

Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- Revolutionary semiconductor material Silicon Carbide
- Low reverse recovery(Qrr)
- Halogen free, RoHs compliant

Product Summary			
V _{DS}	R _{DS(on)} (mΩ)Typ	I _D (A)	Q _g (Typ)
1200V	13.5 @ 18V 75A	166	245nc

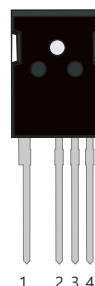
Mechanical Data

- Case:TO-247-4L Package

Application

- Switch mode power supplies
- Renewable energy
- Motor drives
- High voltage DC/DC converters

TO-247-4L



Block Diagram

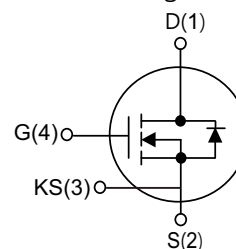


Table1 Absolute Maximum Ratings (T_c=25°C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V _{DS}	1200	V
Gate-Source Voltage(Max)	V _{GS(max)}	-10/+22	V
Recommend Gate-Source Voltage	V _{GSop}	-5/+18	V
Continuous Drain Current	I _D	V _{GS} =18V,T _c =25°C	166
		V _{GS} =18V,T _c =100°C	117
Pulsed Drain Current (Note 1)	I _{DM}	318	A
Power Dissipation T _c =25°C	P _D	789	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +175	°C

Table 2.Thermal Characteristics

Parameter	Symbol	SC15N120P4	Unit
Thermal resistance Junction to Case,Typ	R _{θJC}	0.19	°C/W
Thermal resistance Junction to Ambient,Typ	R _{θJA}	40	°C/W

Table 3. Electrical Characteristics (T_J=25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V,I _D =100μA	1200	-	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =1200V,V _{GS} =0V	-	0.1	20	μA
Gate- Source Leakage Current	I _{GSS}	V _{GS} =22V,V _{DS} =0V	-	-	250	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =21mA	2.0	2.9	4.5	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =18V,I _D =75A,T _J =25°C	-	13.5	24	mΩ
		V _{GS} =18V,I _D =75A,T _J =175°C	-	23.5	-	
Gate Resitance	R _G	f=1MHz	-	1.6	-	Ω
Dynamic Characteristics						
Input Capacitance	C _{ISS}	V _{DS} =800V,V _{GS} =0V, f=1MHz,V _{AC} =25mV	-	5527	-	pF
Output Capacitance	C _{OSS}		-	235	-	pF
Reverse Transfer Capacitance	C _{RSS}		-	10	-	pF
Total switching energy	E _{TOT}	V _{DS} =800V,I _D =75A V _{GS} = -5/+18V,R _G =2.2Ω, L=100uH,T _J =25°C	-	945	-	μJ
Turn-on switching energy	E _{ON}		-	645	-	μJ
Turn-off switching energy	E _{OFF}		-	300	-	μJ
Turn-On Delay Time	td(on)		-	17	-	ns
Turn-On Rise Time	t _{TR}		-	19.5	-	ns
Turn-Off Delay Time	td(off)		-	46.2	-	ns
Turn-Off Fall Time	t _f		-	12.8	-	ns
Total switching energy	E _{TOT}	V _{DS} =800V,I _D =75A V _{GS} = -5/+18V,R _G =2.2Ω, L=100uH,T _J =175°C	-	1107	-	μJ
Turn-on switching energy	E _{ON}		-	718	-	μJ
Turn-off switching energy	E _{OFF}		-	389	-	μJ
Turn-On Delay Time	td(on)		-	16.1	-	ns
Turn-On Rise Time	t _{TR}		-	21	-	ns
Turn-Off Delay Time	td(off)		-	53.2	-	ns
Turn-Off Fall Time	t _f		-	16	-	ns
Total Gate Charge	Q _G	V _{DD} =800V,I _D =75A, V _{GS} = -5/18V	-	245	-	nC
Gate-Source Charge	Q _{GS}		-	73	-	nC
Gate-Drain Charge	Q _{GD}		-	24	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 2)						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = -5V,I _S =75A	-	4.7	-	V
Continuous Diode Forward Current	I _S	T _C =25°C	-	138	-	A
Peak Reverse Drain Current	I _{SM}	pulse width tp limited by Tjmax	-	318	-	A
Reverse Recovery Time	trr	V _{GS} = -5V, V _R =800V, I _{SD} =75A,diF/dt=3970A/μs	-	21	-	ns
Recovered charge	Q _{rr}		-	587	-	nC
Peak reverse recovery current	I _{rrm}		-	52	-	A

