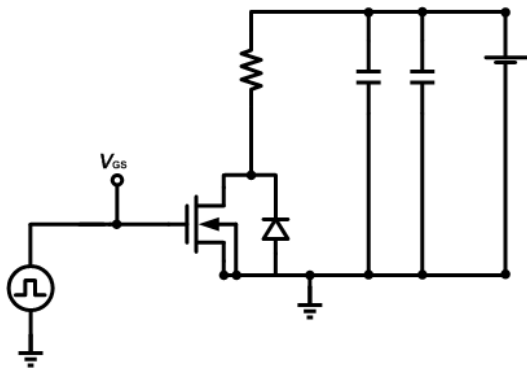
Figure 18: Drain current



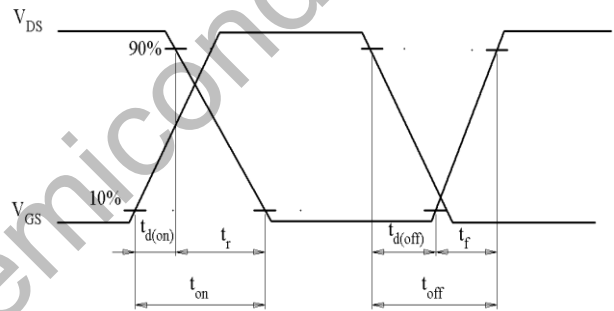
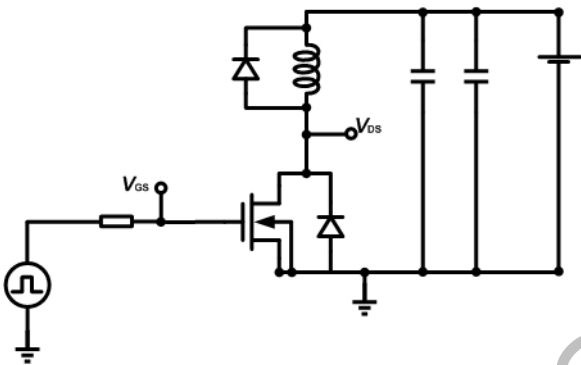
$I_D=f(T_C)$

Test Circuits

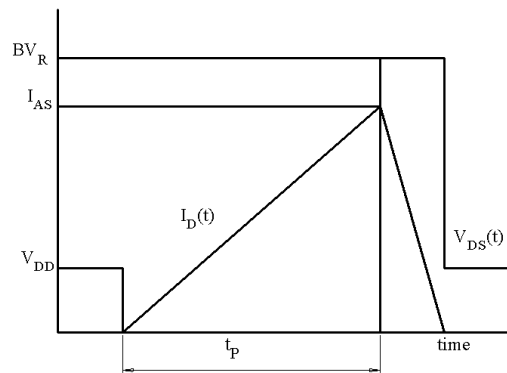
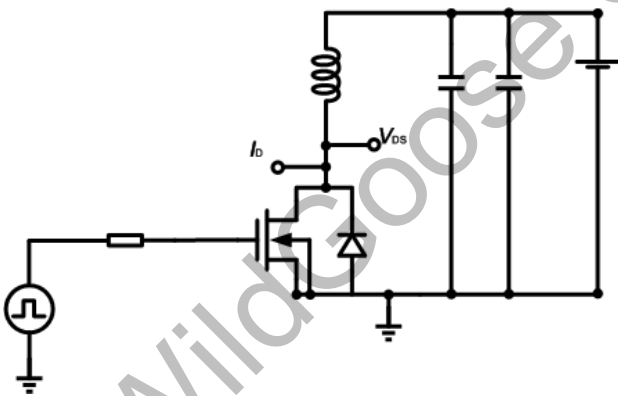
1. Gate Charge Test Circuit & Waveform



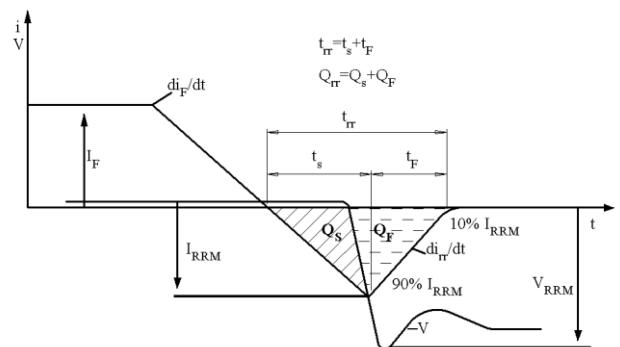
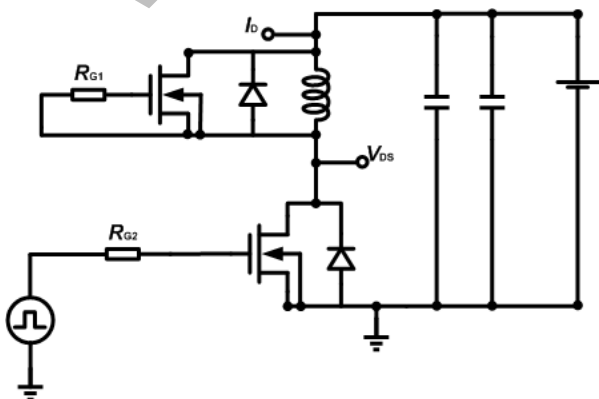
2. Switch Time Test Circuit



3. Unclaimed Inductive Switching Test Circuit & Waveforms



4. Test Circuit and Waveform for Diode Characteristics



Package Dimension

TO-220F

