
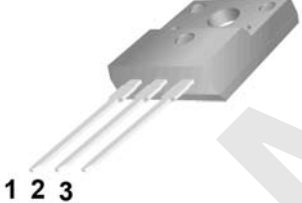
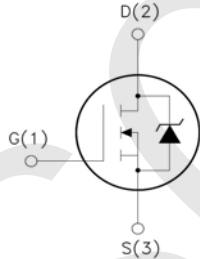


### SM840C

#### Features

- Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Extended Safe Operating Area
- Unrivalled Gate Charge : 28 nC (Typ.)
- BVDSS=500V, ID=9A
- Lower  $R_{DS(on)}$  : 0.75  $\Omega$  (Max) @VG=10V
- 100% Avalanche Tested

TO-220F

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

### Absolute Maximum Ratings (Ta=25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	500	V
$I_D$	Drain Current	$T_j=25^\circ\text{C}$	9.0
		$T_j=100^\circ\text{C}$	5.7
$V_{GS(TH)}$	Gate Threshold Voltage	$\pm 30$	V
$E_{AS}$	Single Pulse Avalanche Energy (note1)	360	mJ
$I_{AR}$	Avalanche Current (note2)	9.0	A
$P_D$	Power Dissipation ( $T_j=25^\circ\text{C}$ )	50	W
$T_j$	Junction Temperature(Max)	150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature	-55~+150	$^\circ\text{C}$
TL	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	-	2.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	$^\circ\text{C}/\text{W}$

### Electrical Characteristics (Ta=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	ID=250 μ A, VGS=0	500	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	ID=250 μ A, Reference to 25°C	--	0.55	--	V/°C
IDSS	Zero Gate Voltage Drain Current	Vds=500V, Vgs=0V	--	--	1	μ A
		Vds=400V, Tc=125°C	--	--	10	μ A
IGSSF	Gate-body leakage Current, Forward	Vgs=+30V, Vds=0V	--	--	100	nA
IGSSR	Gate-body leakage Current, Reverse	Vgs=-30V, Vds=0V	--	--	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	Id=250uA, Vds=Vgs	2	--	4	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	Id=4.5A, Vgs=10V	--	--	0.75	Ω
<b>Dynamic Characteristics</b>						
Ciss	Input Capacitance	VDS=25V, VGS=0, f=1.0MHz	--	1210	--	pF
Coss	Output Capacitance		--	160	--	pF
Crss	Reverse Transfer Capacitance		--	20	--	pF
<b>Switching Characteristics</b>						
Td(on)	Turn-On Delay Time	VDD=250V, ID=9A, RG=25 Ω (Note 3,4)	--	25	60	nS
Tr	Turn-On Rise Time		--	95	200	nS
Td(off)	Turn-Off Delay Time		--	55	120	nS
Tf	Turn-Off Fall Time		--	60	130	nS
Qg	Total Gate Charge	VDS=400, VGS=10V, ID=9A (Note 3,4)	--	28	36	nC
Qgs	Gate-Source Charge		--	7	--	nC
Qgd	Gate-Drain Charge		--	12.5	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximun Continuous Drain-Source Diode Forward Current		--	--	9	A
I <sub>SM</sub>	Maximun Plused Drain-Source Diode Forward Current		--	--	36	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	Id=9A	--	--	1.45	V
trr	Reverse Recovery Time	I <sub>S</sub> =9.0A, V <sub>GS</sub> =0V	--	300	--	nS
Qrr	Reverse Recovery Charge	di <sub>F</sub> /dt=100A/μ S (Note3)	--	2.2	--	μ C
*Notes	1, L=8mH, IAS=9A, VDD=50V, RG=25Ω, Starting T <sub>J</sub> =25°C 2, Repetitive Rating : Pulse width limited by maximum junction temperature 3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2% 4, Essentially Independent of Operating Temperature					