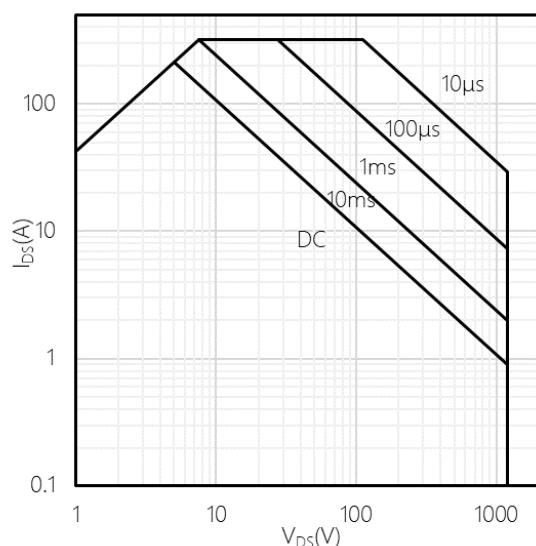
Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

2 Pulse Test: Pulse width ≤300μS, Duty cycle≤2%

Typical Characteristics Diagrams

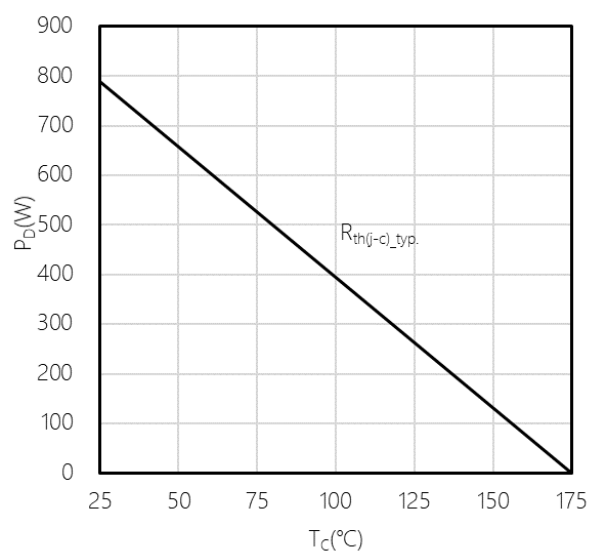
Safe operating area (SOA)

$R_{th(j-c)} = 0.23 \text{ } ^\circ\text{C/W}$, Single Pulse, $T_{vj} = 25^\circ\text{C}$



