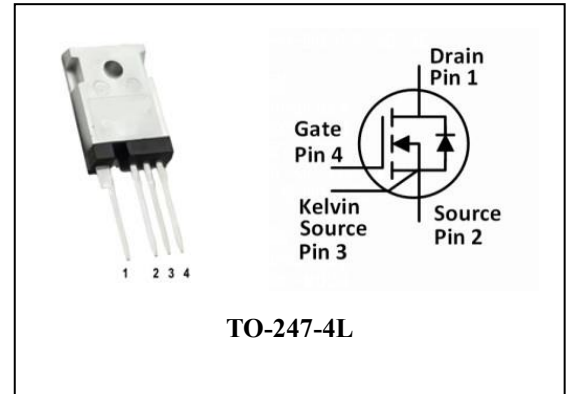


Nano Meter Coated (NMC)SIC MOSFET

Features

- Effectively lower down T_j and R_{th} , better anti-EMI ability
- High speed Switching with Low Capacitances
- High blocking voltage with low on-resistance
- Easy to Parallel and Simple to Drive
- Anti- Latch-Up
- Halogen Free, RoHS Compliant



Applications

- EV Charging Station
- Power Factor Correction or DC/DC Converters
- Solar Inverters
- Motor Drives
- Switch mode power supplies

Top Mark: CSiC120040T1		
Ordering P/N: CSiC120040T1		
Parameter	Value	Unit
V_{DS}	1200	V
$I_D(T_C=25^\circ\text{C})$	88	A
$R_{DS(ON)}$	40	m Ω
$T_{j,max}$	175	$^\circ\text{C}$

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

Parameter	Symbol	Condition	Value	Unit
Drain-Source Voltage	V_{DSmax}	$V_{GS}=0V$, $I_D=100\mu A$	1200	V
Gate-Source Voltage	V_{GSmax}	Absolute maximum values	-10/+22	V
Gate-Source Voltage	V_{GSop}	Recommended operational values	-5/+18	V
Continuous Drain Current	I_D	$V_{GS}=18V$, $T_C=25^\circ\text{C}$	88	A
		$V_{GS}=18V$, $T_C=100^\circ\text{C}$	62	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_p limited by T_{jmax}	180	A
Power Dissipation	P_D	$T_C=25^\circ\text{C}$, $T_J=175^\circ\text{C}$	417	W
Operating Junction Temperature	$T_{vj, op}$		-55~175	$^\circ\text{C}$
Storage Temperature Range	T_{stg}		-55~175	$^\circ\text{C}$

■ Electrical Characteristics (T_c=25°C unless otherwise noted)

Parameter	Symbol	Condition		Value			Unit
				Min	Typ.	Max	
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =100μA		1200			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =10mA	T _{vj} =25°C	2.3	3.2	4	V
			T _{vj} =175°C		2.3		
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V			1	50	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =18V, V _{DS} =0V			10	250	nA
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} =18V, I _D =40A	T _{vj} =25°C		38	53	mΩ
			T _{vj} =175°C		53		
Transconductance	g _{fs}	V _{DS} =20V, I _{DS} =40A	T _{vj} =25°C		27.6		S
			T _{vj} =175°C		21		
Input Capacitance	C _{iss}	V _{GS} =0V V _{DS} =1000V f=100KHz V _{AC} =25mV			3030		pF
Output Capacitance	C _{oss}				125		
Reverse Transfer Capacitance	C _{rss}				10		
C _{oss} Stored Energy	E _{oss}				135		μJ
Avalanche Energy, Single Pluse	E _{AS}	I _D =40A, V _{DD} =50V			2		J
Turn-On Switching Energy	E _{ON}	V _{DS} =800V, V _{GS} =-5/18V I _D =40A, R _{G(ext)} =2.5Ω, T _J =25°C, L=150μH			0.6		mJ
Turn Off Switching Energy	E _{OFF}				0.1		
Turn-On Delay Time	t _{d(on)}	V _{DS} =800V, V _{GS} =-5/18V I _D =40A, R _{G(ext)} =2.5Ω, T _J =25°C, L=150μH Timing relative to V _{DS}			16		ns
Rise Time	t _r				22		
Turn-Off Delay Time	t _{d(off)}				20		
Fall Time	t _f				10		
Gate to Source Charge	Q _{gs}	V _{DS} =800V, V _{GS} =-5/18V I _D =40A			47		nC
Gate to Drain Charge	Q _{gd}				41		
Total Gate Charge	Q _g				132		

■ Body Diode Characteristics ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