## Typical Characteristics

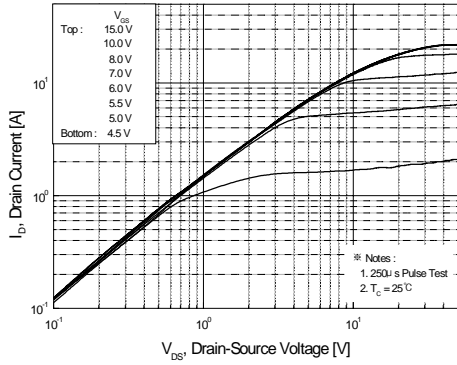


Figure 1. On-Region Characteristics

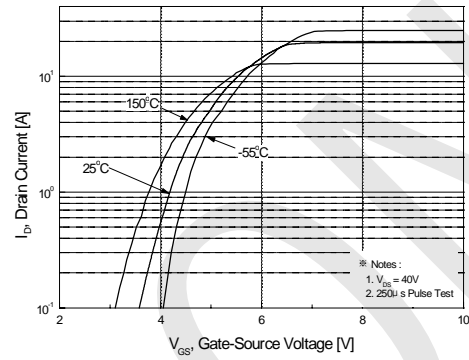


Figure 2. Transfer Characteristics

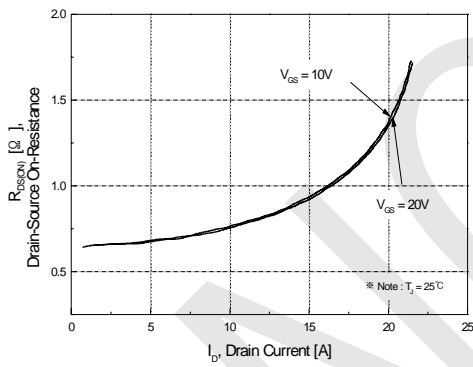


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

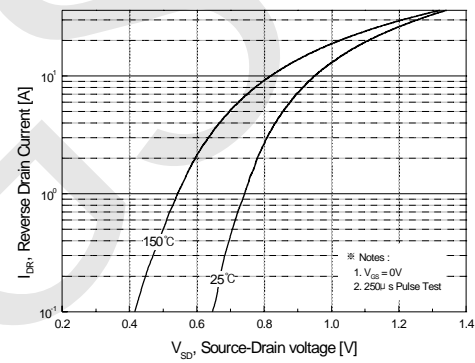


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

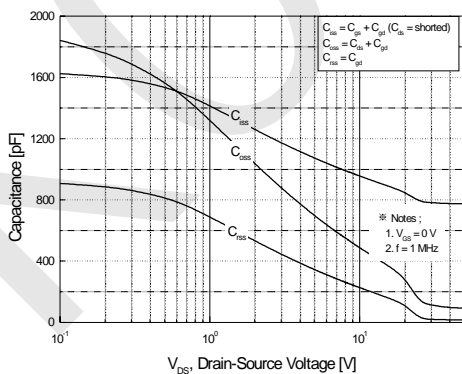


Figure 5. Capacitance Characteristics

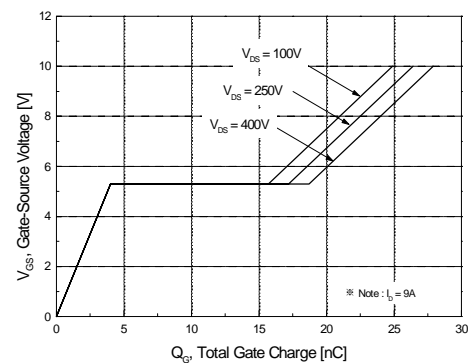
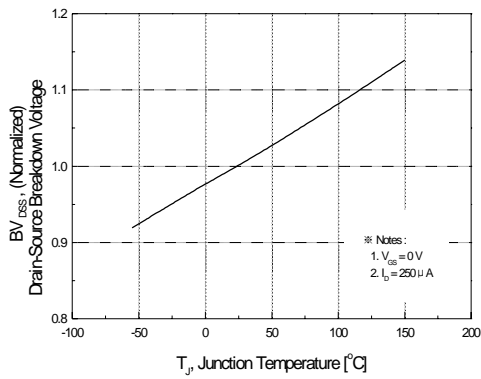
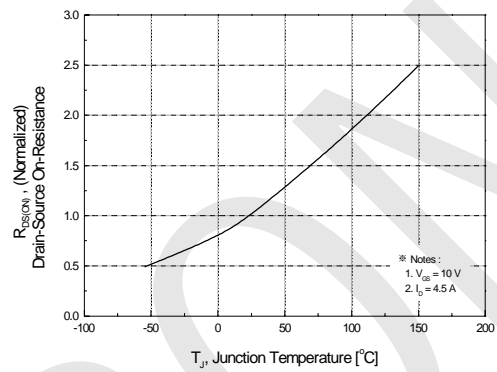


