

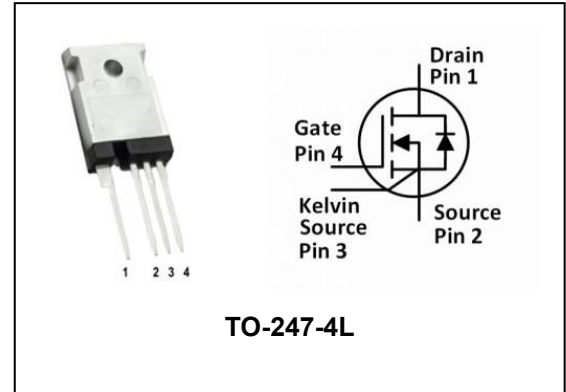
Revision History

<u>Rev. No.</u>	<u>History</u>	<u>Issue Date</u>
1.0	New issue	Oct. 15,2025

Nano Meter Coated (NMC)SIC MOSFET

Features

- ◆ Effectively lower down T_j and R_{th} , better anti-EMI ability
- ◆ High speed Switching and low switching loss
- ◆ High blocking voltage with low on-resistance
- ◆ Temperature-Independent Switching Behavior



Applications

- ◆ PV string inverters
- ◆ Solar power optimizer
- ◆ Switch mode power supplies
- ◆ Online UPS/ Industrial UPS
- ◆ High Voltage DC/ DC Converters

Top Mark:	CSiC120013T1	
Ordering P/N:	CSiC120013T1	
Parameter	Value	Unit
V_{DS}	1200	V
$I_D(T_C=25^\circ\text{C})$	150	A
$R_{DS(ON)}$	13	m Ω
$T_{j,max}$	175	$^\circ\text{C}$

Absolute Maximum Ratings ($T_j=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSS}	Drain-Source Voltage	1200	V	
I_D	Continuous DC Drain Current for $R_{th(j-c,typ.)}$, Limited by $T_{VJ(max)}$	150	A	$T_C = 25^\circ\text{C}$
		107		$T_C = 100^\circ\text{C}$
		87		$T_C = 125^\circ\text{C}$
I_{DM}	Peak Drain Current, t_p Limited by $T_{VJ(max)}$	281	A	$T_C = 25^\circ\text{C}$
		199		$T_C = 100^\circ\text{C}$
		162		$T_C = 125^\circ\text{C}$
$V_{GS, max}$	Gate-Source Max Voltage	-10/22	V	
$V_{GS, op}$	Gate-Source Operate Voltage	-5/18	V	
E_{AS}	Single Pulse Avalanche Energy	729	mJ	$L=0.5\text{mH}$, $I_{AS}=54\text{A}$, $V_{DD}=50\text{V}$, $V_{GS}=18\text{V}$
P_{tot}	Power Dissipation for $R_{th(j-c,typ.)}$	681.8	W	$T_C = 25^\circ\text{C}$

■ Static Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test condition	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	$I_D = 100 \mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2	3.2	4.5	V	$V_{DS} = V_{GS}, I_D = 21mA$	$T_{VJ} = 25^\circ C$
			2.3				$T_{VJ} = 175^\circ C$
I_{DSS}	Drain-Source Leakage Current			20	μA	$V_{GS} = 0 V, V_{DS} = 1200 V$	$T_{VJ} = 25^\circ C$
			11				$T_{VJ} = 175^\circ C$
I_{GSS}	Gate-Source Leakage Current			250	nA	$V_{GS} = 22 V, V_{DS} = 0 V$	$T_{VJ} = 25^\circ C$
			295				$T_{VJ} = 175^\circ C$
I_{SGS}	Source-Gate Leakage Current			250	nA	$V_{GS} = -10 V, V_{DS} = 0 V$	$T_{VJ} = 25^\circ C$
			-132				$T_{VJ} = 175^\circ C$
$R_{DS(on)}$	Drain-Source On-State Resistance		13		m Ω	$V_{GS} = 18 V, I_D = 75 A$	$T_{VJ} = 25^\circ C$
			25				$T_{VJ} = 175^\circ C$
g_{fs}	Transconductance		56.2		S	$V_{DS} = 20 V, I_D = 75 A$	
$R_{G(int)}$	Internal Gate Resistance		1.25		Ω	$f = 1MHz, V_{AC} = 25 mV$	
C_{iss}	Input Capacitance		5357		pF	$V_{GS} = 0 V, V_{DS} = 800 V, f = 1MHz$	
C_{oss}	Output Capacitance		240		pF		
C_{rss}	Reverse Transfer Capacitance		9		pF		
Q_{GS}	Gate to Source Charge		71.6		nC	$V_{GS} = -5 V / +18 V, V_{DD} = 800 V, I_D = 75 A$	
Q_{GD}	Gate to Drain Charge		17.9		nC		
Q_G	Total Gate Charge		219.0		nC		

