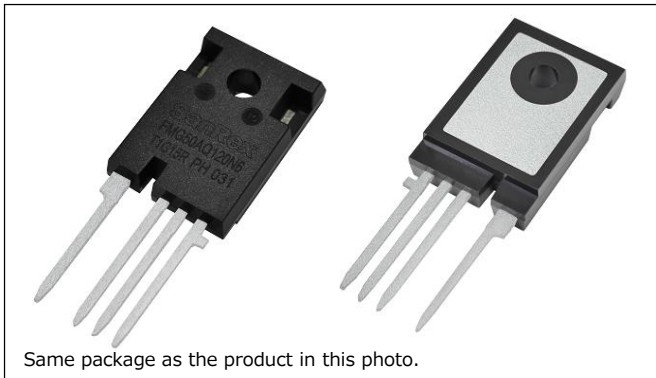
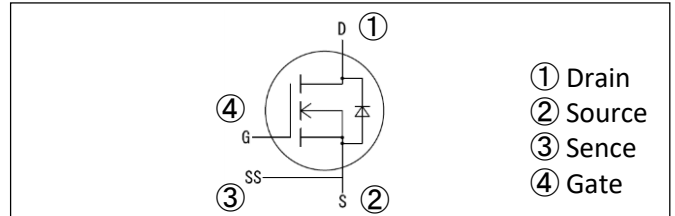


# FMG50AQ120N6



$V_{RRM} = 1200V$   
 $I_{T(AV)} = 50A$



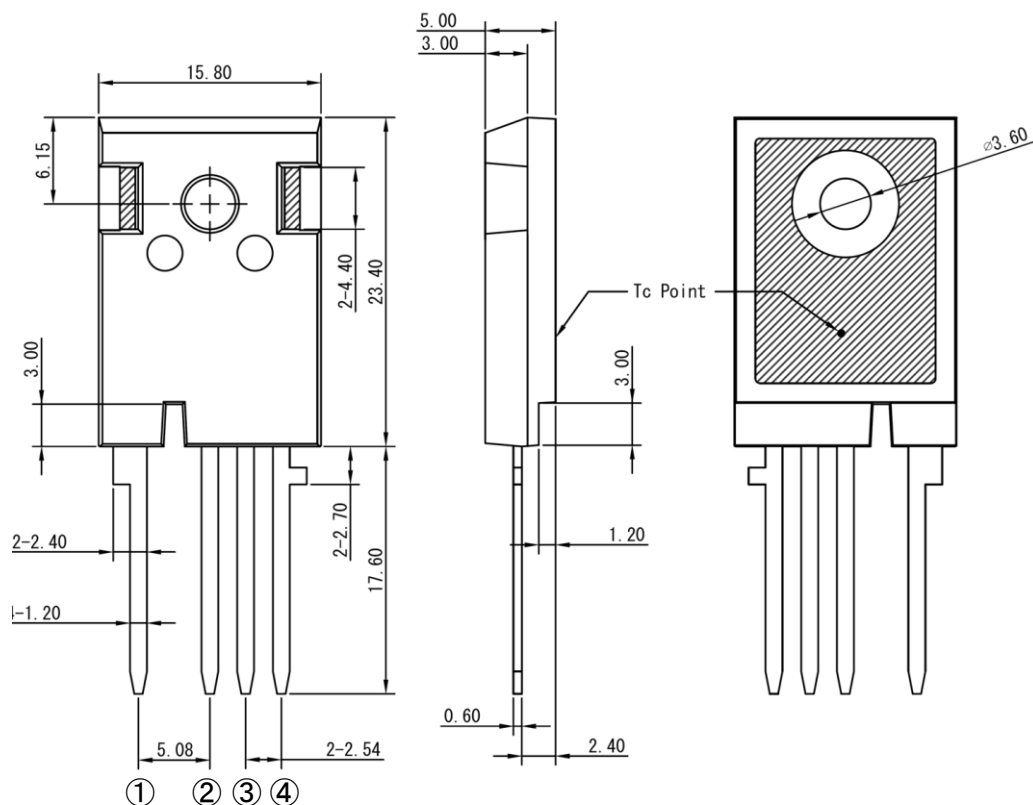
■ TO-247-4L package SiC MOSFET

### Advantages

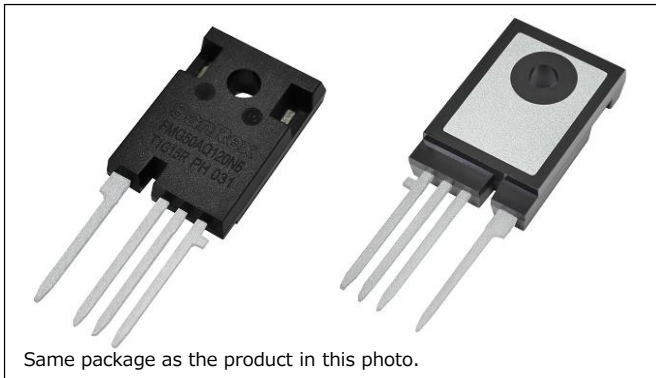
- Low power loss thanks to loss  $R_{DS(on)}$  and low switching loss.
- Low temperature dependency of  $R_{DS(on)}$  reducing thermal runaway risks at high temperature operation
- Safe gate driving at high frequency operation through optimized  $V_{GS(th)}$ (4.0V)
- The four-pin TO-247-4L package further enhancing the high-speed switching performance of SiC MOSFET
- Top level short circuit tolerance enabling safety design of equipment
- No additional FWD required

### Applications

- Industrial Inverters, DC-DC Converters, EV Battery Chargers, Resonant Power Supply

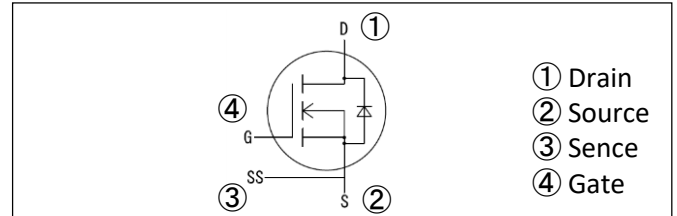


# FMG50AQ120N6



$V_{RRM} = 1200V$

$I_T(AV) = 50A$



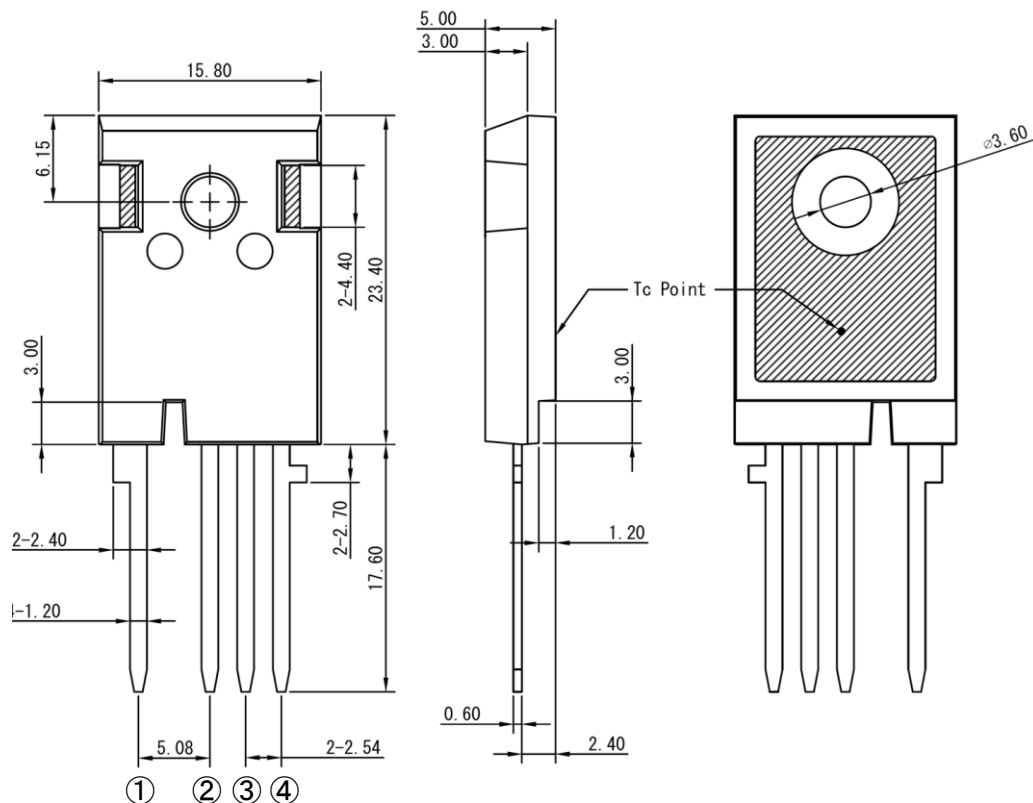
■ TO-247-4L package SiC MOSFET

### 特長

- 小さいオン抵抗とスイッチングロスによる低損失
- 熱暴走に強い温度変化の小さいオン抵抗
- 高周波動作での高いノイズ特性をもたらすゲート特性 ( $V_{GS(th)} : 4.0V$ )
- SiC MOSFETの高速スイッチング性能を引き出す4ピンのTO-247-4Lパッケージを採用
- 回路保護設計が容易なトップレベルの短絡耐量
- 外付けFWD不要

### 用途

- 産業用インバータ、DC-DCコンバータ、EV充電器、共振電源



■ Maximum Ratings (T<sub>j</sub>=25°C unless otherwise specified)

Item	Symbol	Unit	Ratings	Conditions
Drain-Source Voltage	V <sub>DSS</sub>	V	1200	
Gate-Source Voltage(+)	V <sub>GSS</sub>	V	22	
Gate-Source Voltage(-)		V	-7	
Drain Current	I <sub>D</sub>	A	50	V <sub>GS</sub> =20V, T <sub>c</sub> =108°C, DC
	I <sub>D(pulse)</sub>	A	150	Pulse
Source Current	I <sub>S</sub>	A	50	V <sub>GS</sub> =-5V, T <sub>c</sub> =108°C, DC
	I <sub>S(pulse)</sub>	A	150	Pulse
Total Power Dissipation	P <sub>tot</sub>	W	440	T <sub>c</sub> =25°C
Operating Junction Temperature	T <sub>j</sub>	°C	-40~+150	
Storage Temperature	T <sub>stg</sub>	°C	-40~+150	
Isolation Voltage	V <sub>iso</sub>	V	2500	AC, RMS, 1min

■ Electrical Characteristics (T<sub>j</sub>=25°C unless otherwise specified)