Figure 6. Gate Charge Characteristics

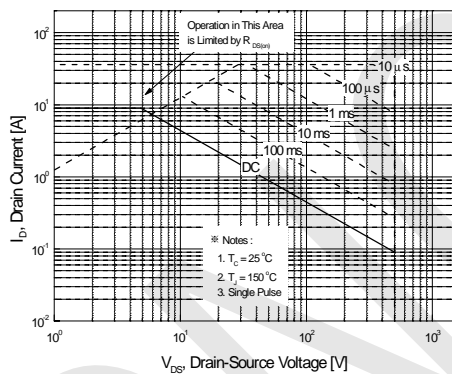
#### Typical Characteristics (Continued)



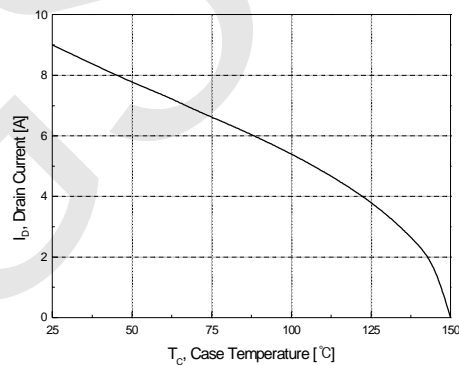
**Figure 7. Breakdown Voltage Variation vs Temperature**



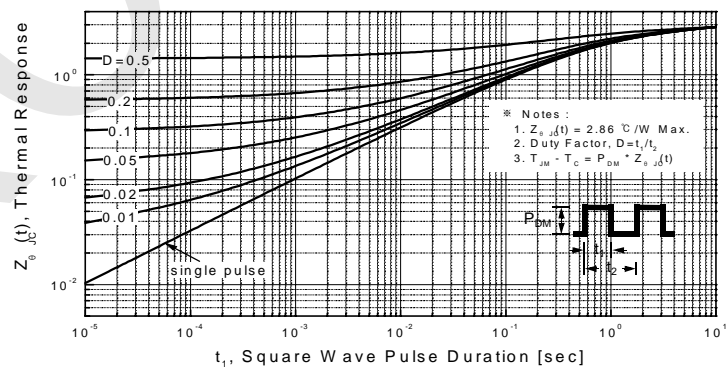
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9-2. Maximum Safe Operating Area**

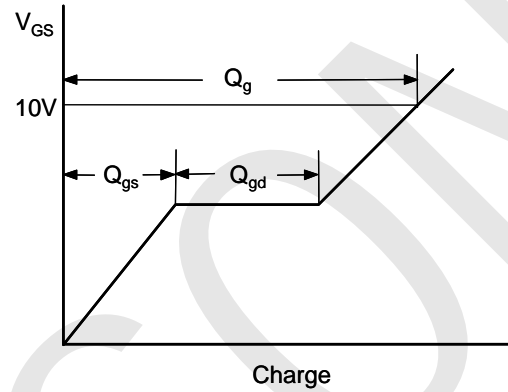
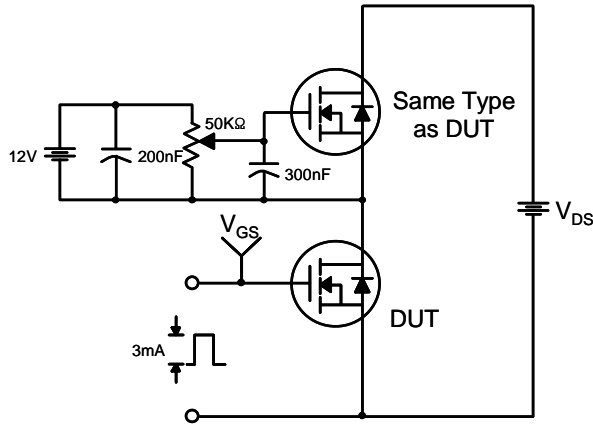