■ Dynamic Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test condition	
$t_{d(on)}$	Turn-On Delay Time		16.0		ns	$V_{GS} = -5\text{ V} / +18\text{ V}$, $L=100\mu\text{H}$ $V_{DD} = 800\text{ V}$, $I_D = 75\text{ A}$, $R_{G(on)} = 2\ \Omega$, $R_{G(off)} = 2\ \Omega$	$T_{VJ} = 25\text{ }^{\circ}\text{C}$
			15.8				$T_{VJ} = 125\text{ }^{\circ}\text{C}$
			15.2				$T_{VJ} = 175\text{ }^{\circ}\text{C}$
t_r	Rise Time		17.9		ns		$T_{VJ} = 25\text{ }^{\circ}\text{C}$
			19.0				$T_{VJ} = 125\text{ }^{\circ}\text{C}$
			20.4				$T_{VJ} = 175\text{ }^{\circ}\text{C}$
$t_{d(off)}$	Turn-Off Delay Time		36.2		ns		$T_{VJ} = 25\text{ }^{\circ}\text{C}$
			37.9				$T_{VJ} = 125\text{ }^{\circ}\text{C}$
			39.2				$T_{VJ} = 175\text{ }^{\circ}\text{C}$
t_f	Fall Time		8.5		ns		$T_{VJ} = 25\text{ }^{\circ}\text{C}$
			7.1				$T_{VJ} = 125\text{ }^{\circ}\text{C}$
			7.0				$T_{VJ} = 175\text{ }^{\circ}\text{C}$

Dynamic Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test condition	
E _{on}	Turn-On Switching Loss		538.2		μJ	V _{GS} = -5 V / +18 V, L=100uH V _{DD} = 800 V, I _D = 75 A, R _{G(on)} = 2 Ω, R _{G(off)} = 2 Ω	T _{VJ} = 25 °C
			589.1				T _{VJ} = 125 °C
			628.0				T _{VJ} = 175 °C
E _{off}	Turn-Off Switching Loss		166.5		μJ		T _{VJ} = 25 °C
			114.2				T _{VJ} = 125 °C
			105.3				T _{VJ} = 175 °C
E _{tot}	Total Switching Energy		704.7		μJ		T _{VJ} = 25 °C
			686.9				T _{VJ} = 125 °C
			658.3				T _{VJ} = 175 °C

Note: Eon/ Eoff result with body diode

Maximum Ratings For Body Diode (TVJ= 25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V _{DSS}	Drain-Source Voltage	1200	V	
I _{SM}	Peak Reverse Drain Current, tp Limited by T _{VJ(max)}	281	A	T _C = 25 °C
		199		T _C = 100 °C
		162		T _C = 125 °C