Item	Symbol	Unit	Ratings			Conditions
			Min.	Typ.	Max.	
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V	1200			V <sub>GS</sub> =0V, I <sub>D</sub> =100μA
Static Drain-Source On-State Voltage	V <sub>DS(on)</sub>	V		0.65	1.40	V <sub>GS</sub> =20V, I <sub>D</sub> =50A
				0.75	1.50	V <sub>GS</sub> =20V, I <sub>D</sub> =50A, T <sub>j</sub> =150°C
On-State Resistance	R <sub>DS(on)</sub>	mΩ		13.0	28.0	V <sub>GS</sub> =20V, I <sub>D</sub> =50A
				15.0	30.0	V <sub>GS</sub> =20V, I <sub>D</sub> =50A, T <sub>j</sub> =150°C
Drain Cutoff Current	I <sub>DSS</sub>	μA			100	V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V	3	4	5	V <sub>DS</sub> =10V, I <sub>D</sub> =1.5mA
Gate-Source Leakage Current	I <sub>GSS</sub>	nA			100	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V
Switching Characteristics	t <sub>d(on)</sub>	ns		54		I <sub>D</sub> =50A, V <sub>DS</sub> =600V, V <sub>GS</sub> =+20V/-5V, R <sub>G</sub> =6.8Ω, L=480μH
	t <sub>r</sub>	ns		48		
	t <sub>rr</sub>	ns		42		
	t <sub>d(off)</sub>	ns		92		
	t <sub>f</sub>	ns		62		
Total Gate Charge	Q <sub>G</sub>	nC		290		I <sub>D</sub> =50A, V <sub>DS</sub> =600V, V <sub>GS</sub> =+20V/-5V
Input Capacitance	C <sub>iss</sub>	nF		9.0		V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=100kHz
Output Capacitance	C <sub>oss</sub>	nF		2.5		
Reverse Transfer Capacitance	C <sub>rss</sub>	nF		0.2		
Source-Drain Voltage	V <sub>SD</sub>	V		2.65	2.90	V <sub>GS</sub> =-5V, I <sub>S</sub> =50A
				2.65	2.95	V <sub>GS</sub> =-5V, I <sub>S</sub> =50A, T <sub>j</sub> =150°C
Total Capacitive Charge	Q <sub>c</sub>	nC		700		I <sub>SD</sub> =50A, V <sub>DS</sub> =600V, di <sub>SD</sub> /dt=800A/μs, V <sub>GS</sub> =-5V
Internal Gate Resistance	R <sub>G(int)</sub>	Ω		0.8		
Internal Stray Inductance	L <sub>s</sub>	nH		6		between Drain and Source (root of terminal)

■ Thermal Characteristics (T<sub>j</sub>=25°C unless otherwise specified)

Junction-to-Case Thermal Resistance	R <sub>th(j-c)</sub>	°C/W		0.22	0.28	
Case-to-Heat sink Thermal Resistance	R <sub>th(c-f)</sub>	°C/W		1.7		Thermal conductivity = 9×10 <sup>-3</sup> W/cm·°C

■ Mechanical Characteristics (T<sub>j</sub>=25°C unless otherwise specified)

Weight	-	g		4.8		
Mounting Torque(M3)	-	N·m			0.8	Main terminals and mounting to heat sink Recommended value 0.4-0.5N·m

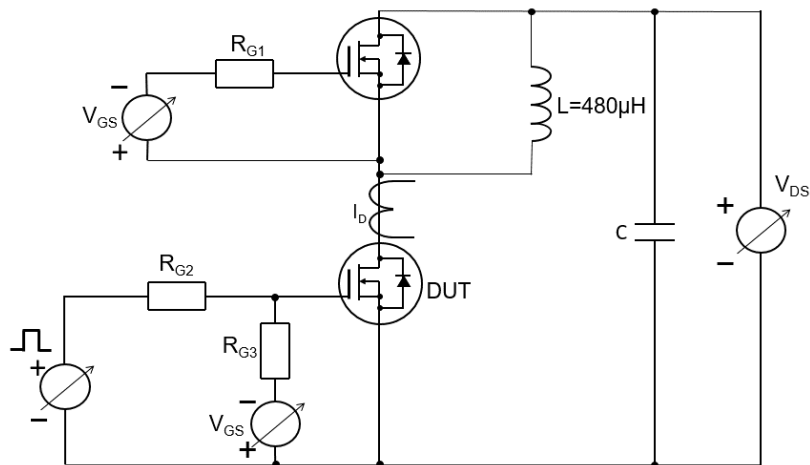


Fig.1 Inductive load switching time test circuit

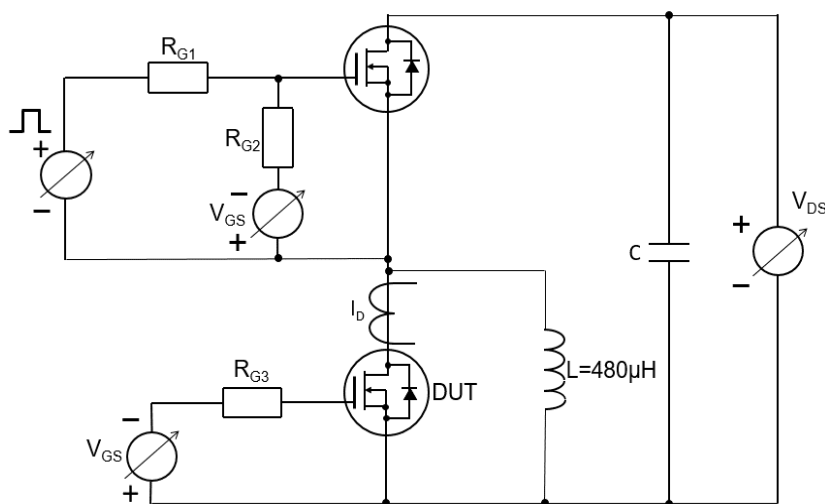


Fig.2 Inductive load recovery switching time test circuit

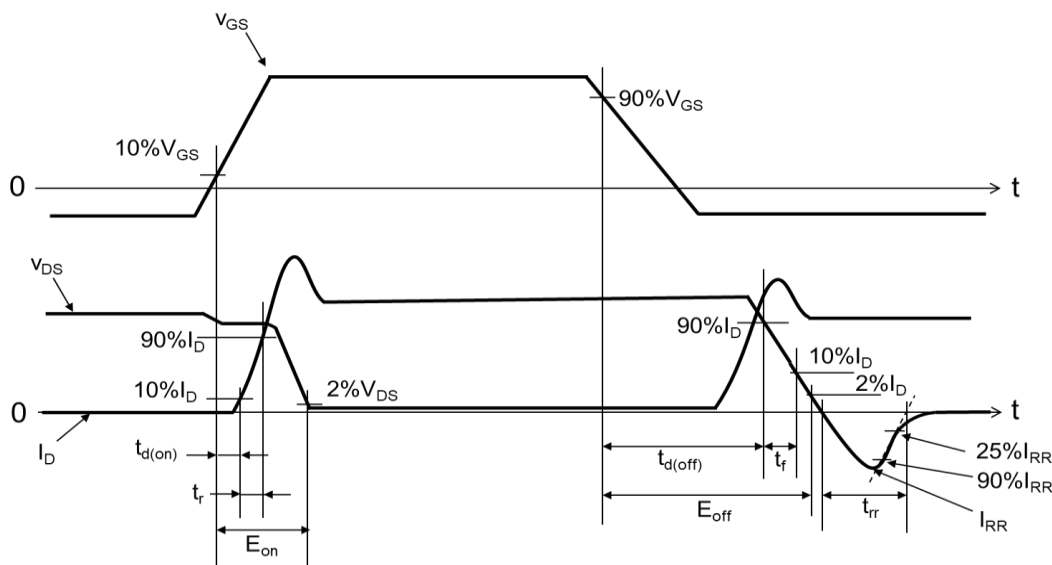


Fig.3 Switching waveform at the time of Inductive load

Fig.4 Output Characteristics (Typical)

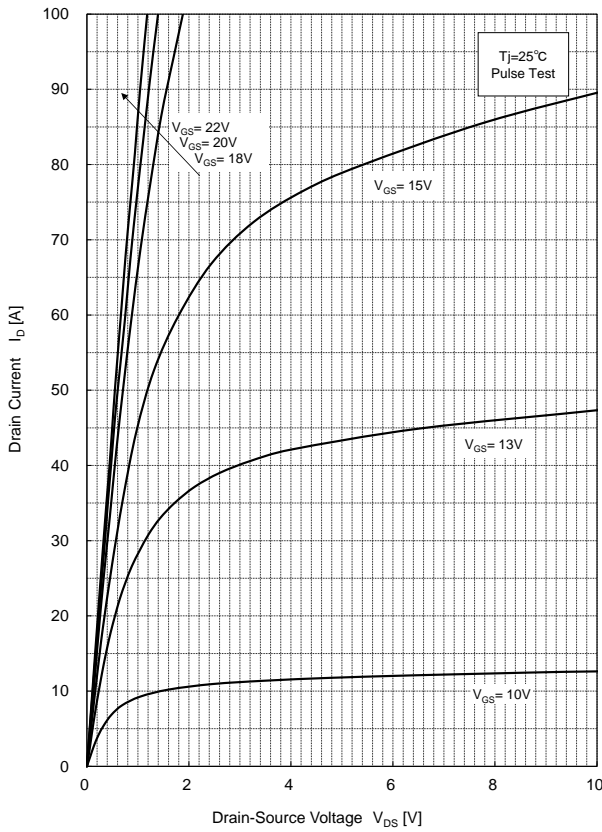


Fig.5 Output Characteristics (Typical)

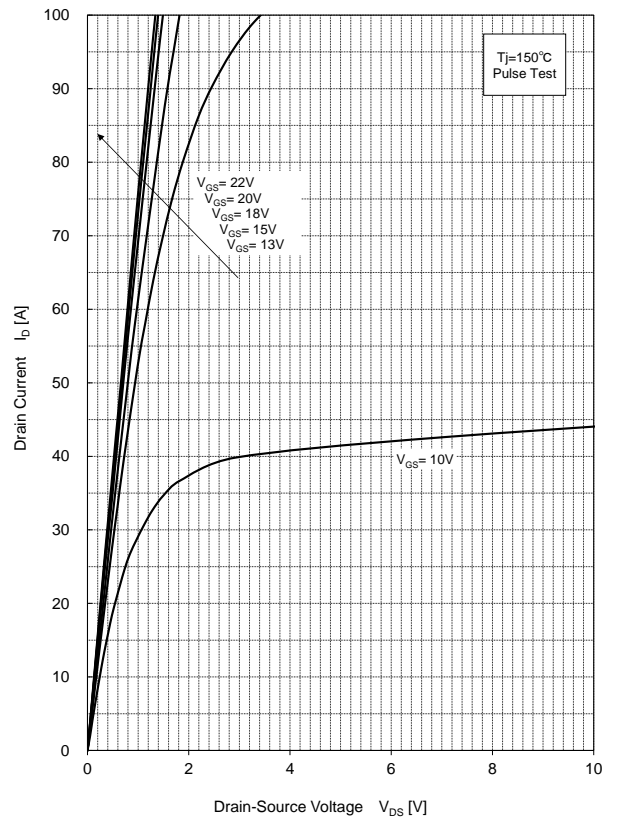


Fig.6 Transfer Characteristics (Typical)