Power dissipation as a function of case temperature limited by bond wire

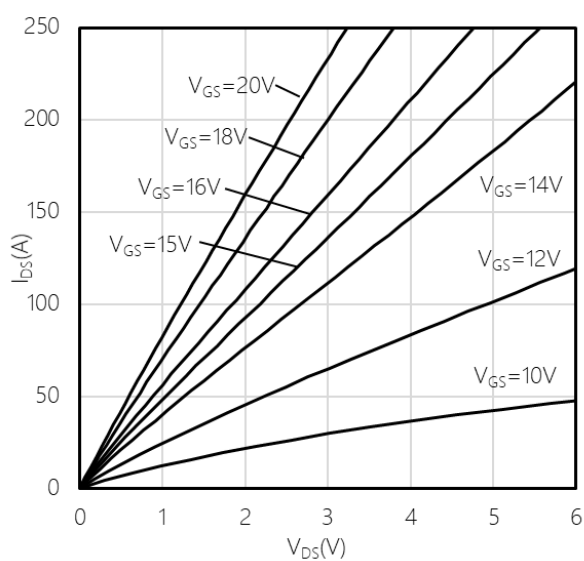
$$P_D = f(T_C)$$



Typical output characteristic, V_{GS} as parameter

$$I_{DS} = f(V_{DS})$$

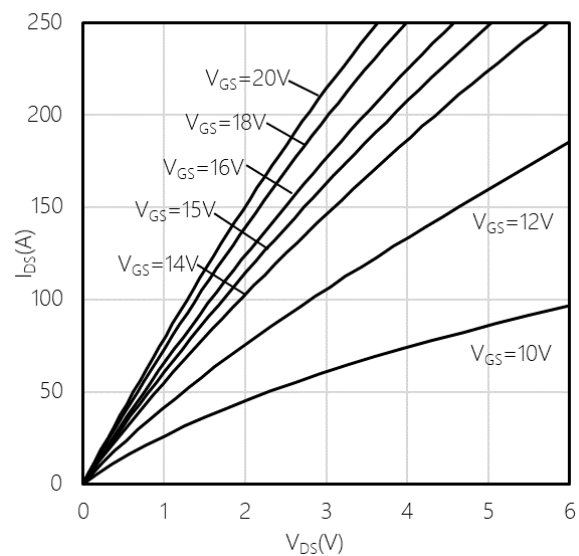
$T_{vj} = -55^\circ\text{C}$



Typical output characteristic, V_{GS} as parameter

$$I_{DS} = f(V_{DS})$$

$T_{vj} = 25^\circ\text{C}$

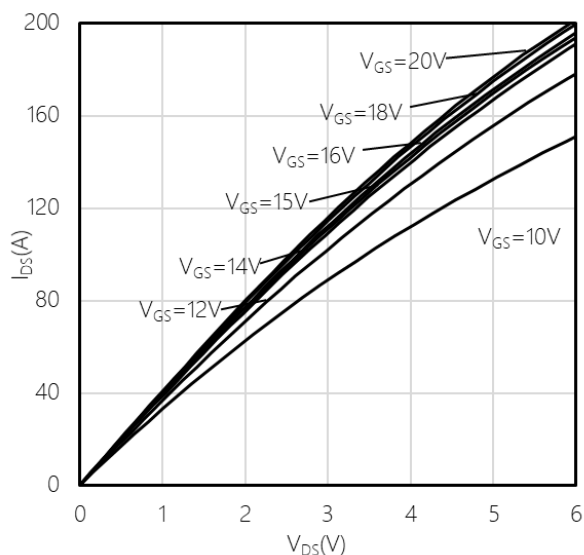


Typical Characteristics Diagrams

Typical output characteristic, V_{GS} as parameter

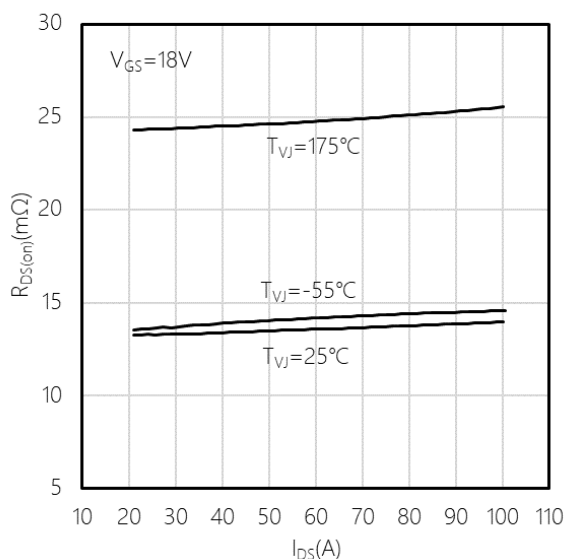
$$I_{DS} = f(V_{DS})$$

$$T_{VJ} = 175^{\circ}\text{C}$$



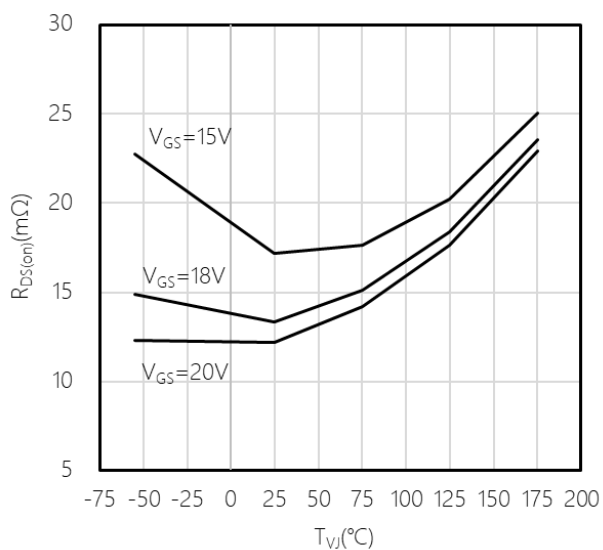
Typical on-state resistance as a function of drain current

$$R_{DS(on)} = f(I_{DS}), V_{GS} = 18\text{V}$$



Typical on-state resistance as a function of temperature

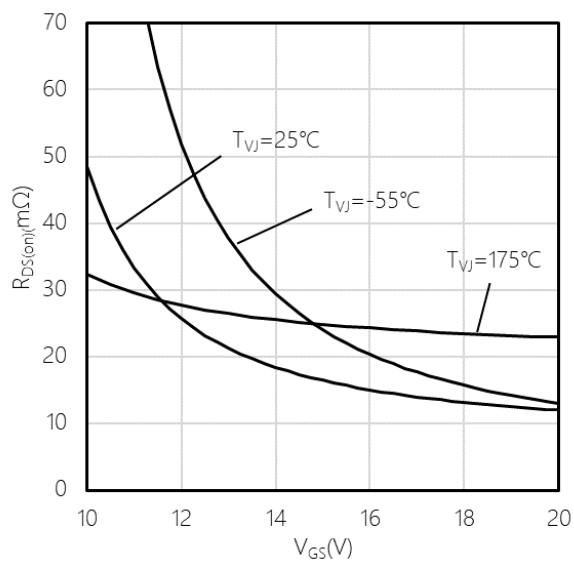
$$R_{DS(on)} = f(T_{VJ}), I_{DS} = 75\text{A}$$