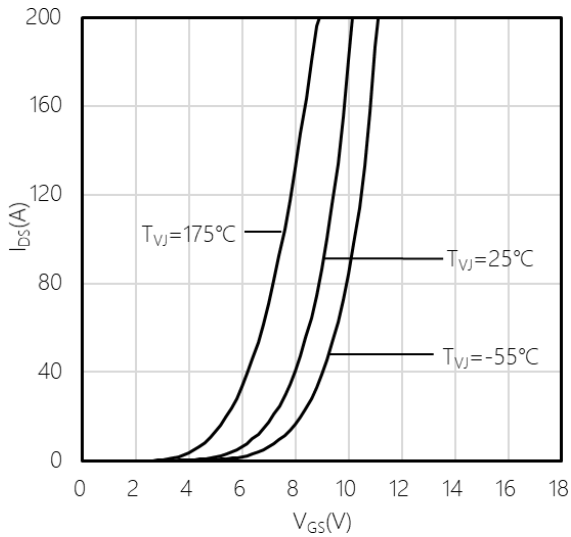
Body Diode Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test conditions	
V _{SD}	Body Diode Forward Voltage		4.8		V	V _{GS} = -5 V, I _{SD} = 75 A	T _{VJ} = 25 °C
			4.4				T _{VJ} = 125 °C
			4.2				T _{VJ} = 175 °C
I _{rrm}	Peak Reverse Recovery Current		45.5		A	V _{DS} = 800 V, V _{GS} = -5 V, I _{SD} =75A, di/dt = 3670 A / μs	T _{VJ} = 25 °C
			50.5				T _{VJ} = 125 °C
			56.6				T _{VJ} = 175 °C
Q _{rr}	Reverse Recovery Charge		0.55		μC		T _{VJ} = 25 °C
			0.82				T _{VJ} = 125 °C
			1.14				T _{VJ} = 175 °C
t _{rr}	Reverse Recovery Time		22.0		ns		T _{VJ} = 25 °C
			34.6				T _{VJ} = 125 °C
			35.1				T _{VJ} = 175 °C
E _{rr}	Reverse Recovery Energy		77.5		μJ		T _{VJ} = 25 °C
			149.2				T _{VJ} = 125 °C
			229.7				T _{VJ} = 175 °C

Typical transfer characteristic

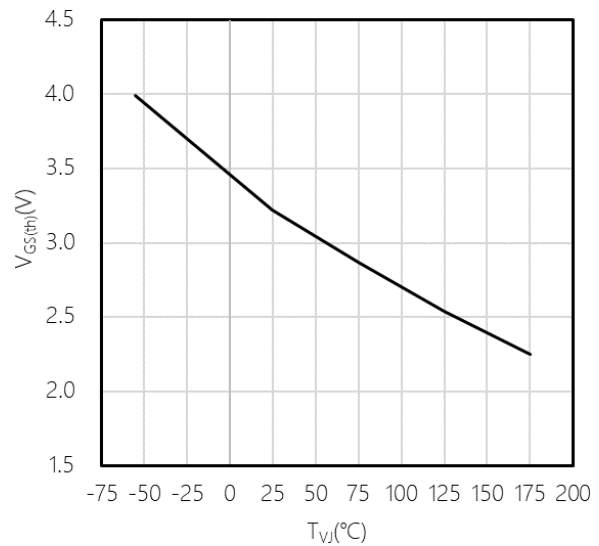
$$I_{DS} = f(V_{GS})$$

$$V_{DS} = 20 \text{ V}$$



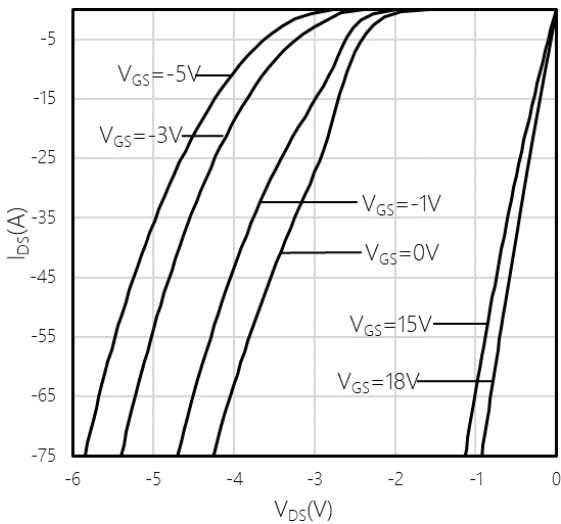
Typical gate-source threshold voltage as a function of junction temperature