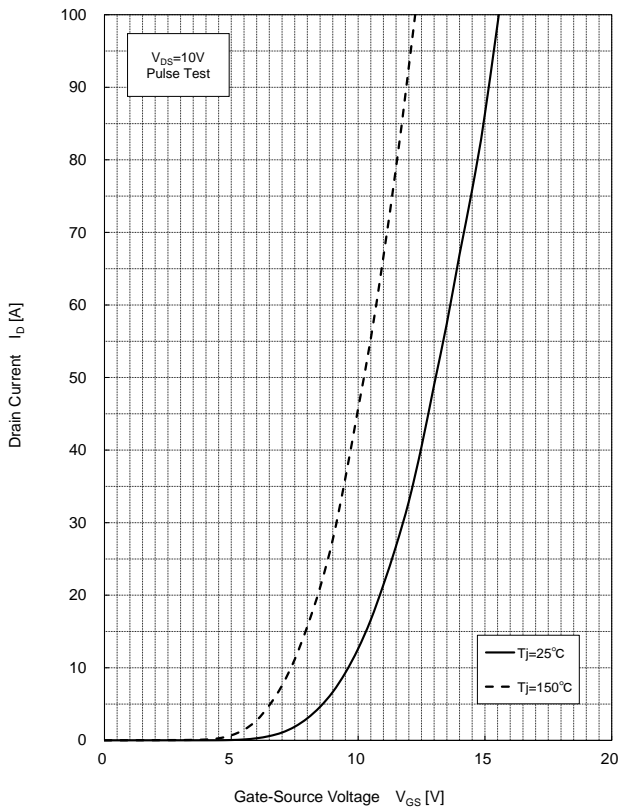


Fig.7 3rd Quadrant Characteristics (Typical)

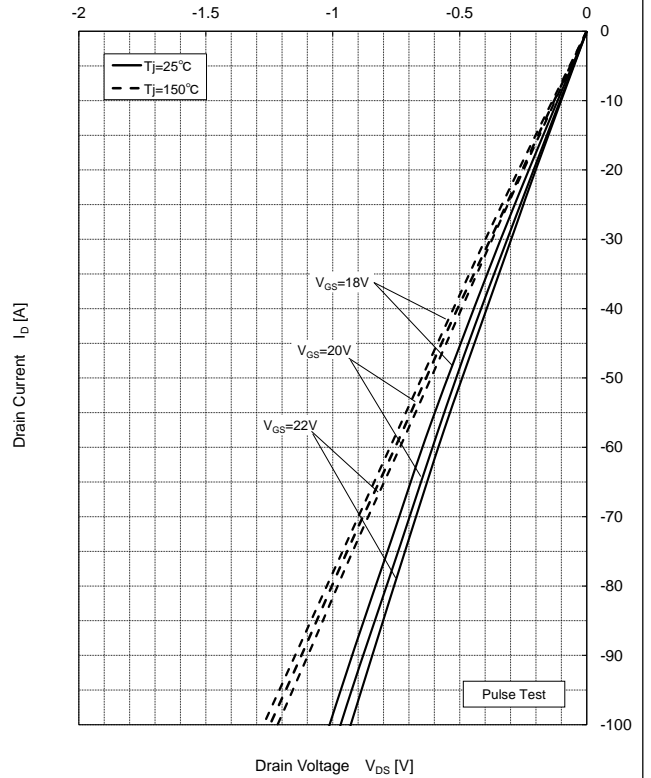


Fig.8 3rd Quadrant Characteristics (Typical)

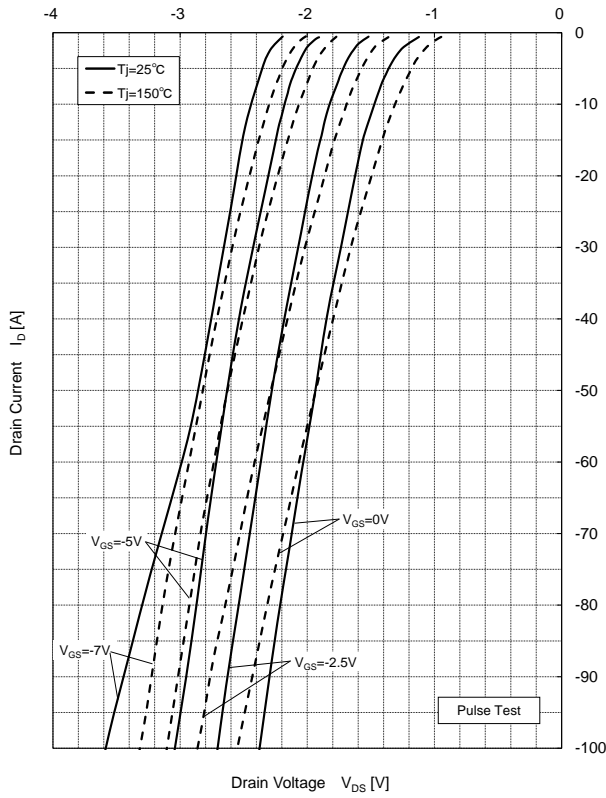


Fig.9 On-State Resistance vs Junction Temperature (Typical)

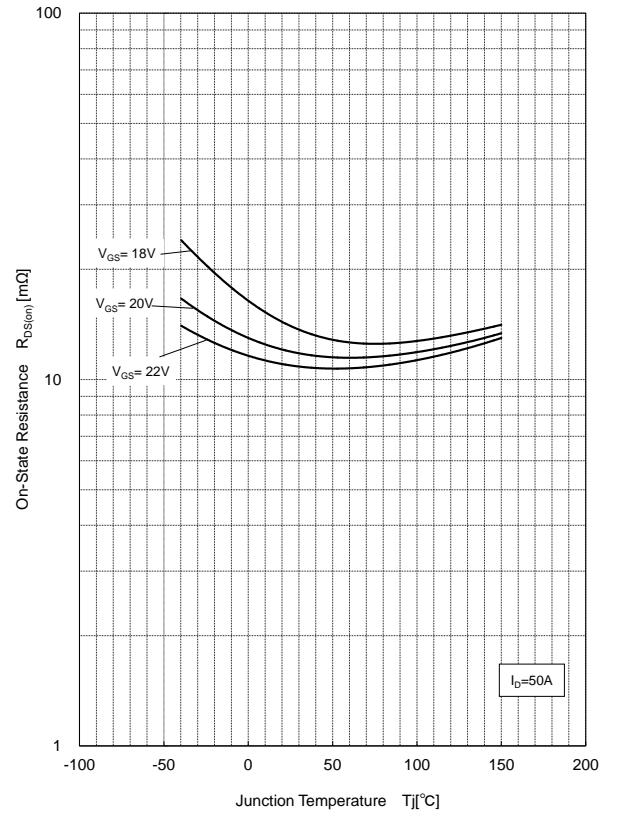


Fig.10 Source-Drain Voltage vs Junction Temperature (Typical)

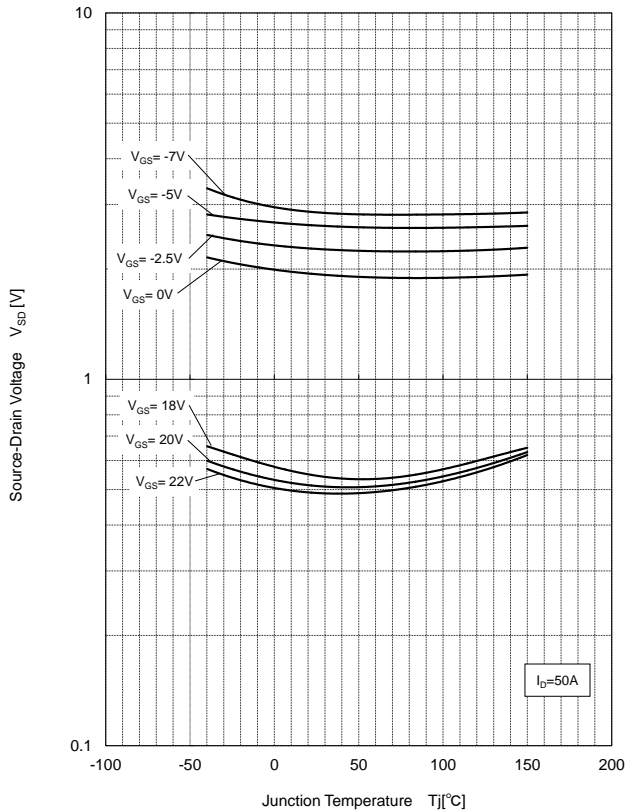


Fig.11 Capacitance (Typical)

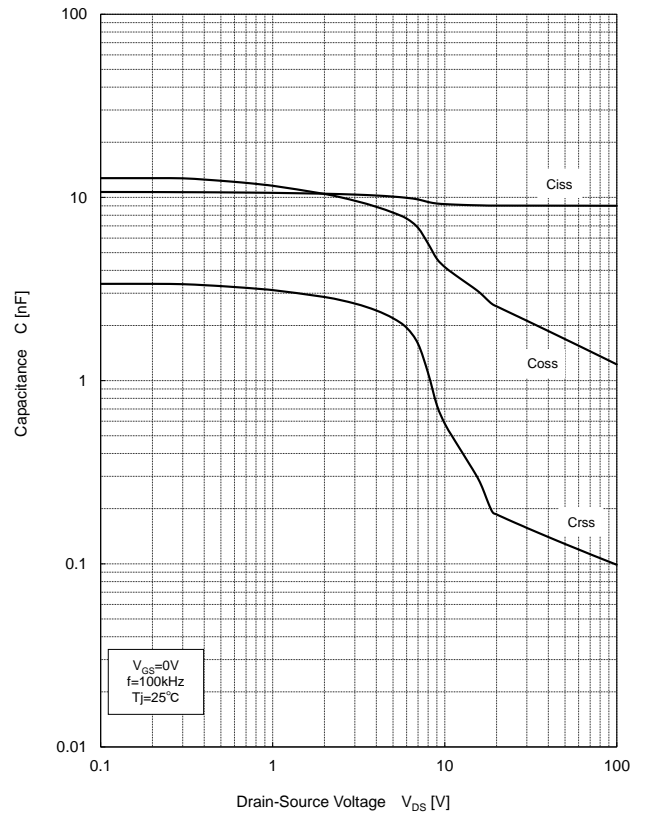


Fig.12 Gate Charge Characteristics (Typical)

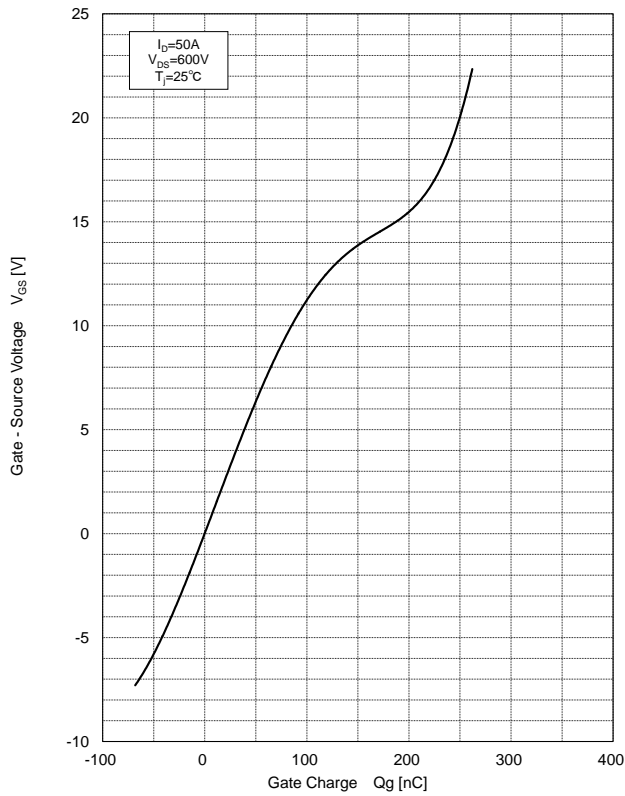


Fig.13 Switching Time vs Drain Current (Typical)