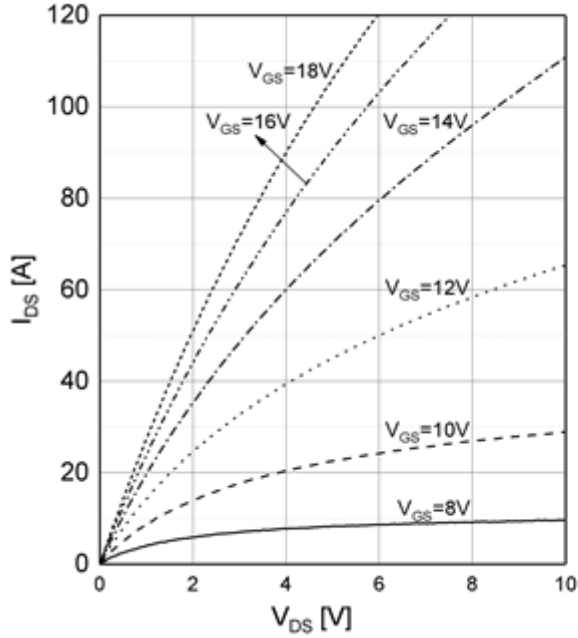
Parameter	Symbol	Condition		Value			Unit
				Min	Typ.	Max	
Diode Forward Voltage	V_{SD}	$V_{GS}=-5\text{V}, I_{SD}=20\text{A}$	$T_{vj}=25^{\circ}\text{C}$		4.5		V
			$T_{vj}=175^{\circ}\text{C}$		4.1		
Continuous Diode Forward Current	I_S	$V_{GS}=-5\text{V}, T_C=25^{\circ}\text{C}$				75	A
Diode Pulse Current	$I_{S(\text{pulse})}$	$V_{GS}=-5\text{V}$, Pulse width t_p limited by $T_{j\text{max}}$				180	A
Reverse Recovery Time	t_{rr}	$V_{GS}=-5\text{V}$ $I_{SD}=40\text{A}$ $R_{G(\text{ext})}=7.5\Omega$			59		ns
Reverse Recovery Charge	Q_{rr}				3		uC
Peak Reverse Recovery Current	I_{rrm}		$T_J=25^{\circ}\text{C}$ $V_R=800\text{V}$		22		A

■ Thermal Characteristics

Parameter	Symbol	Condition	Value			Unit
			Min	Typ.	Max	
Thermal Resistance: Junction to Case	$R_{th(J-C)}$			0.36	0.46	$^{\circ}\text{C/W}$