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

$$R_{DS(on)} = f(V_{GS})$$

$$I_{DS} = 75\text{A}$$

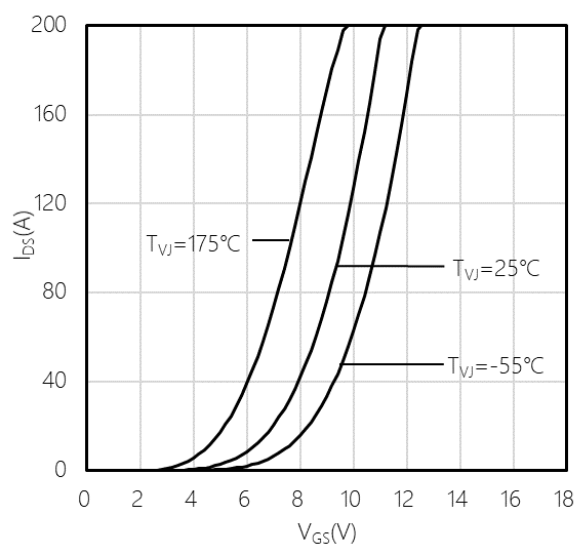


Typical Characteristics Diagrams

Typical transfer characteristic

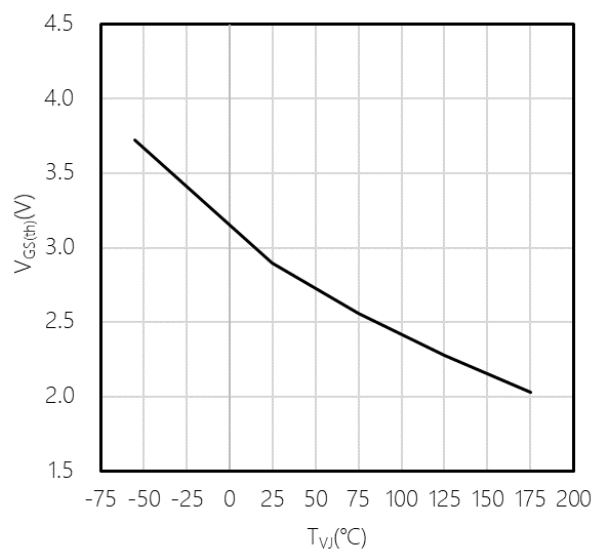
$$I_{DS} = f(V_{GS})$$

$$V_{DS} = 10 \text{ V}$$



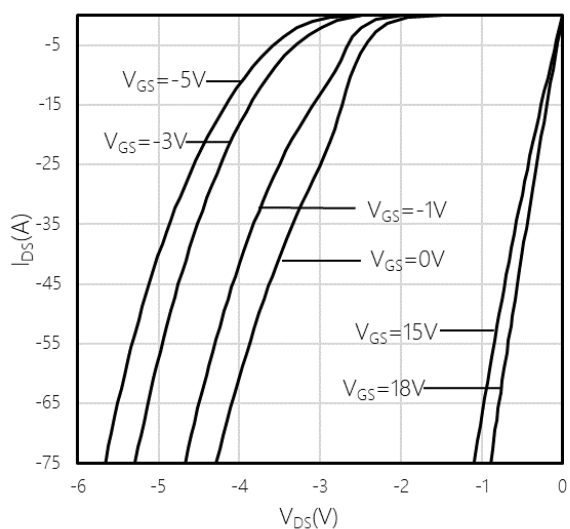
Typical gate-source threshold voltage as a function of junction temperature

$$V_{GS(th)} = f(T_{VJ}), I_{DS} = 23 \text{ mA}$$



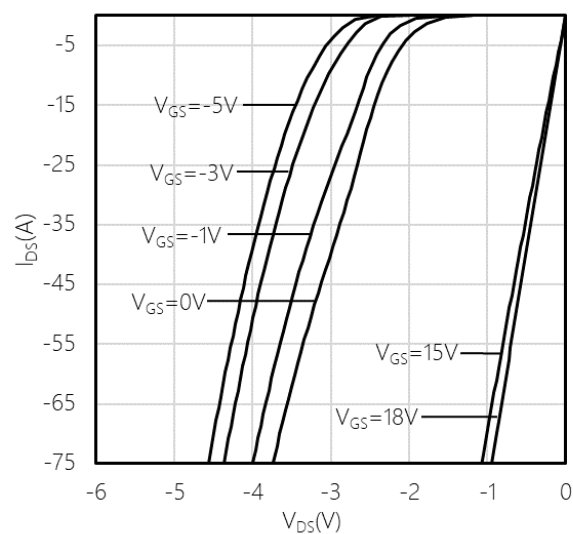
Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

$$I_{DS} = f(V_{DS}), T_{VJ} = -55^\circ\text{C}$$



Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

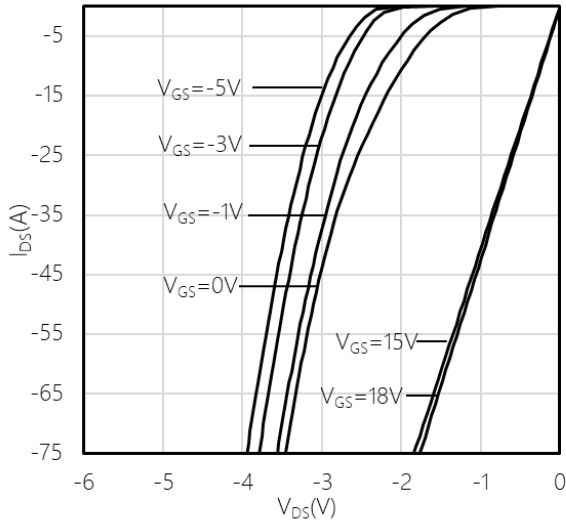
$$I_{DS} = f(V_{DS}), T_{VJ} = 25^\circ\text{C}$$