$$V_{GS(th)} = f(T_{VJ}), I_{DS} = 21 \text{ mA}$$



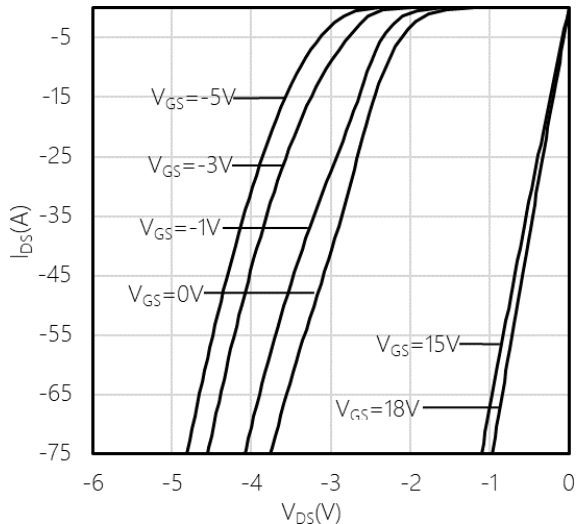
Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

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



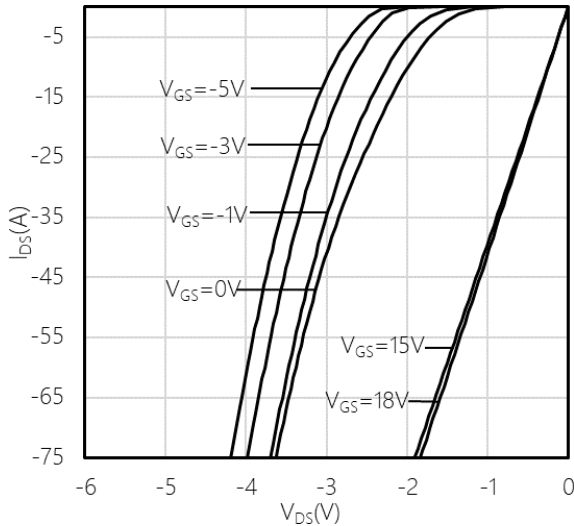
Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

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



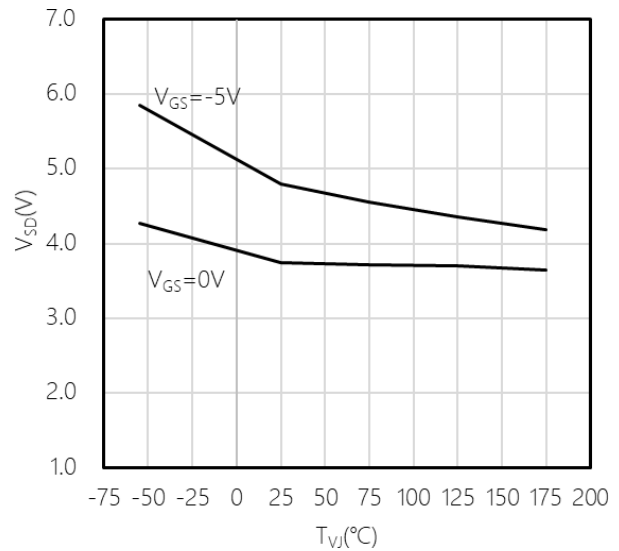
Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

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



Typical reverse drain voltage as function of junction temperature

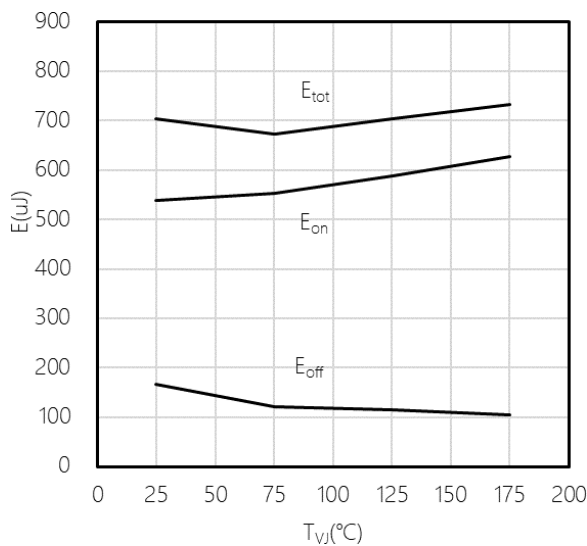
$V_{SD} = f(T_{VJ})$, $I_{SD} = 37.5\text{ A}$