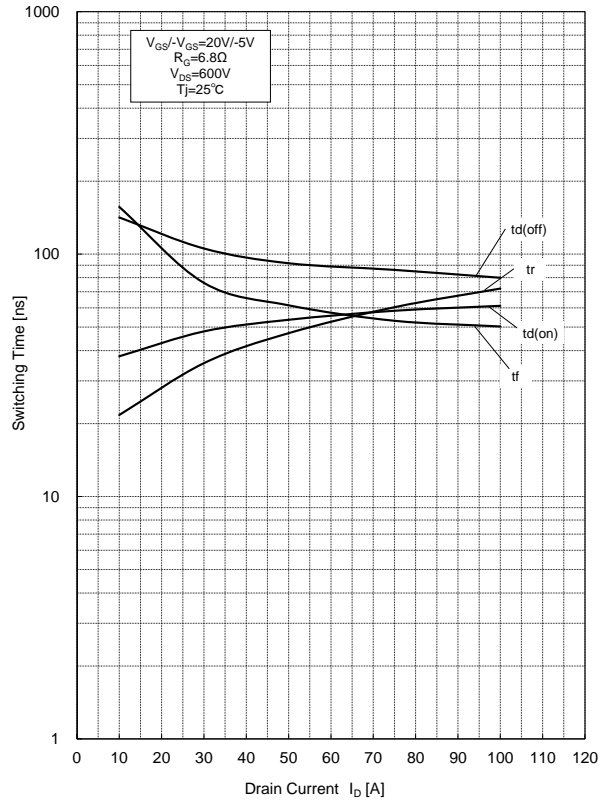


Fig.14 Switching Time vs Drain Current (Typical)

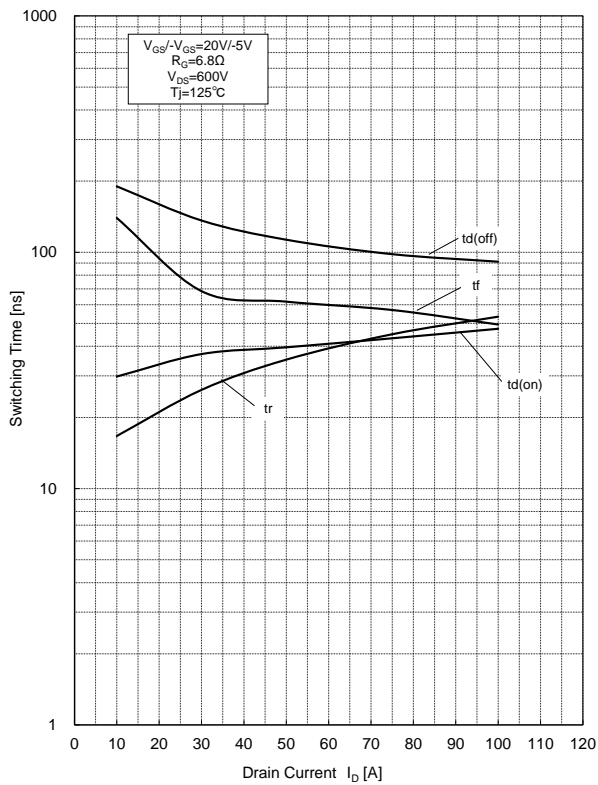


Fig.15 Switching Time vs Drain Current (Typical)

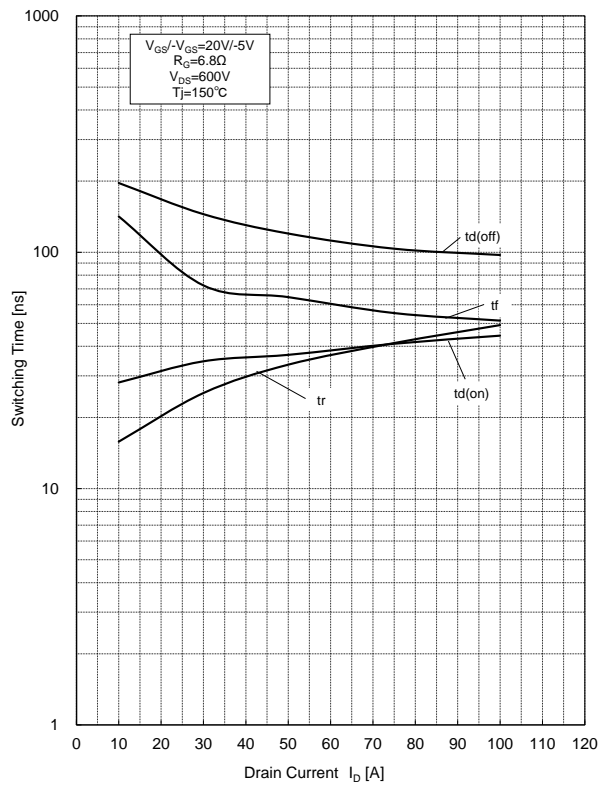


Fig.16 Switching Loss vs Drain Current (Typical)

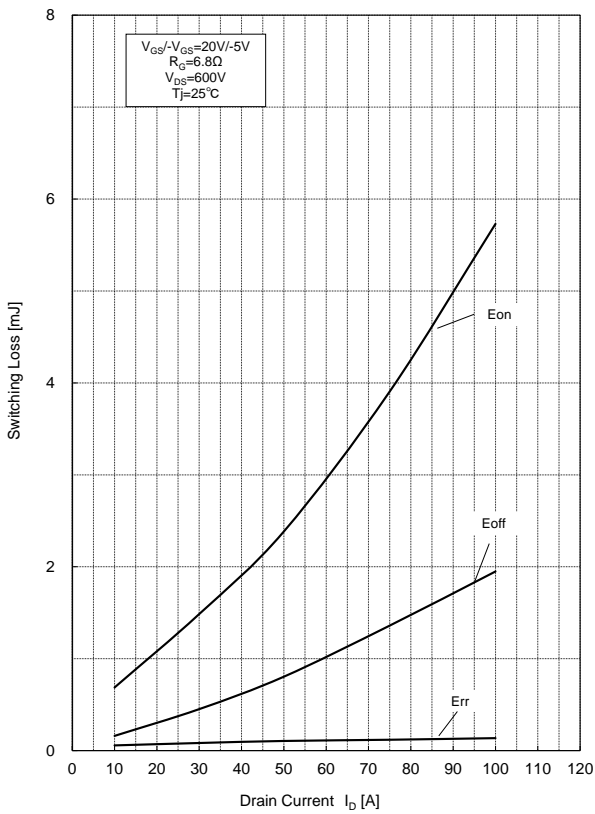


Fig.17 Switching Loss vs Drain Current (Typical)

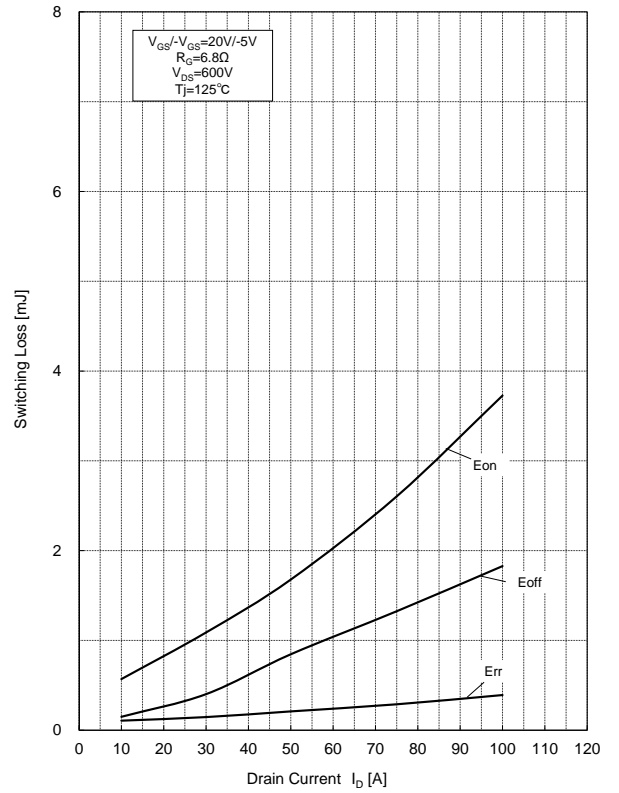


Fig.18 Switching Loss vs Drain Current (Typical)

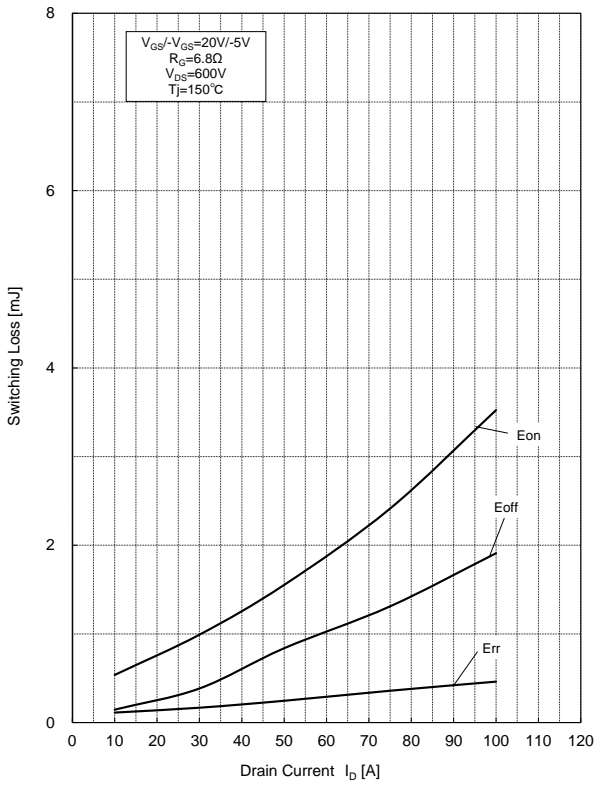


Fig.19 Switching Time vs Gate Resistance (Typical)