Typical Characteristics Diagrams

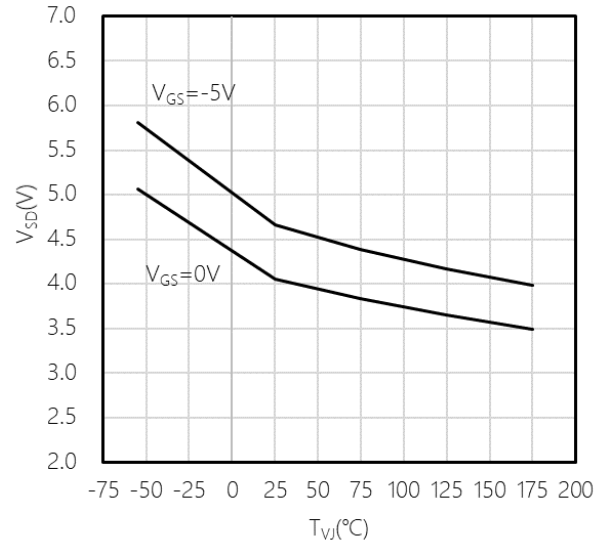
Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

$$I_{DS} = f(V_{DS}), T_{VJ} = 175\text{ }^{\circ}\text{C}$$



Typical reverse drain voltage as function of junction temperature

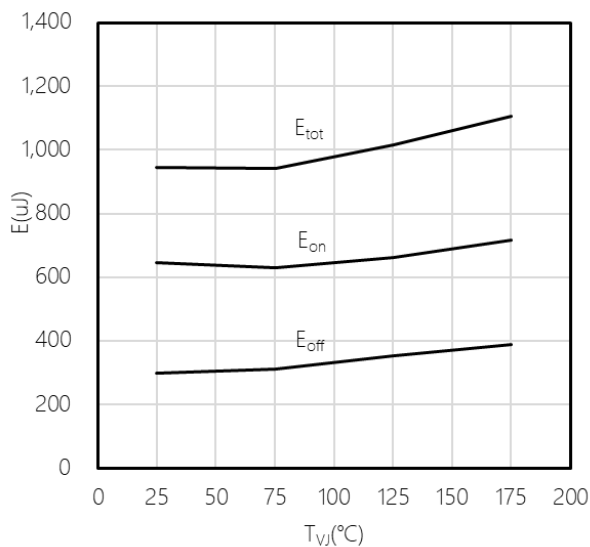
$$V_{SD} = f(T_{VJ}), I_{SD} = 75\text{ A}$$



Typical switching energy as a function of junction temperature, 2nd device own body diode: $V_{GS} = -5\text{ V}$

$$E = f(T_{VJ})$$

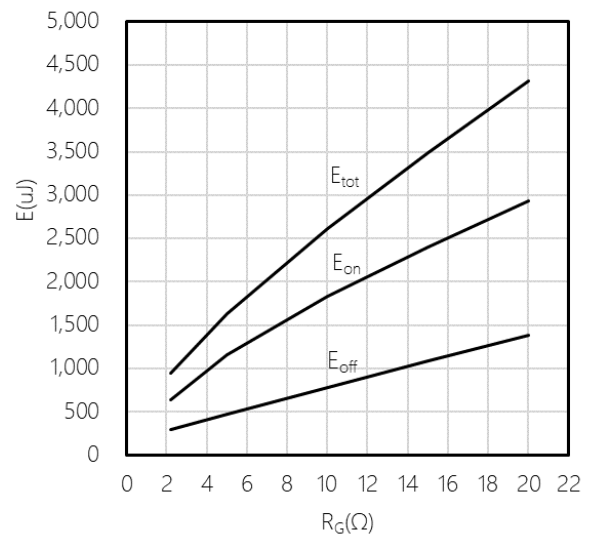
$V_{DS} = 800\text{ V}$, $R_{G(ext)} = 2.2\text{ }\Omega$, $V_{GS} = -5\text{ V} / +18\text{ V}$, $I_{DS} = 75\text{ A}$