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

$E = f(T_{VJ})$

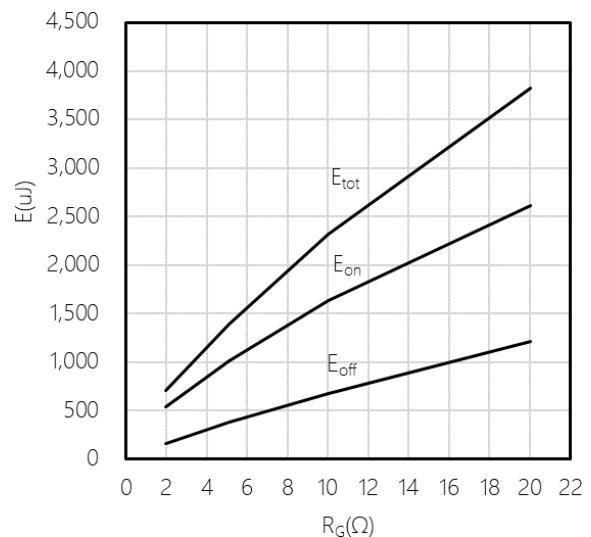
$V_{DS} = 800\text{ V}$, $R_{G(\text{ext})} = 2\ \Omega$, $V_{GS} = -5\text{ V} / +18\text{ V}$, $I_{DS} = 75\text{ A}$



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

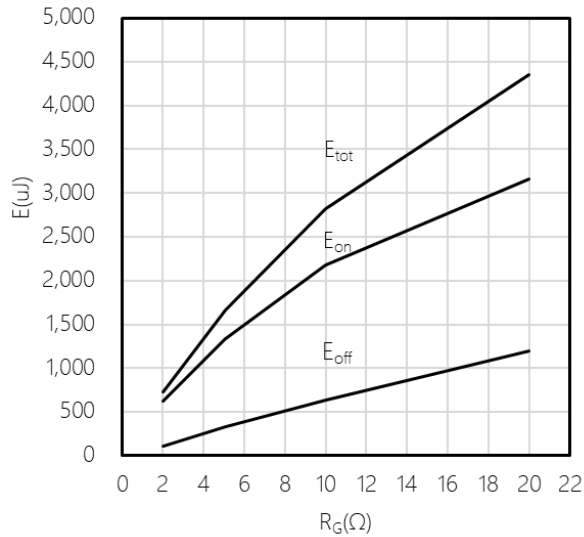
$E = f(R_{G(\text{ext})})$

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



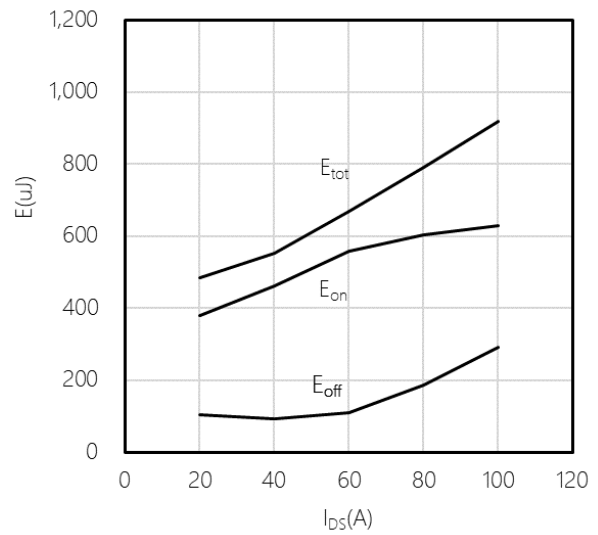
Typical switching energy losses as a function of gate resistance, 2nd device own body diode: $V_{GS} = -5\text{ V}$
 $E = f(R_{G(ext)})$