**Figure 10. Maximum Drain Current vs Case Temperature**

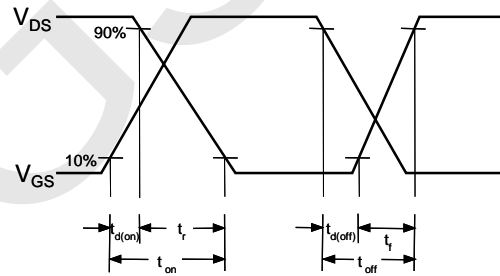
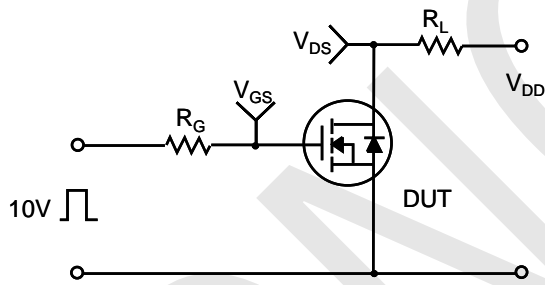


**Figure 11-2. Transient Thermal Response Curve**

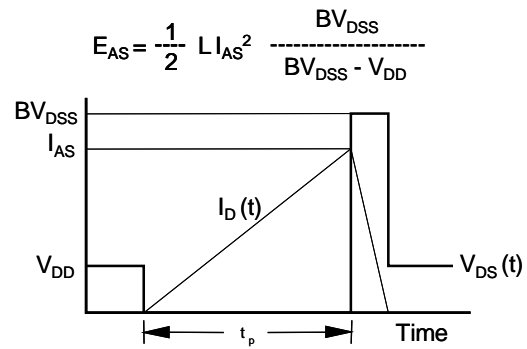
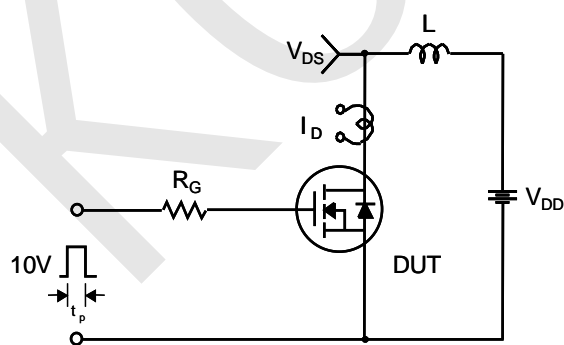
### Gate Charge Test Circuit & Waveform



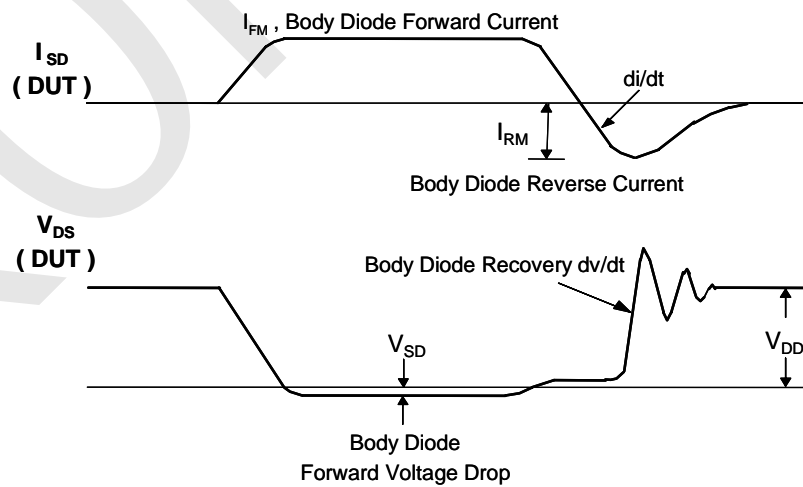
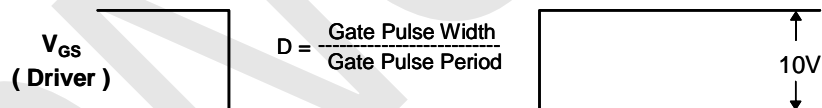
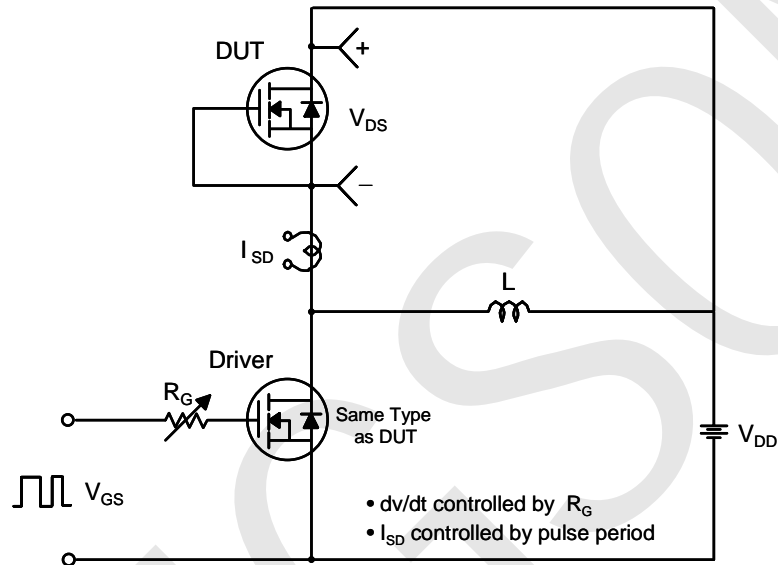
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching Test Circuit & Waveforms