Typical switching energy losses as a function of gate resistance, 2nd device own body diode: $V_{GS} = -5\text{ V}$

$$E = f(R_{G(ext)})$$

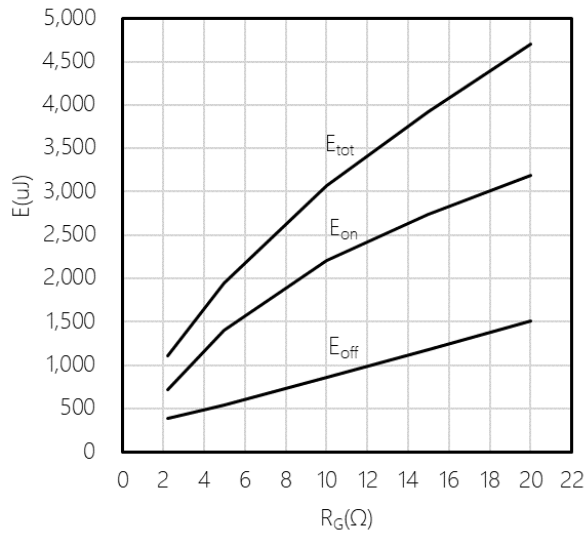
$V_{GS} = -5/18\text{ V}$, $I_{DS} = 75\text{ A}$, $T_{VJ} = 25\text{ }^{\circ}\text{C}$, $V_{DS} = 800\text{ V}$



Typical switching energy losses as a function of gate resistance, 2nd device own body diode: $V_{GS} = -5$ V

$$E = f(R_{G(ext)})$$

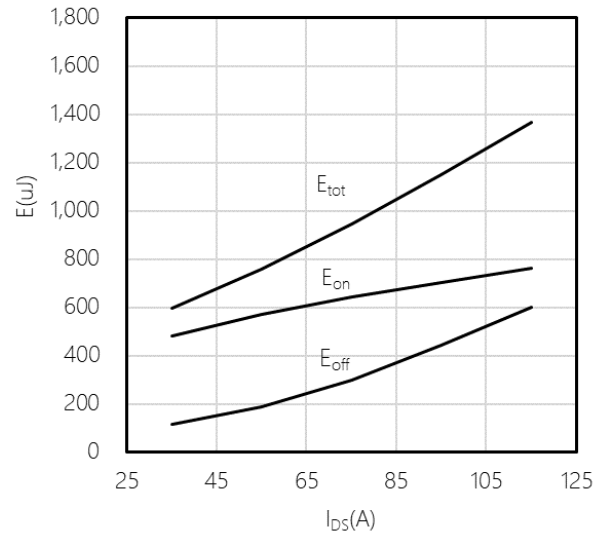
$V_{GS} = -5/18$ V, $I_{DS} = 75$ A, $T_{VJ} = 175$ °C, $V_{DS} = 800$ V



Typical switching energy losses as a function of I_{DS} , 2nd device own body diode: $V_{GS} = -5$ V

$$E = f(I_{DS})$$

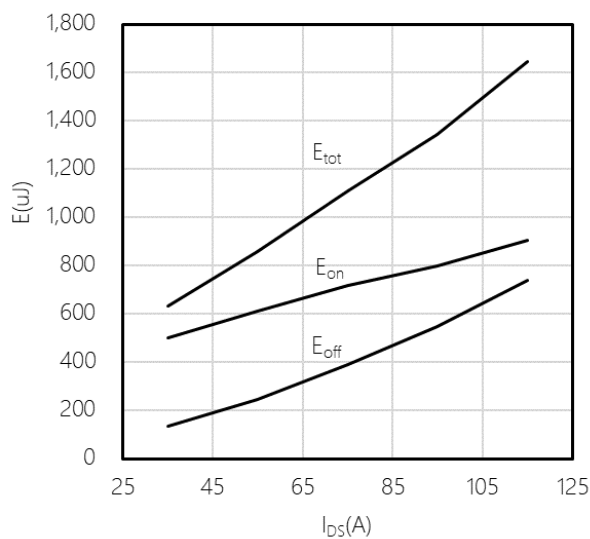
$V_{GS} = -5/18$ V, $R_{G(ext)} = 2.2$ Ω, $T_{VJ} = 25$ °C, $V_{DS} = 800$ V



Typical switching energy losses as a function of I_{DS} , 2nd device own body diode: $V_{GS} = -5$ V

$$E = f(I_{DS})$$

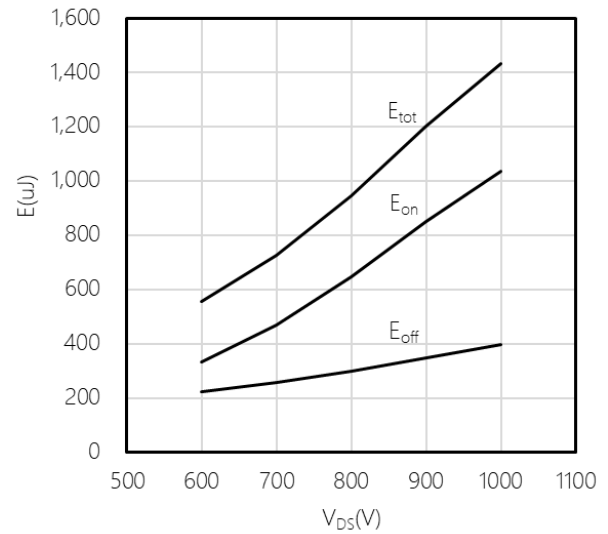
$V_{GS} = -5/18$ V, $R_{G(ext)} = 2.2$ Ω, $T_{VJ} = 175$ °C, $V_{DS} = 800$ V