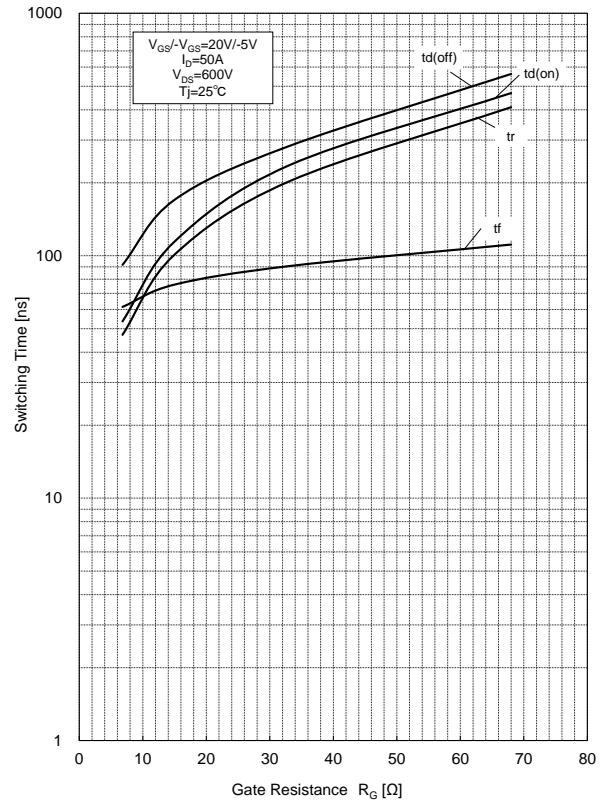




Fig.20 Switching Time vs Gate Resistance (Typical)

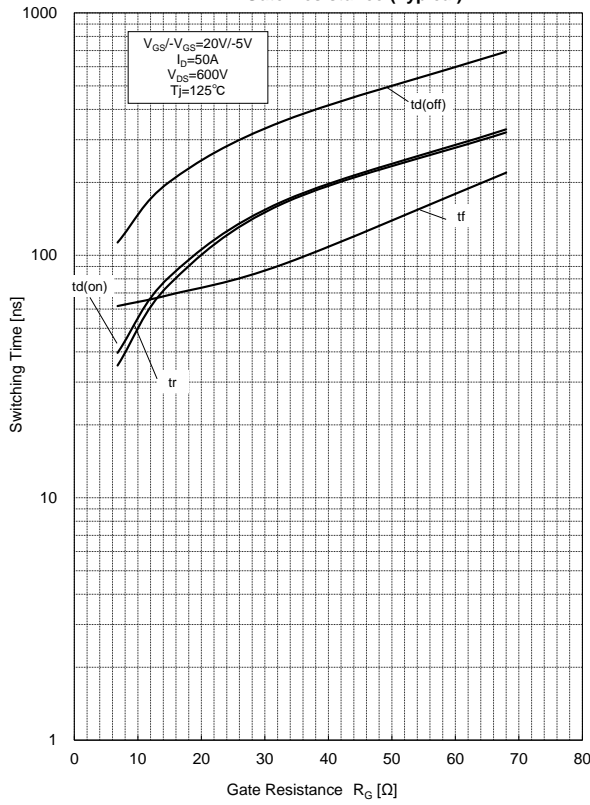


Fig.21 Switching Time vs Gate Resistance (Typical)

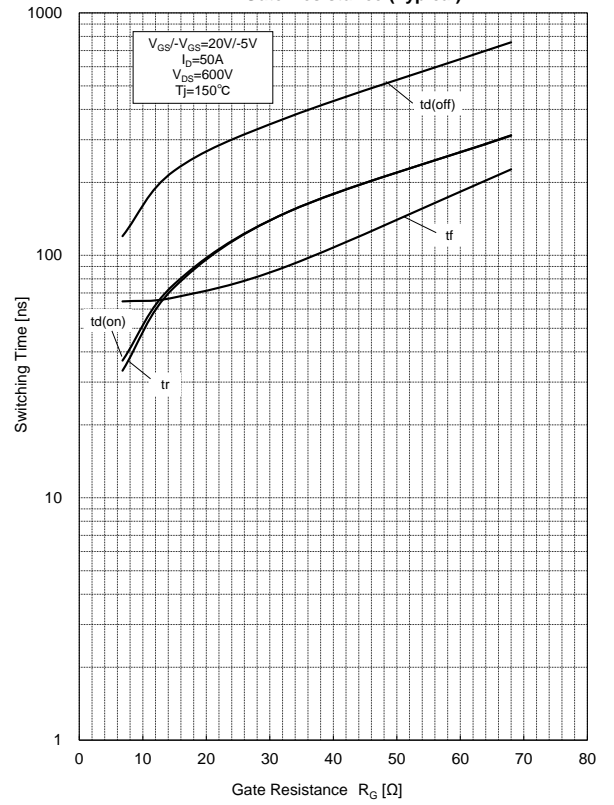


Fig.22 Switching Loss vs Gate Resistance (Typical)

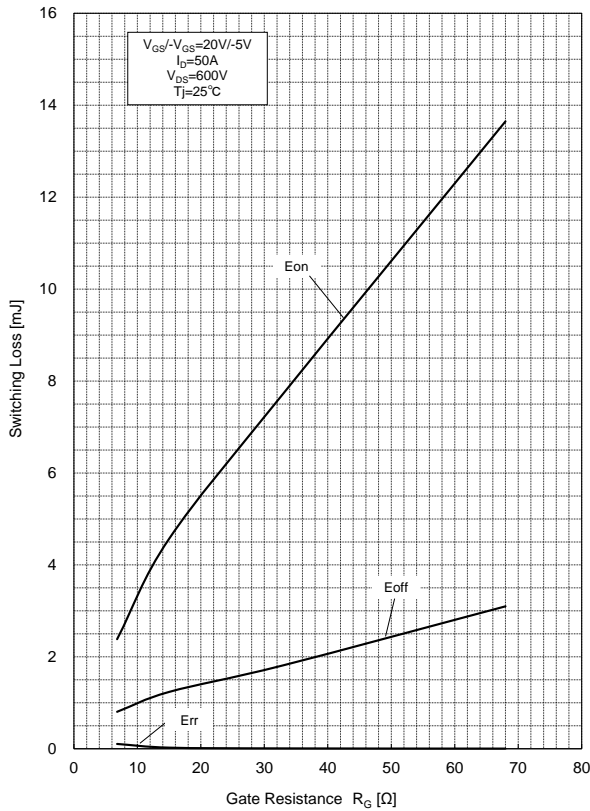
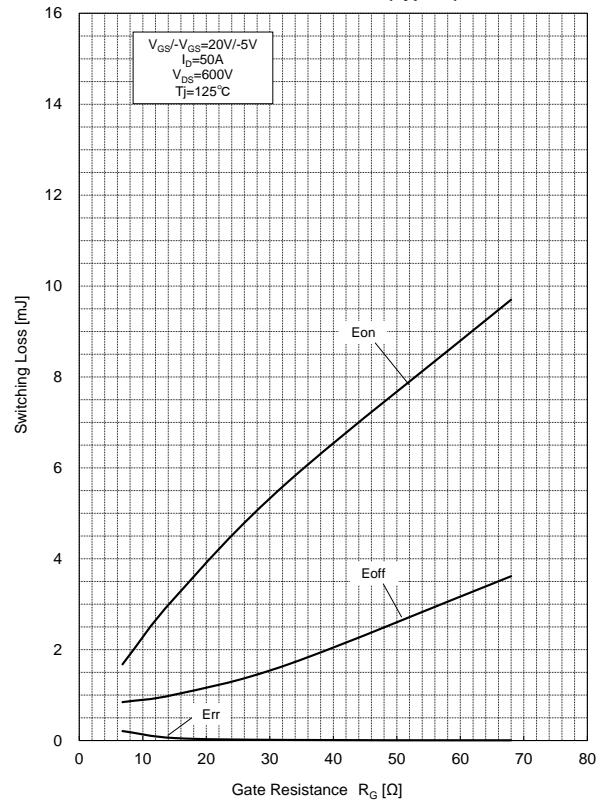
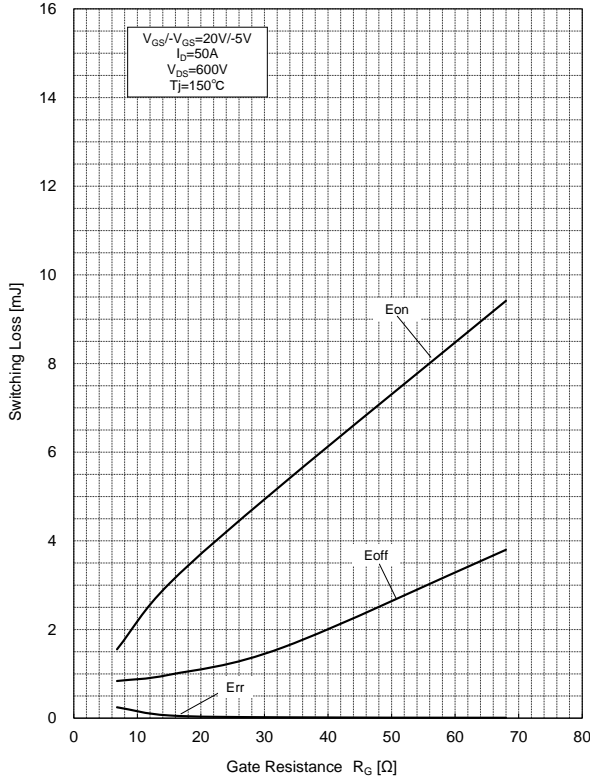


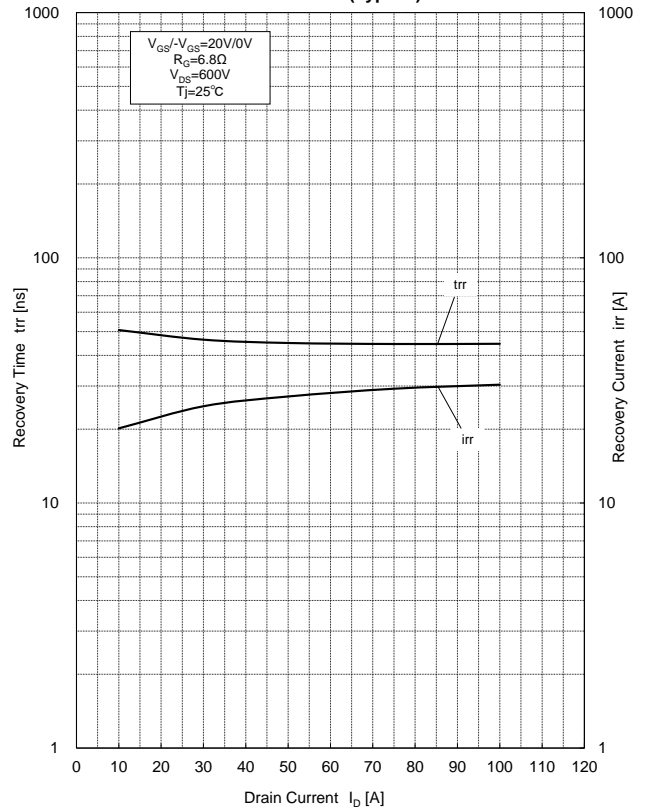
Fig.23 Switching Loss vs Gate Resistance (Typical)