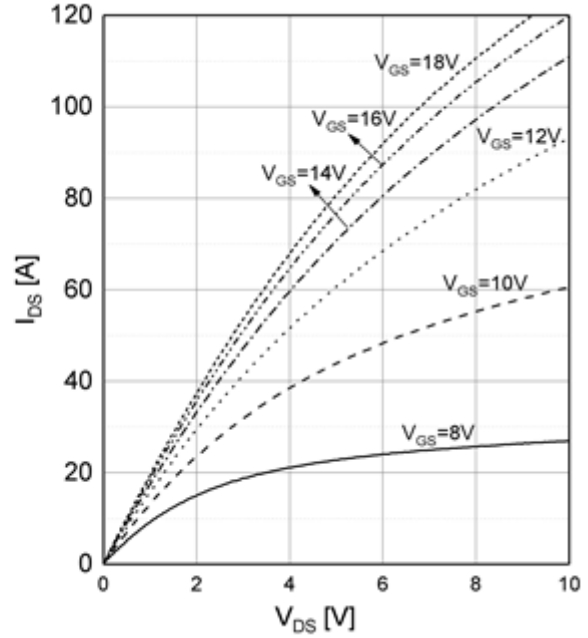
Output Characteristics

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



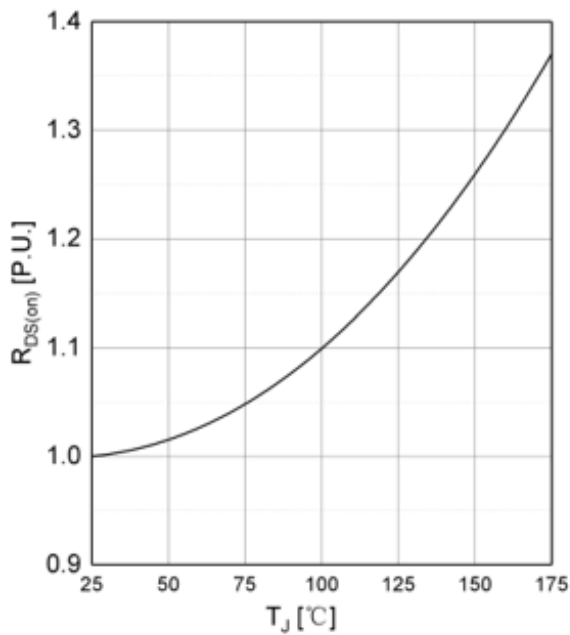
Output Characteristics

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



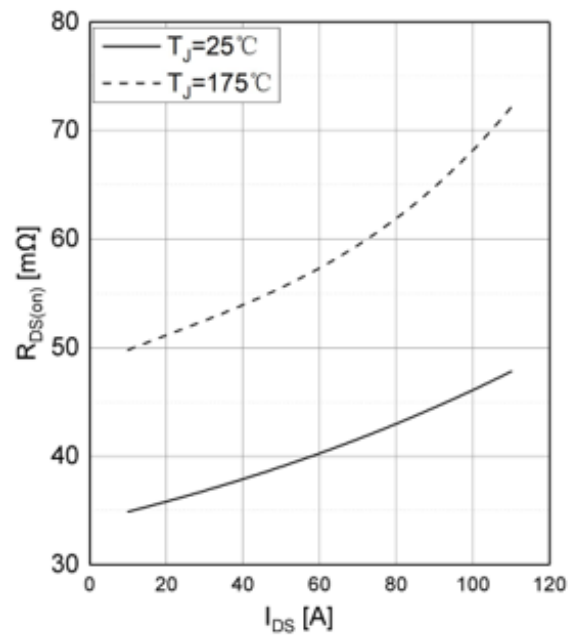
Normalized On-Resistance

$$R_{DS(on)}=f(T_J), I_{DS}=40\text{A}, V_{GS}=18\text{V}$$



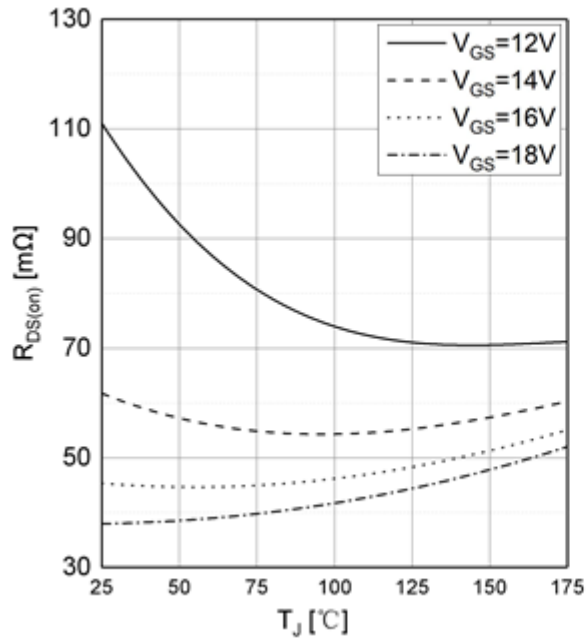
On-Resistance

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