Typical switching energy losses as a function of V_{DS} , 2nd device own body diode: $V_{GS} = -5$ V

$$E = f(V_{DS})$$

$V_{GS} = -5/18$ V, $R_{G(ext)} = 2.2$ Ω, $T_{VJ} = 25$ °C, $I_{DS} = 75$ A

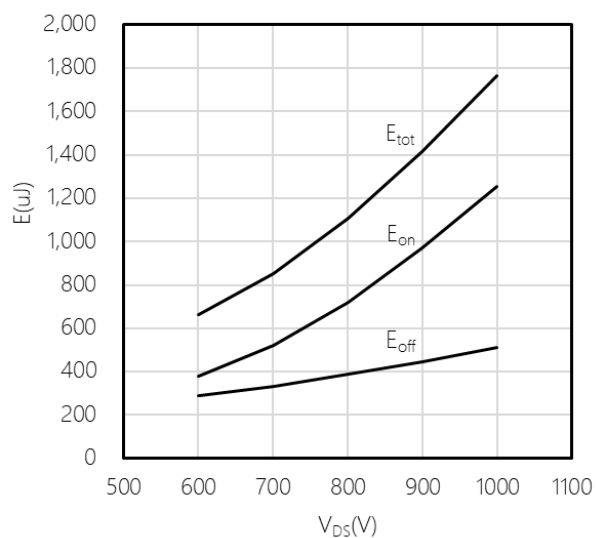


Typical switching energy losses as a function of V_{DS} ,

2nd device own body diode: $V_{GS} = -5\text{ V}$

$$E = f(V_{DS})$$

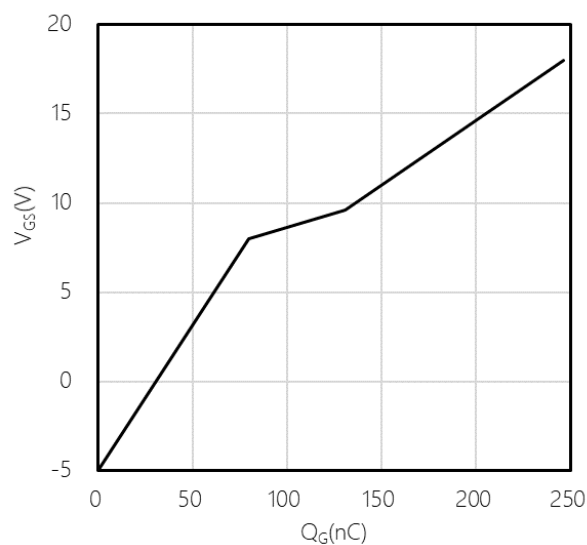
$V_{GS} = -5/18\text{ V}$, $R_{G(ext)} = 2.2\ \Omega$, $T_{VJ} = 175\text{ }^{\circ}\text{C}$, $I_{DS} = 75\text{ A}$



Typical gate charge

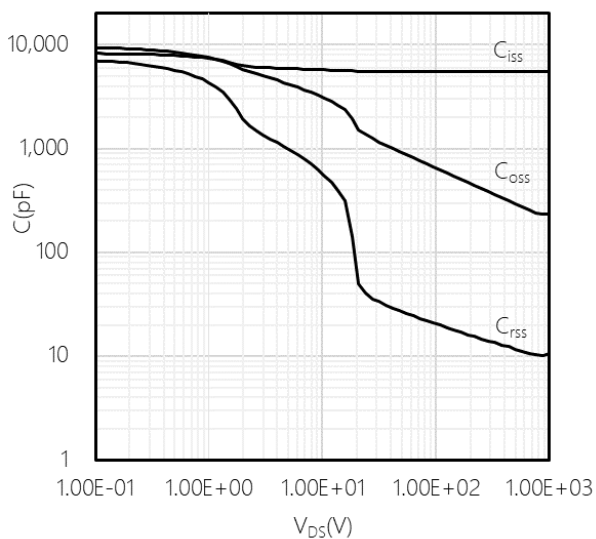
$V_{GS} = f(Q_G)$, $I_{DS} = 75\text{ A}$, $V_{DS} = 800\text{ V}$