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



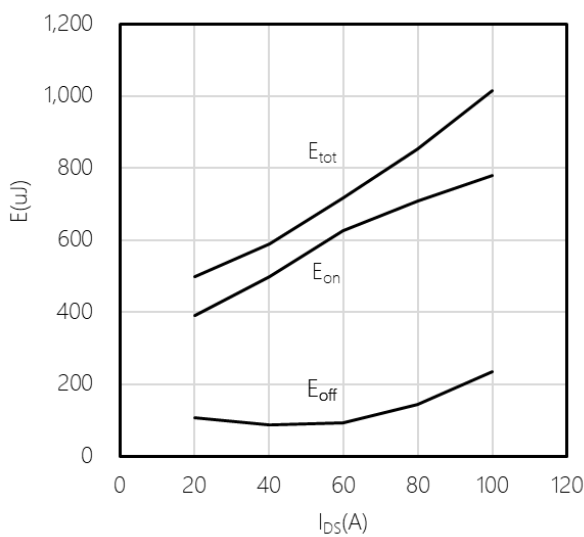
Typical switching energy losses as a function of gate resistance, 2nd device own body diode: $V_{GS} = -5\text{ V}$
 $E = f(I_{DS})$

$V_{GS} = -5/18\text{ V}$, $R_{G(ext)} = 2\text{ Ω}$, $T_{VJ} = 25\text{ °C}$, $V_{DS} = 800\text{ V}$



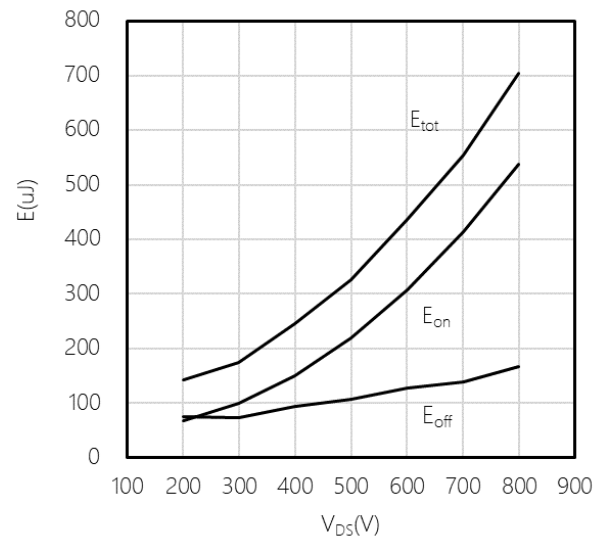
Typical switching energy losses as a function of gate resistance, 2nd device own body diode: $V_{GS} = -5\text{ V}$
 $E = f(I_{DS})$

$V_{GS} = -5/18\text{ V}$, $R_{G(ext)} = 2\text{ Ω}$, $T_{VJ} = 175\text{ °C}$, $V_{DS} = 800\text{ V}$



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

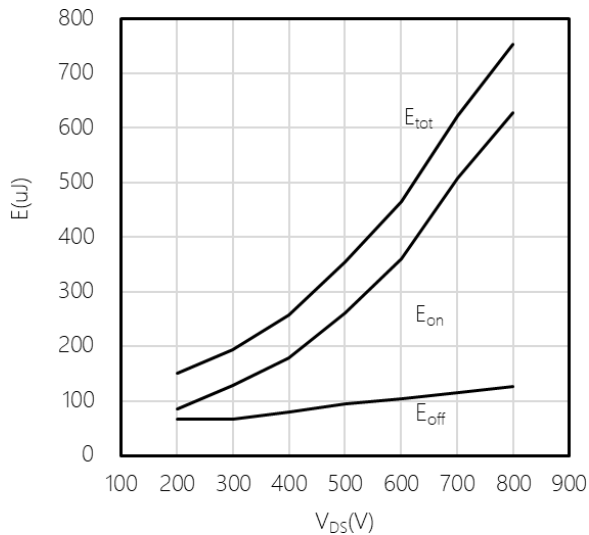
$V_{GS} = -5/18\text{ V}$, $R_{G(ext)} = 2\text{ Ω}$, $T_{VJ} = 25\text{ °C}$, $I_{DS} = 75\text{ A}$