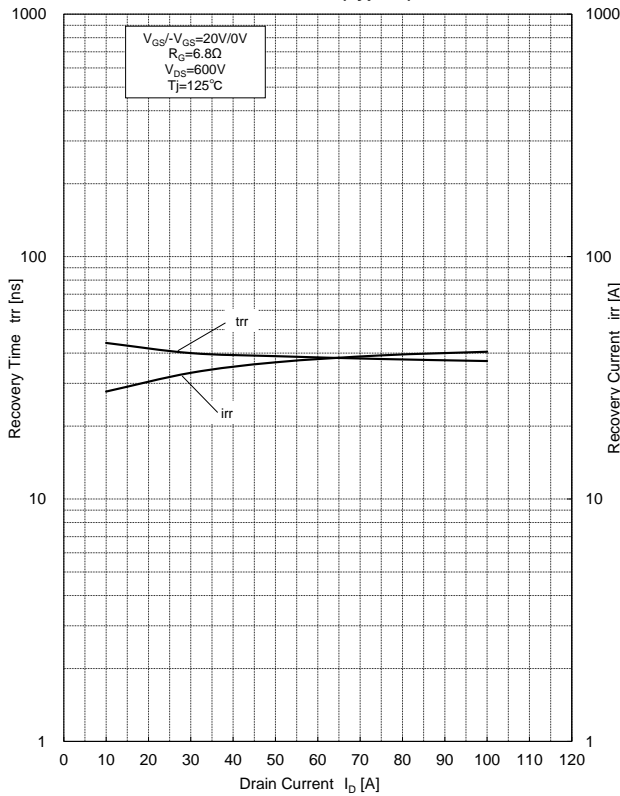
**Fig.24 Switching Loss vs Gate Resistance (Typical)**



**Fig.25 Recovery Characteristics vs Drain Current (Typical)**



**Fig.26 Recovery Characteristics vs Drain Current (Typical)**



**Fig.27 Recovery Characteristics vs Drain Current (Typical)**

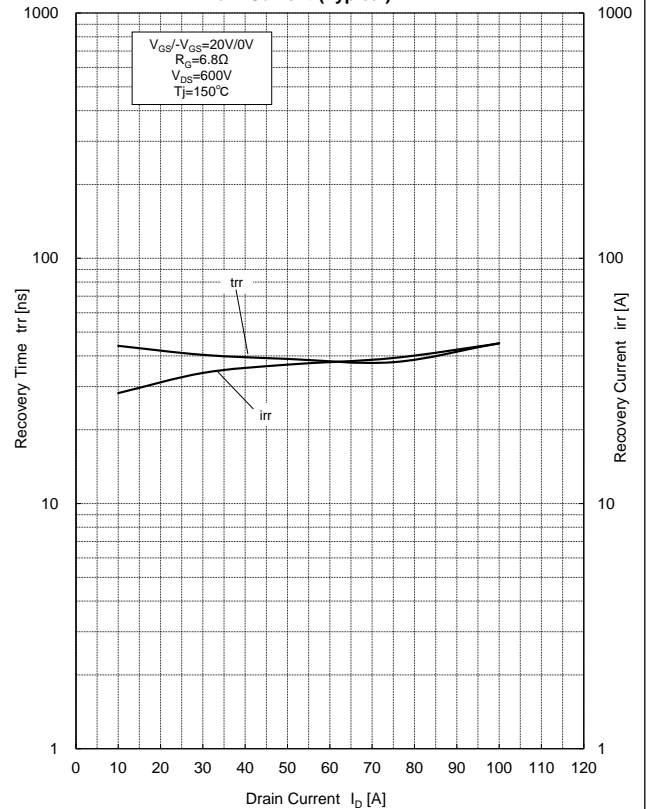


Fig.28 Recovery Characteristics vs Drain Current (Typical)

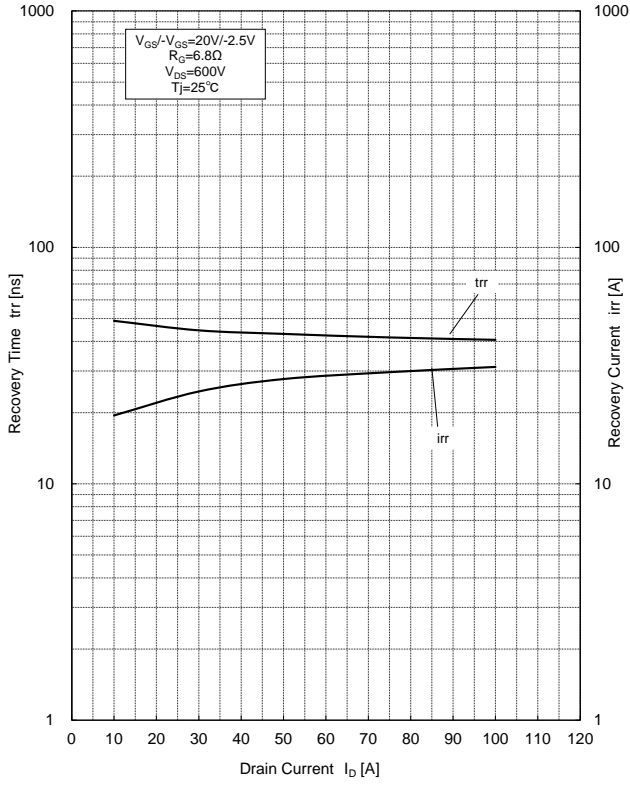


Fig.29 Recovery Characteristics vs Drain Current (Typical)

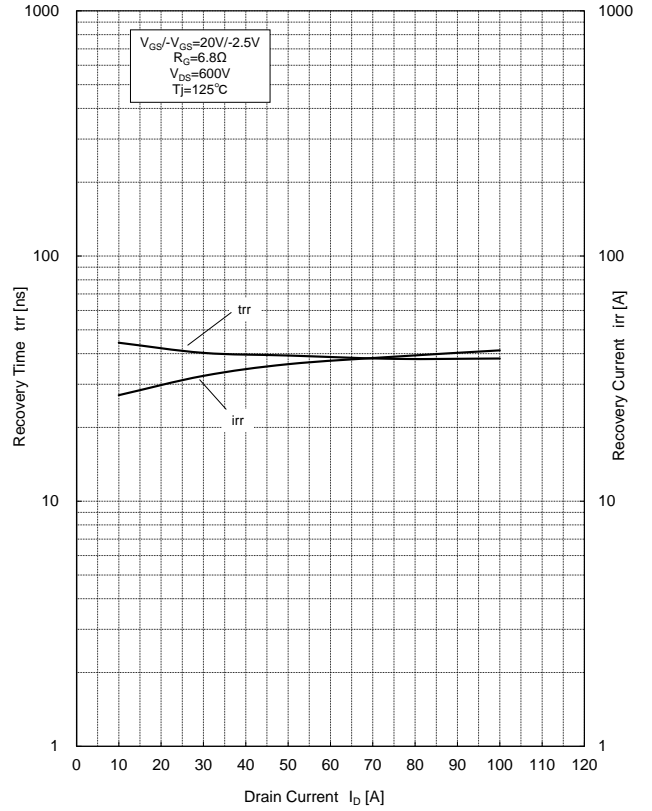


Fig.30 Recovery Characteristics vs Drain Current (Typical)

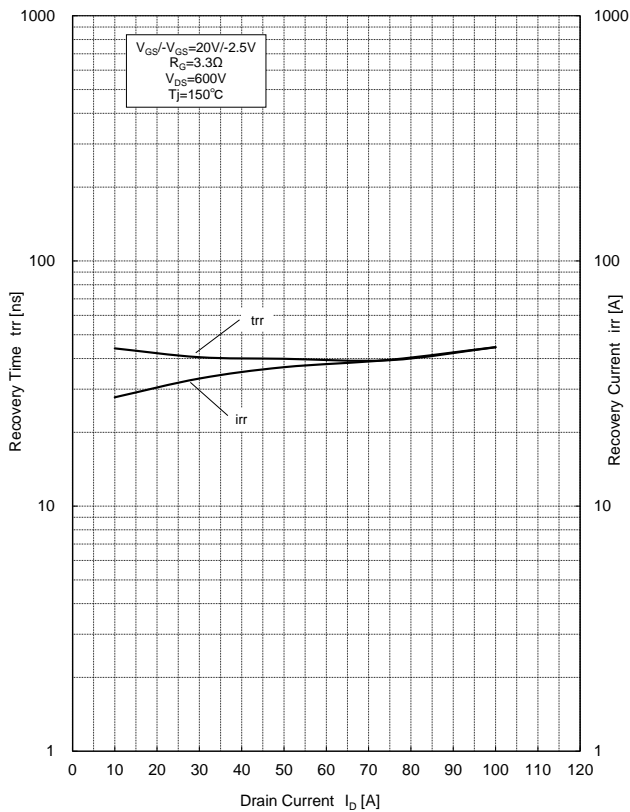
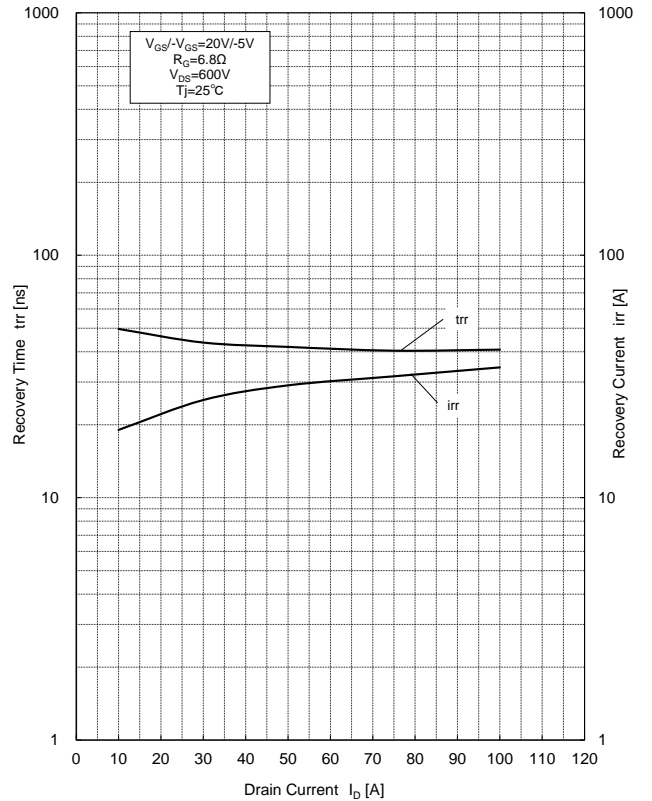
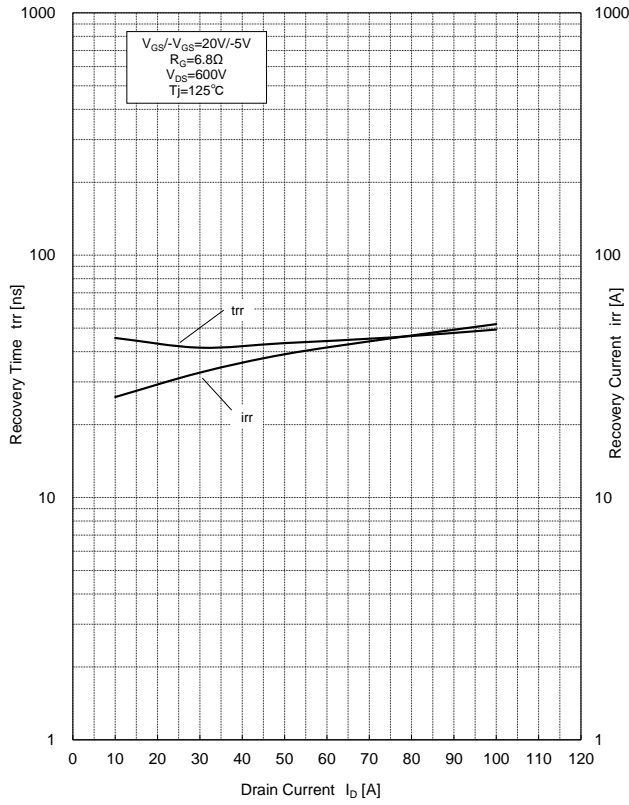