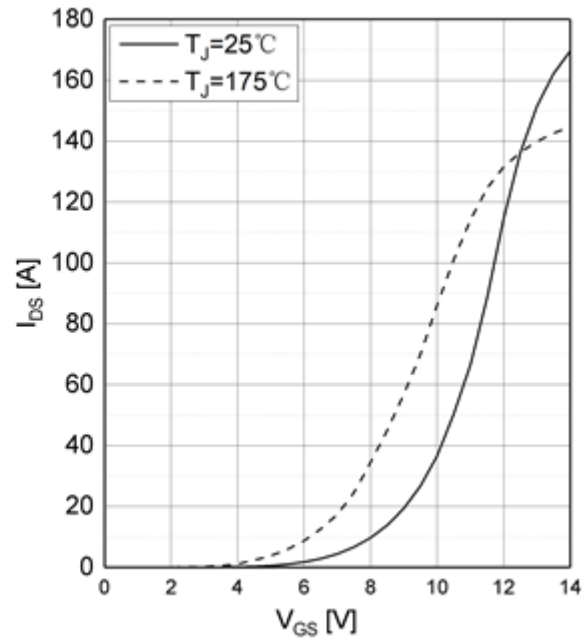
On-Resistance

$$R_{DS(on)} = f(T_J), I_{DS} = 40A$$



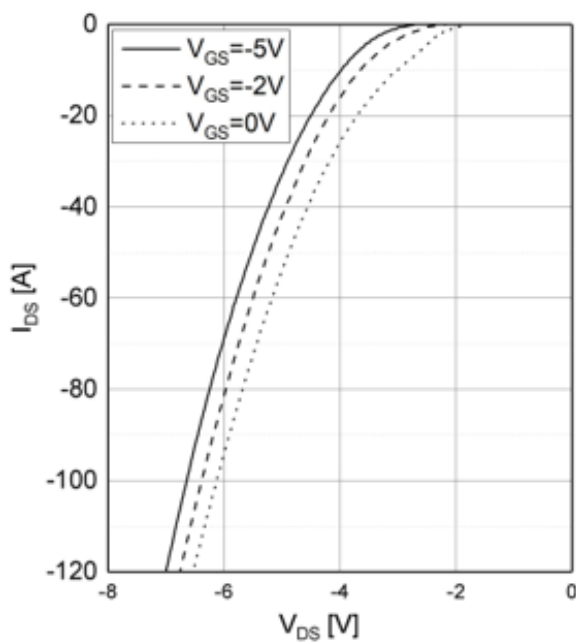
Transfer Characteristics

$$I_{DS} = f(V_{GS}), V_{DS} = 20V$$



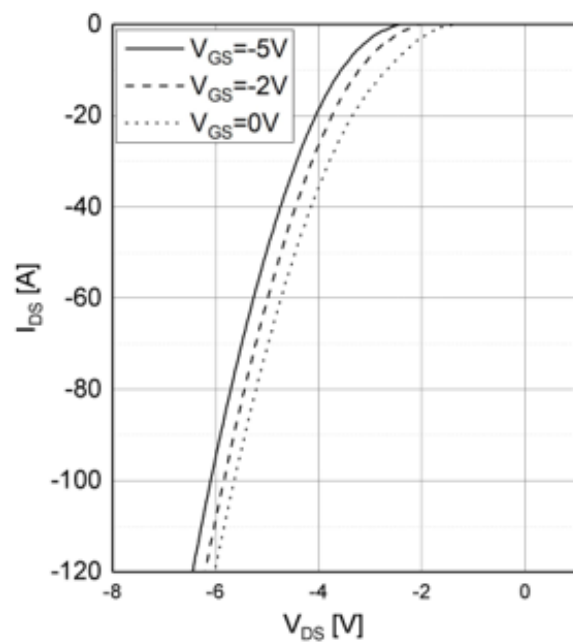
Body Diode Characteristics

$$I_{DS} = f(V_{DS}), T_J = 25°C$$



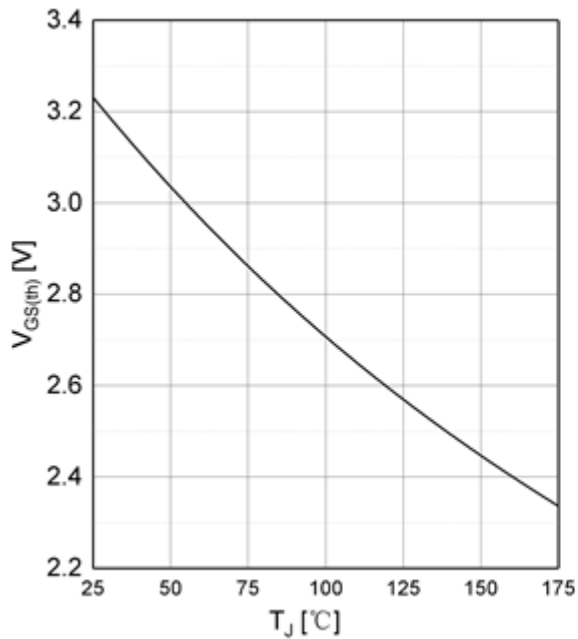
Body Diode Characteristics

$$I_{DS} = f(V_{DS}), T_J = 175°C$$