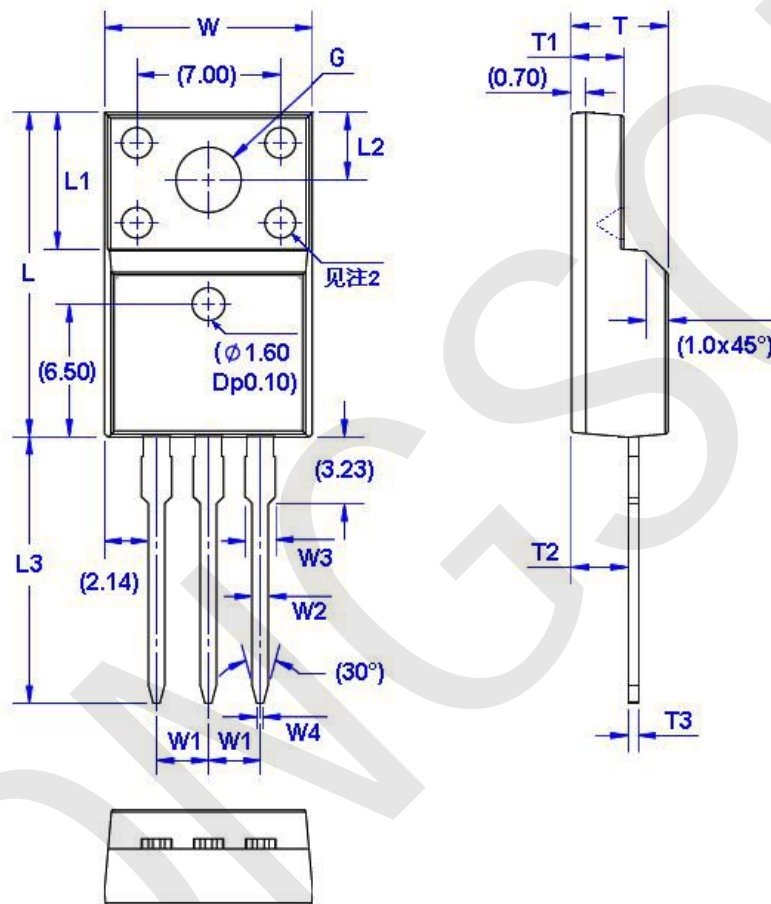
### Peak Diode Recovery dv/dt Test Circuit & Waveforms



### Package Dimension

### TO-220F

Unit: mm



Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.96	10.36	W4	0.25	0.45	L3	12.78	13.18	T3	0.45	0.60
W1	2.54	(TYP)	L	15.67	16.07	T	4.50	4.90	G( $\Phi$ )	3.08	3.28
W2	0.70	0.90	L1	6.48	6.88	T1	2.34	2.74			
W3	1.24	1.47	L2	3.20	3.40	T2	2.56	2.96			