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

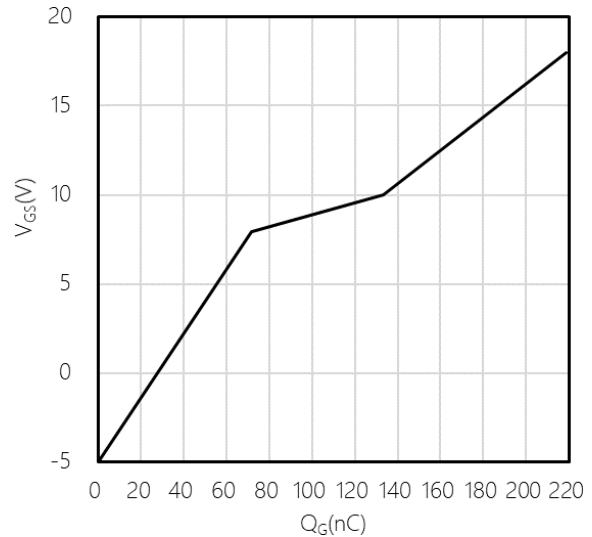
$E = f(V_{DS})$

$V_{GS} = -5/18\text{ V}$, $R_{G(ext)} = 2\ \Omega$, $T_{VJ} = 175\text{ }^{\circ}\text{C}$, $I_{DS} = 75\text{ A}$