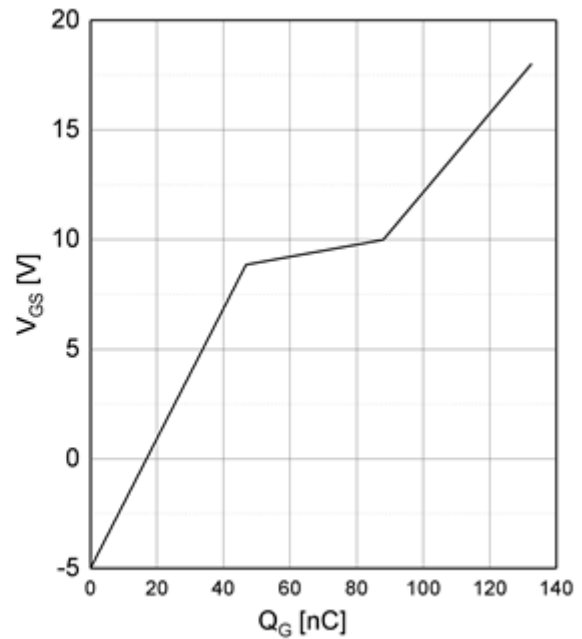
Threshold Voltage

$V_{GS(th)}=f(T_J)$, $V_{GS}=V_{DS}$, $I_{DS}=10mA$



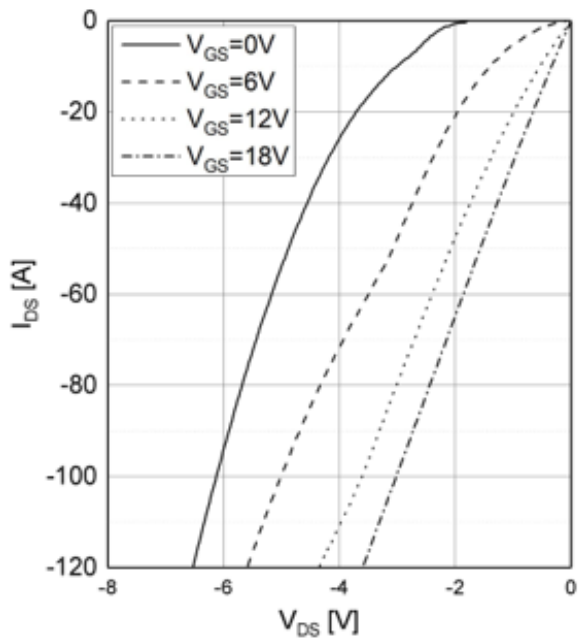
Gate Charge Characteristics

$V_{GS}=f(Q_G)$, $I_{DS}=40A$, $I_{GS}=50mA$, $V_{DS}=800V$, $T_J=25°C$



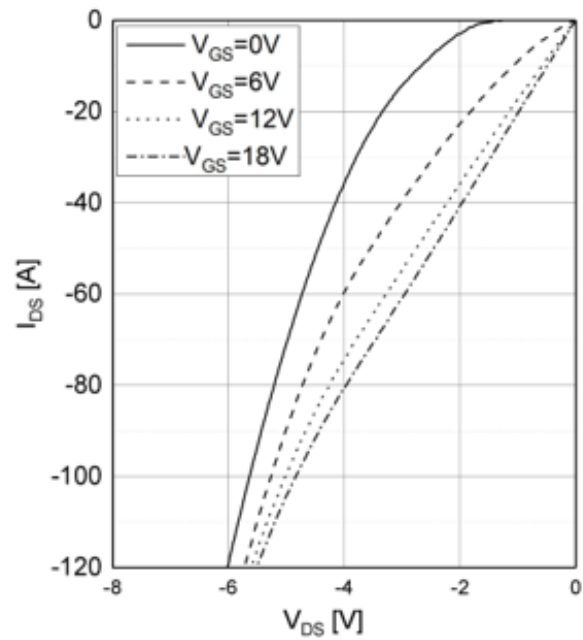
3rd Quadrant Characteristics

$I_{DS}=f(V_{DS})$, $T_J=25°C$



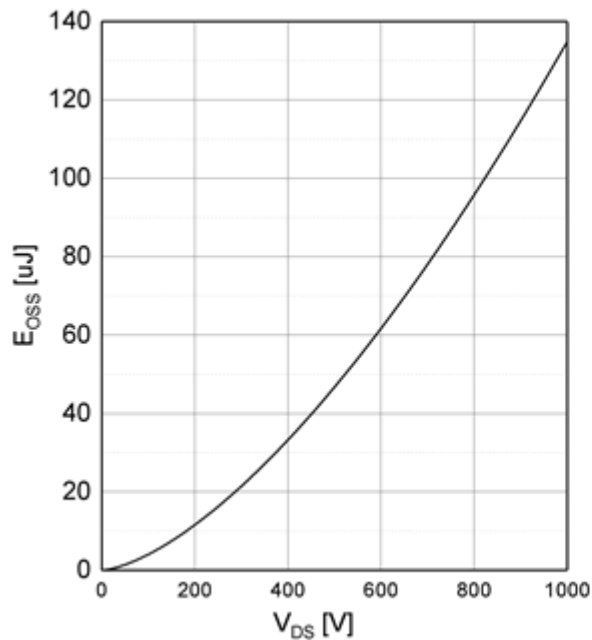
3rd Quadrant Characteristics

$I_{DS}=f(V_{DS})$, $T_J=175°C$