turn-on pulse



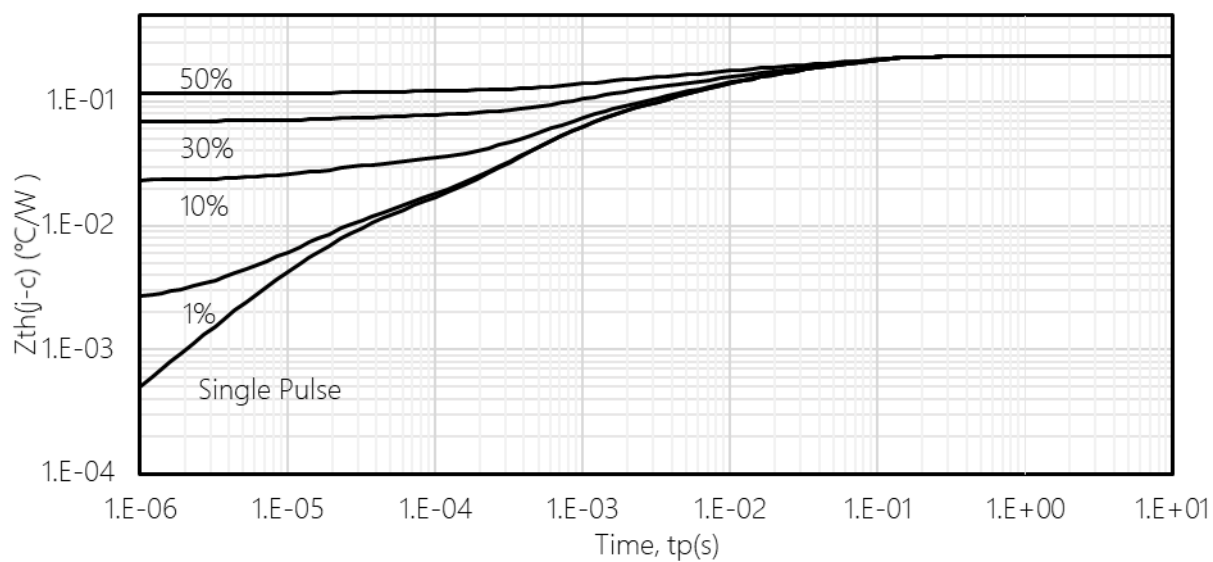
Typical capacitance as a function of drain-source voltage

$C = f(V_{DS})$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$



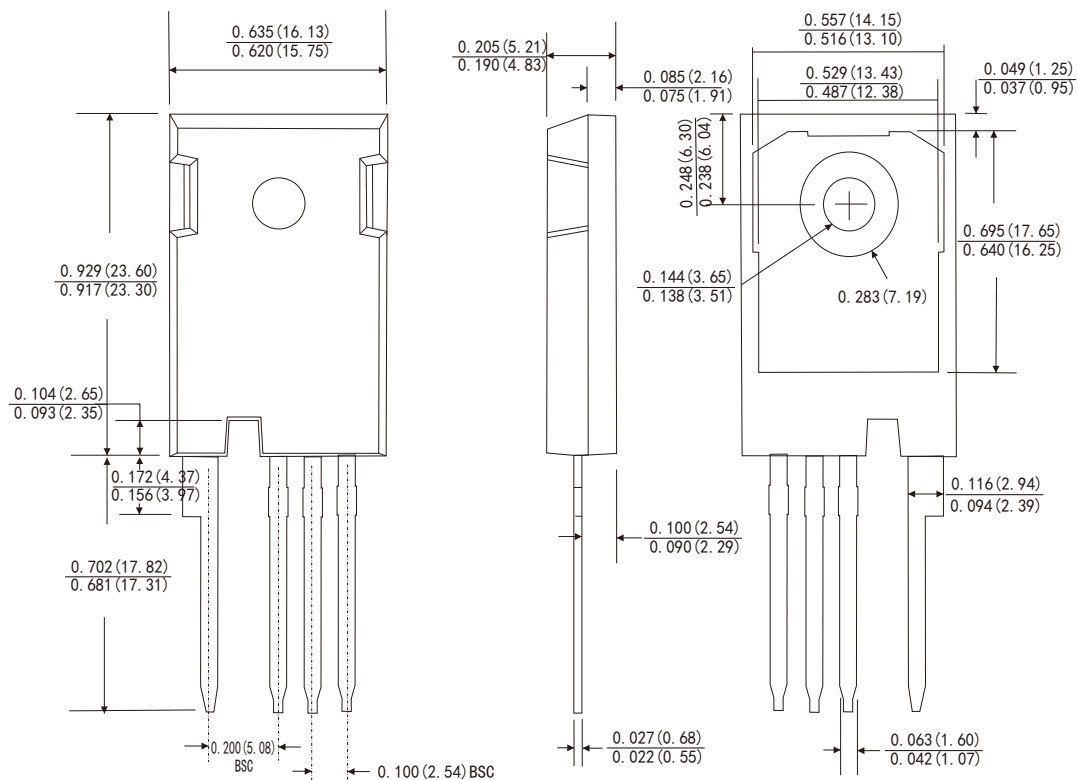
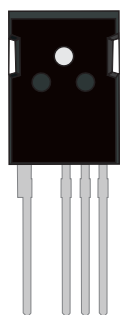
Transient thermal resistance (MOSFET)

($Z_{th(j-c,max)} = f(t_p)$, Parameter $D = t_p/T$)



Dimensions

TO-247-4L package



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