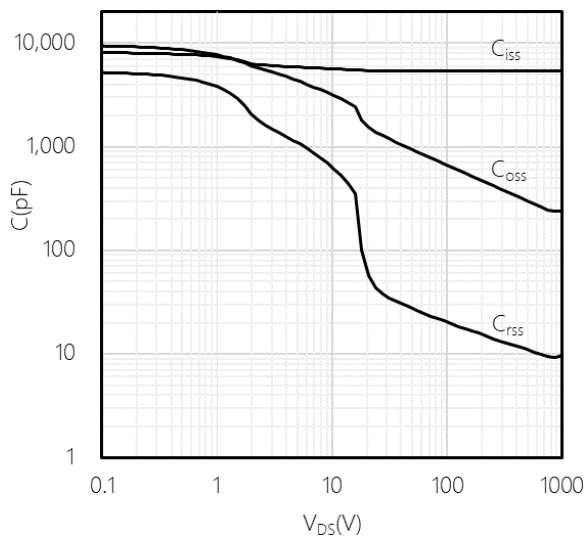
Typical gate charge

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



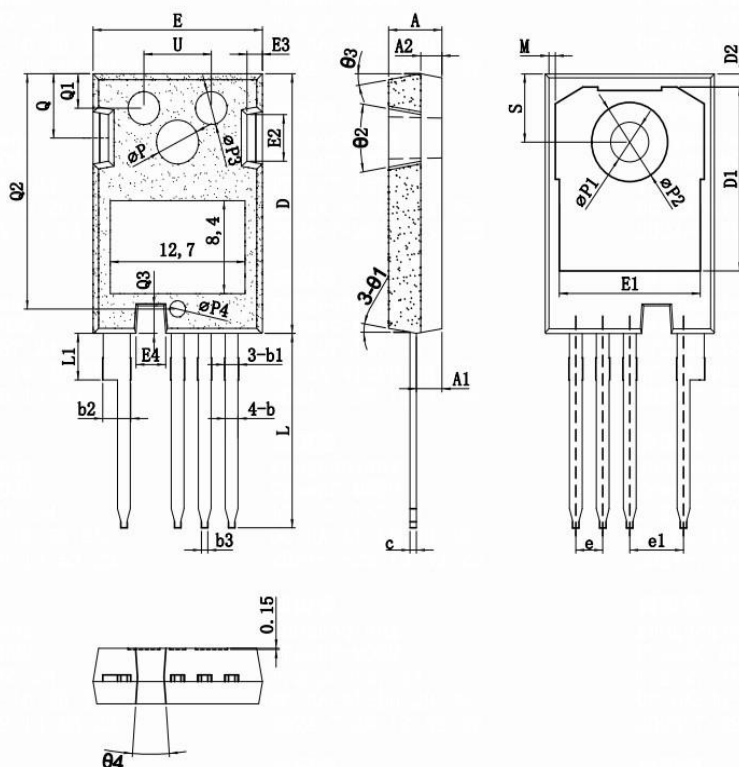
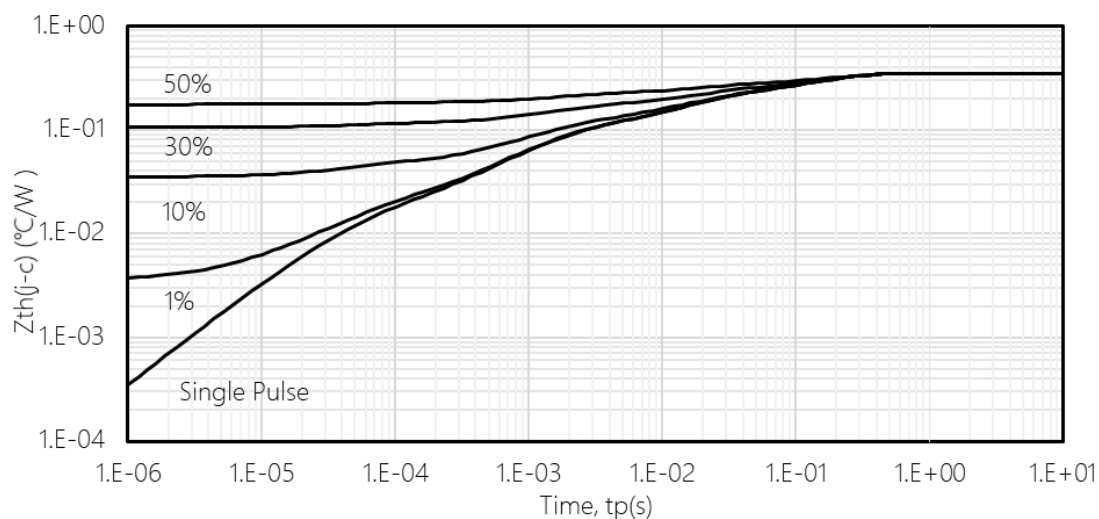
Typical capacitance as a function of drain-source voltage

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



Max. transient thermal resistance (MOSFET)

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



SYMBOL	mm		
	MIN	NOM	MAX
*A	4.83	5.02	5.21
*A1	2.29	2.42	2.54
A2	1.91	2.00	2.16
*b	1.07	1.20	1.33
*b1	1.15	1.30	1.45
*b2	2.39	2.67	2.94
b3	0.45	0.60	0.75
*C	0.55	0.60	0.68
*D	23.30	23.45	23.60
D1	16.35	16.65	16.95
D2	0.95	1.19	1.25
*E	15.75	15.94	16.13
E1	13.10	13.25	13.40
E2	4.00	4.40	4.80
E3	1.00	1.45	1.90
E4	2.40	2.80	3.20
*e	2.50	2.54	2.58
*e1	5.03	5.08	5.13
*L	17.31	17.57	17.82
*L1	-	-	4.37
M	0.40	0.60	0.80
*ΦP	3.90	4.00	4.10
*ΦP1	3.51	3.61	3.71
ΦP2	7.03	7.18	7.33
ΦP3	2.80	3.00	3.20
ΦP4	1.30	1.50	1.70
Q	5.49	5.79	6.00
Q1	2.80	3.10	3.40
Q2	19.95	21.25	21.55
Q3	2.35	2.50	2.65
S	6.04	6.17	6.30
U	6.05	6.35	6.55
θ1	6°	10°	13°
θ2	16°	20°	24°
θ3	6°	10°	13°
θ4	5°	8°	11°

Package Outline

Common Dimensions