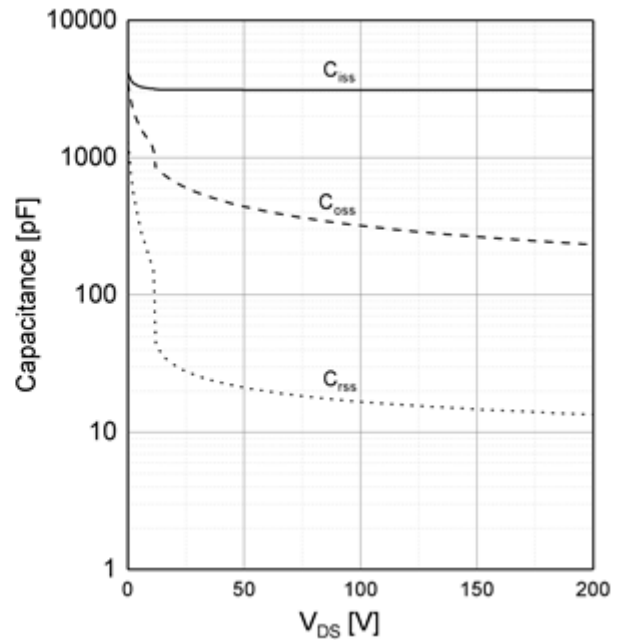
Output Capacitor Stored Energy

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



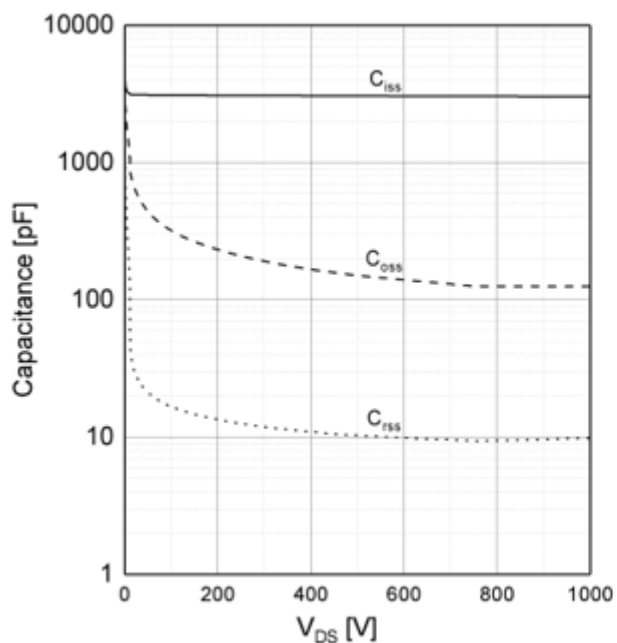
Capacitances

$$\text{Capacitances}=f(V_{DS}), T_J=25^{\circ}\text{C}, V_{AC}=25\text{mV}, f=100\text{KHz}, (0-200\text{V})$$



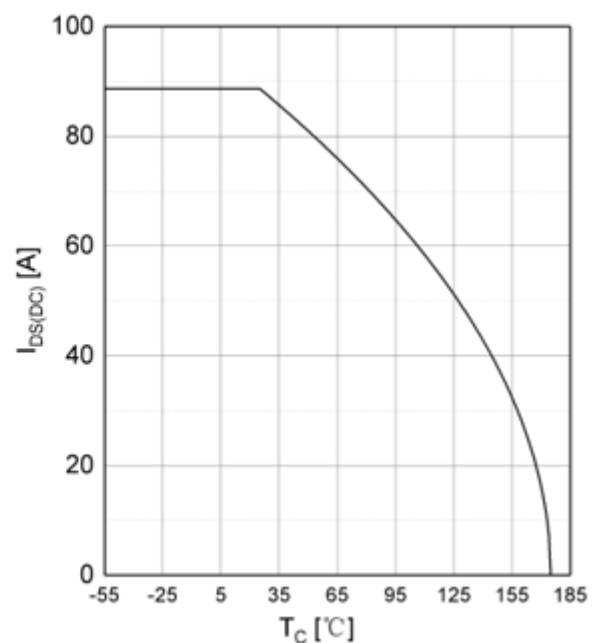
Capacitances

$$\text{Capacitances}=f(V_{DS}), T_J=25^{\circ}\text{C}, V_{AC}=25\text{mV}, f=100\text{KHz}, (0-1000\text{V})$$