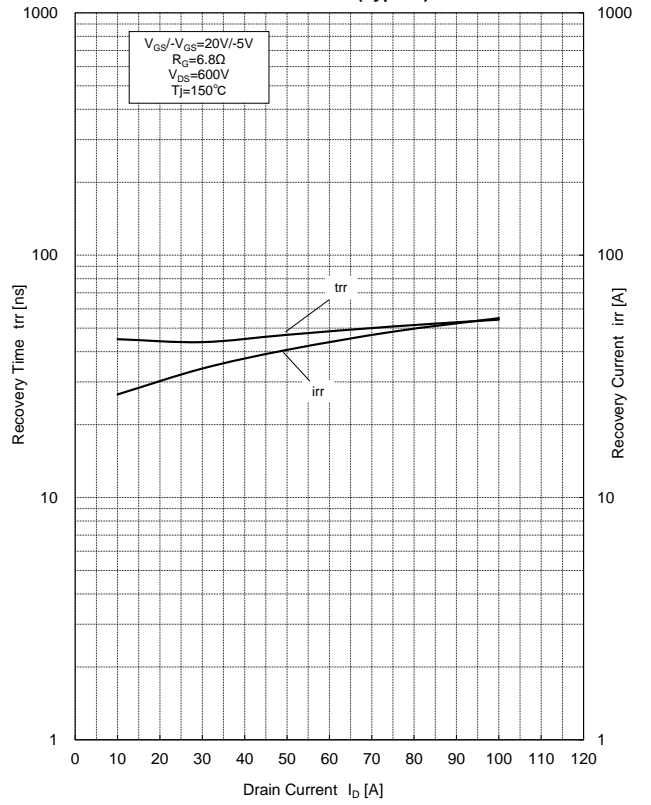
Fig.31 Recovery Characteristics vs Drain Current (Typical)



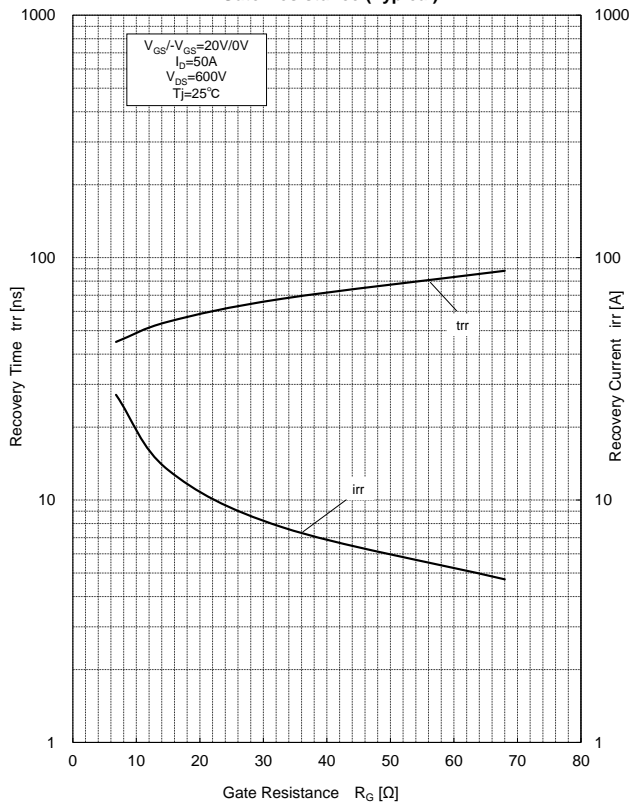
**Fig.32 Recovery Characteristics vs Drain Current (Typical)**



**Fig.33 Recovery Characteristics vs Drain Current (Typical)**



**Fig.34 Recovery Characteristics vs Gate Resistance (Typical)**



**Fig.35 Recovery Characteristics vs Gate Resistance (Typical)**

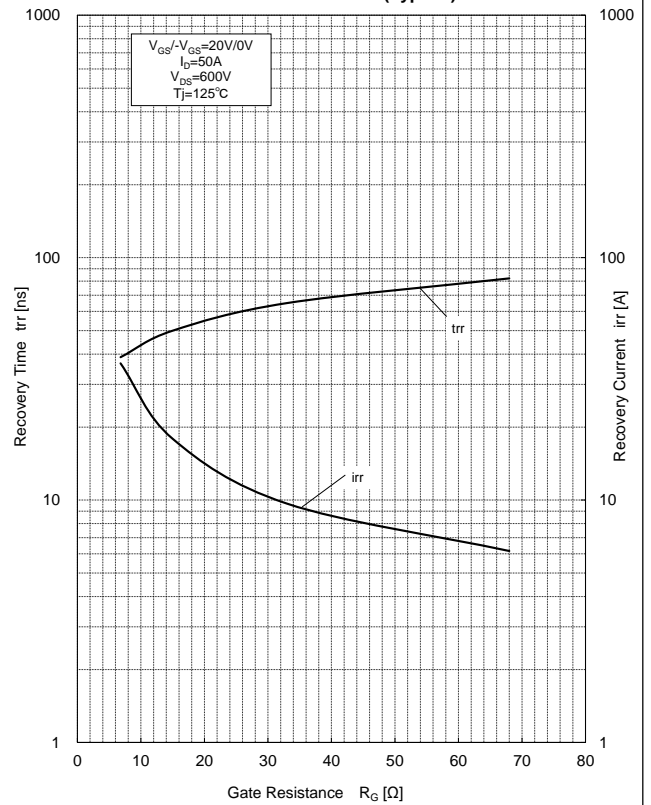


Fig.36 Recovery Characteristics vs Gate Resistance (Typical)

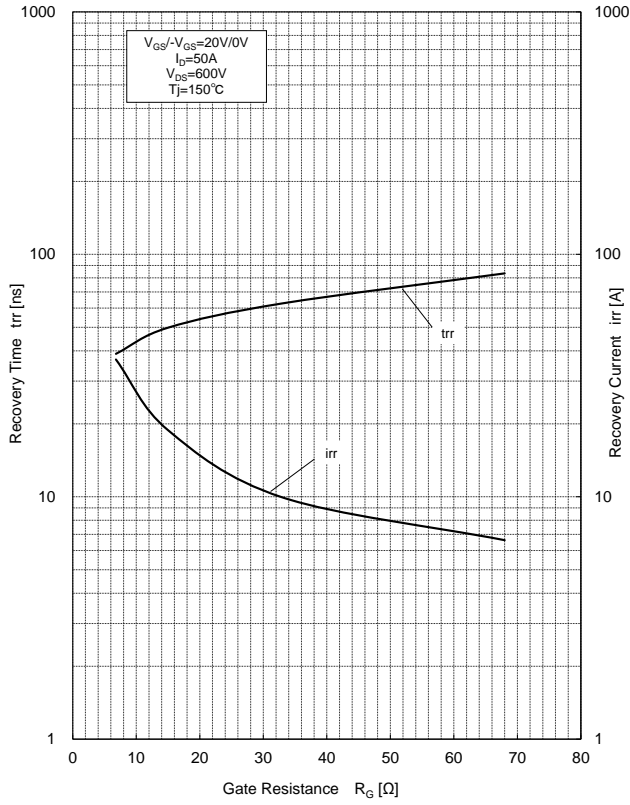


Fig.37 Recovery Characteristics vs Gate Resistance (Typical)

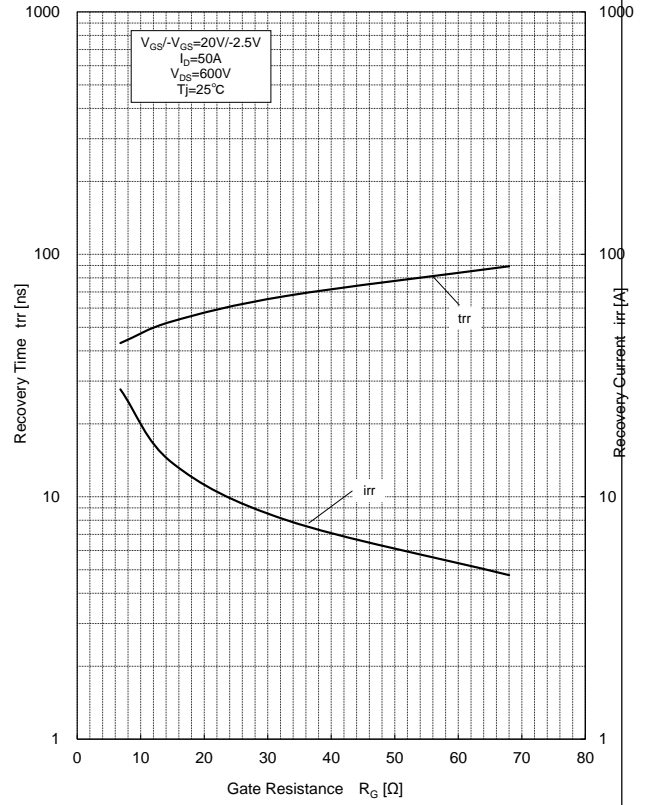


Fig.38 Recovery Characteristics vs Gate Resistance (Typical)