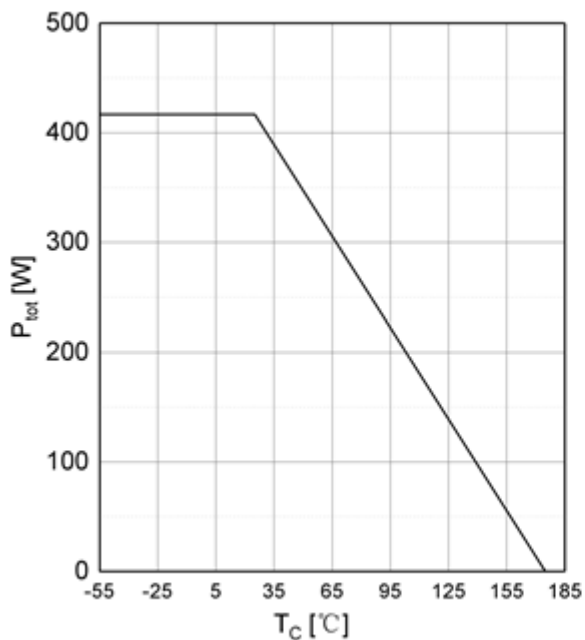
Continuous Drain Current Derating

$$I_{DS(DC)}=f(T_c), T_J \leq 175^{\circ}\text{C}$$



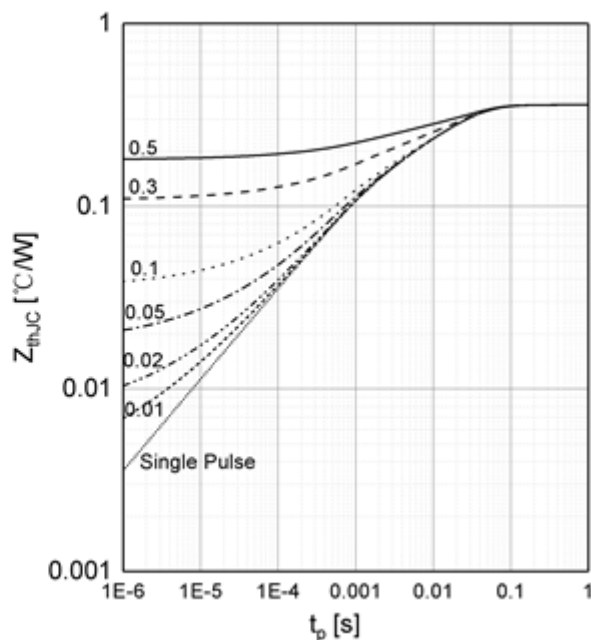
Maximum Power Dissipation Derating

$$P_{\text{tot}}=f(T_c), T_J \leq 175^\circ\text{C}$$



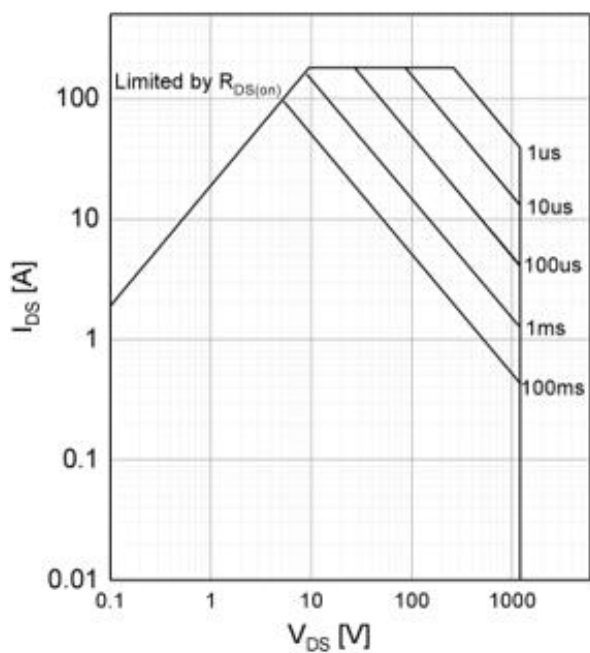
Transient Thermal Impedance(Junction-Case)

$$Z_{\text{thJC}}=f(t_p)$$



Safe Operating Area

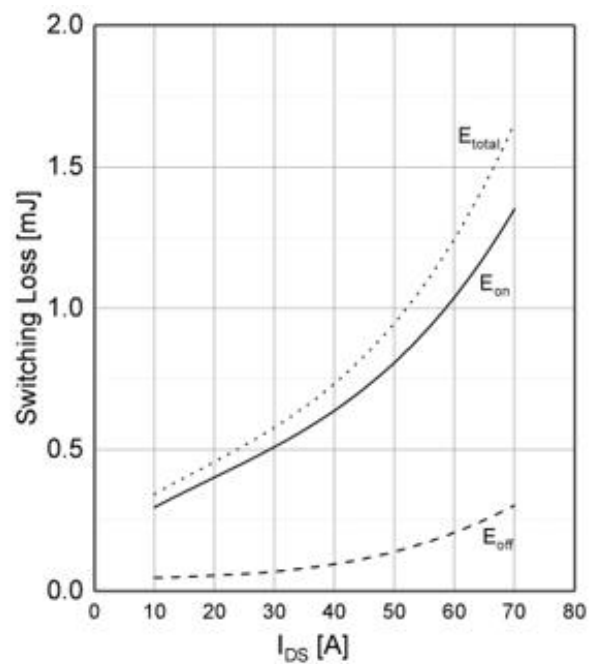
$$I_{\text{DS}}=f(V_{\text{DS}}), T_c=25^\circ\text{C}, D=0, \text{Parameter: } t_p$$