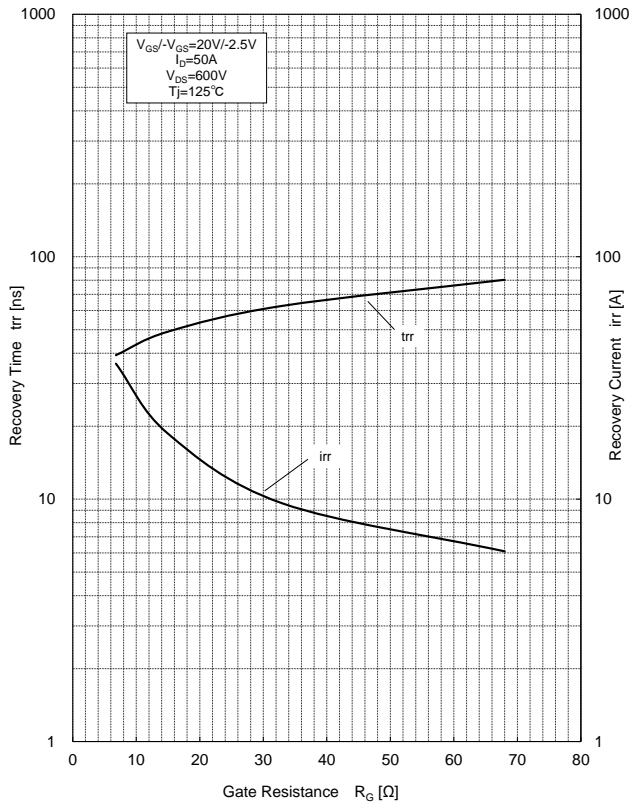
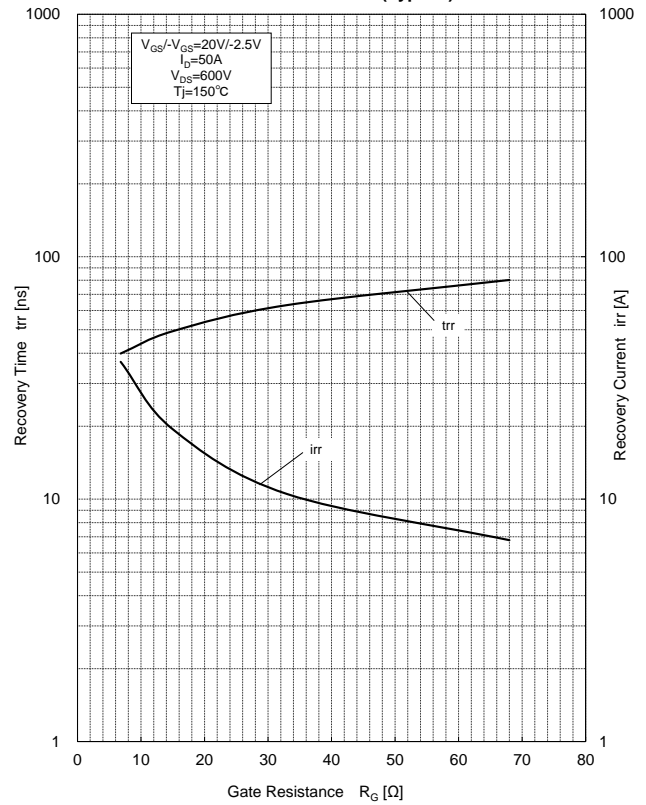
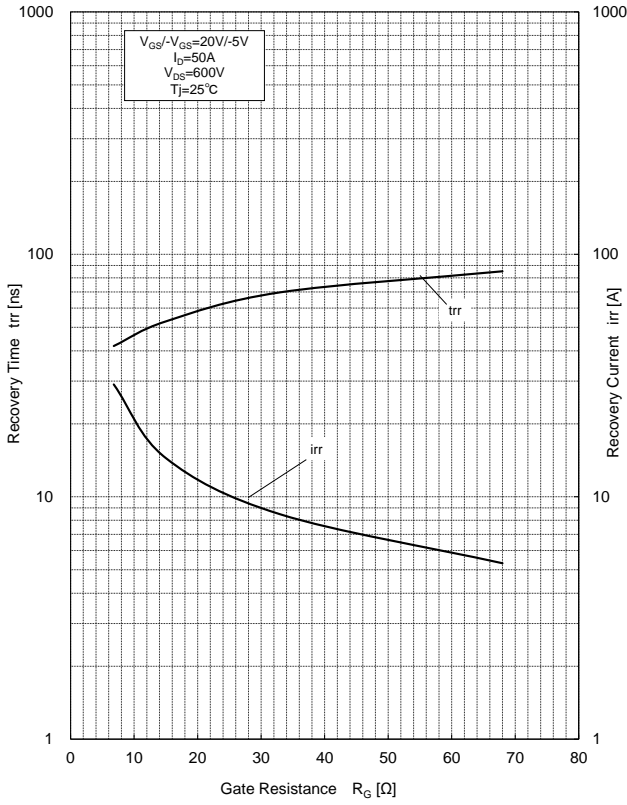


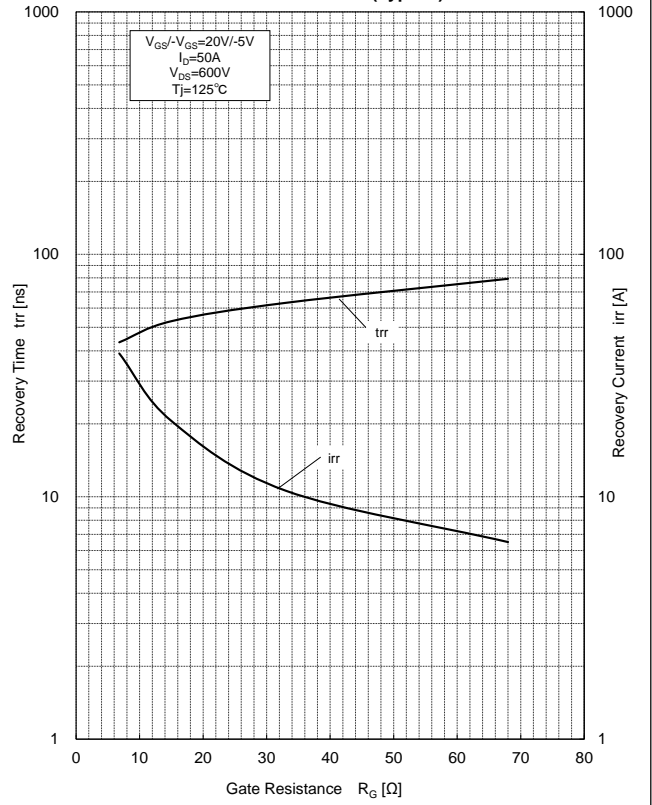
Fig.39 Recovery Characteristics vs Gate Resistance (Typical)



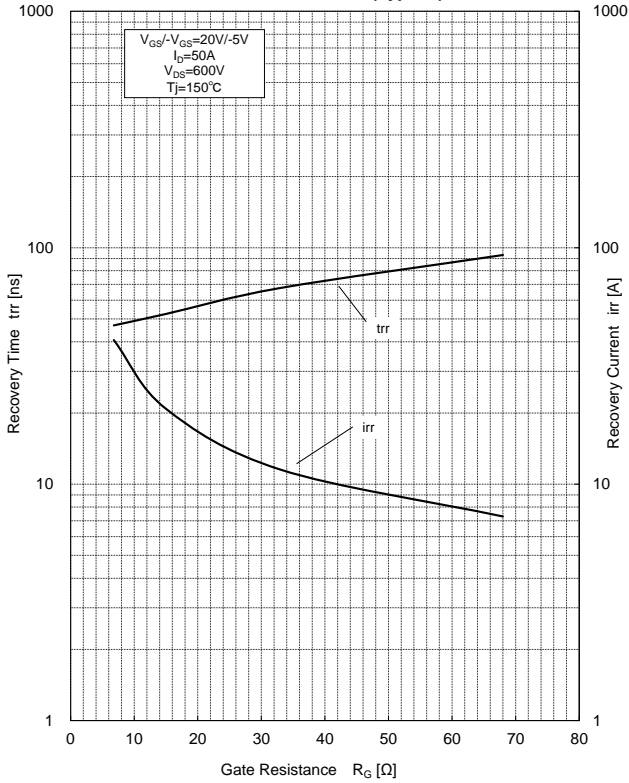
**Fig.40 Recovery Characteristics vs Gate Resistance (Typical)**



**Fig.41 Recovery Characteristics vs Gate Resistance (Typical)**



**Fig.42 Recovery Characteristics vs Gate Resistance (Typical)**



**Fig.43 Safe Operating Area**

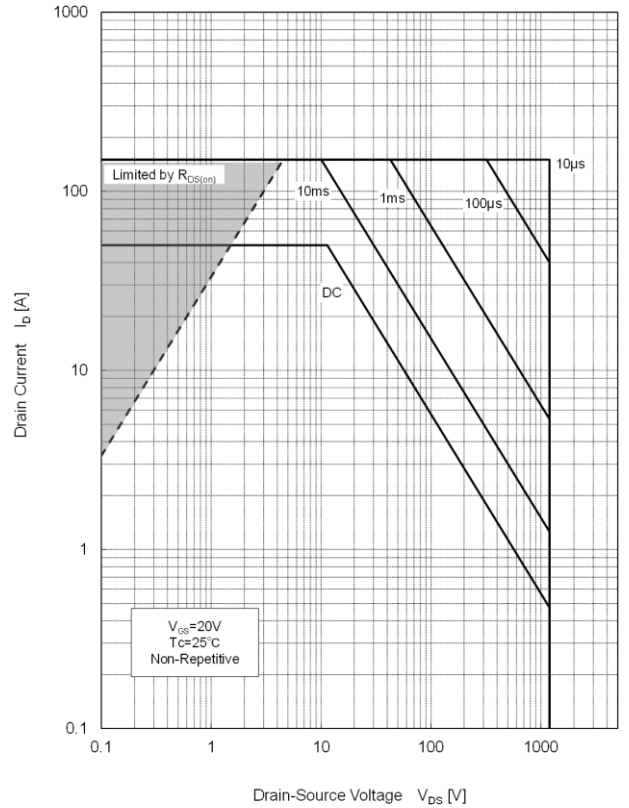
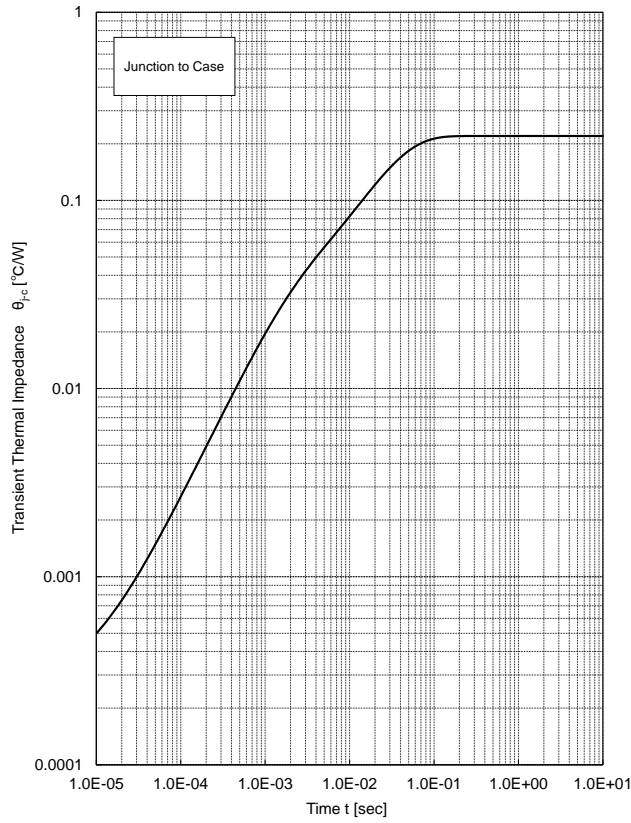


Fig.44 Transient Thermal Impedance



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