Switching Energy

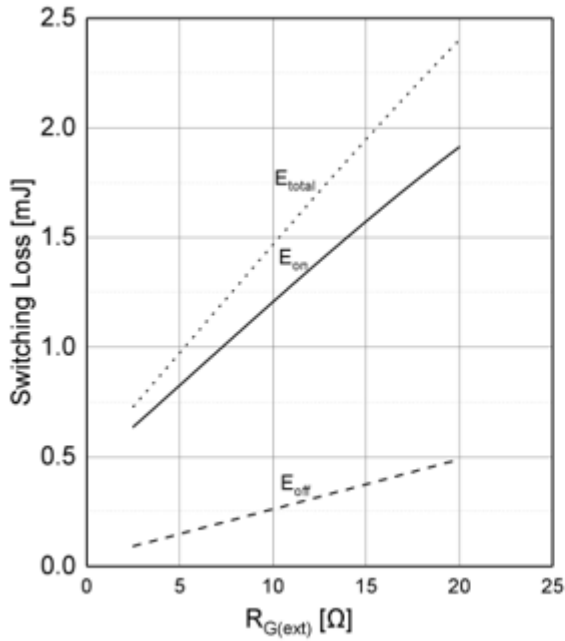
$$\text{Switching Loss}=f(I_{\text{DS}}), T_J=25^\circ\text{C}, V_{\text{DD}}=800\text{V},$$

$$R_{\text{G(ext)}}=2.5\Omega, V_{\text{GS}}=-5\text{V}/+18\text{V}, L=150\mu\text{H}$$



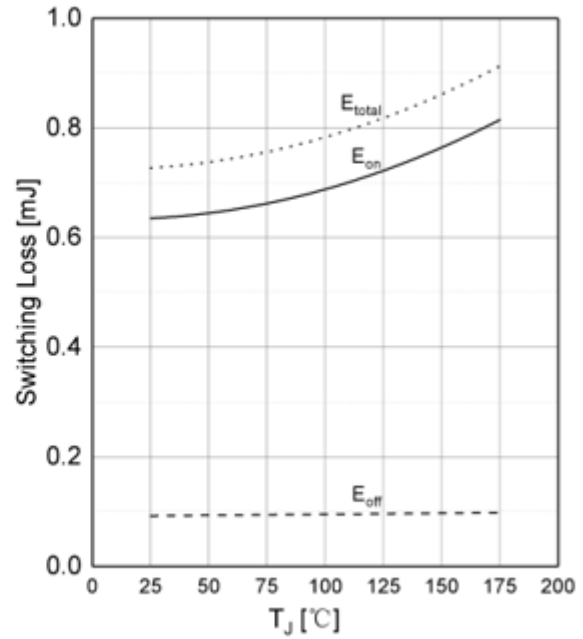
Switching Energy

Switching Loss=f($R_{G(ext)}$), $T_J=25^\circ\text{C}$, $V_{DD}=800\text{V}$,
 $I_{DS}=40\text{A}$, $V_{GS}=-5\text{V}/+18\text{V}$, $L=150\mu\text{H}$



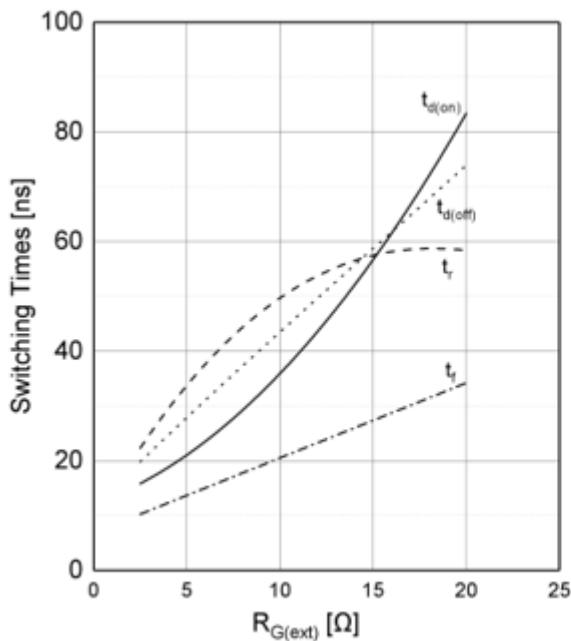
Switching Energy

Switching Loss=f(T_J), $V_{DD}=800\text{V}$, $I_{DS}=40\text{A}$,
 $R_{G(ext)}=2.5\Omega$, $V_{GS}=-5\text{V}/+18\text{V}$, $L=150\mu\text{H}$



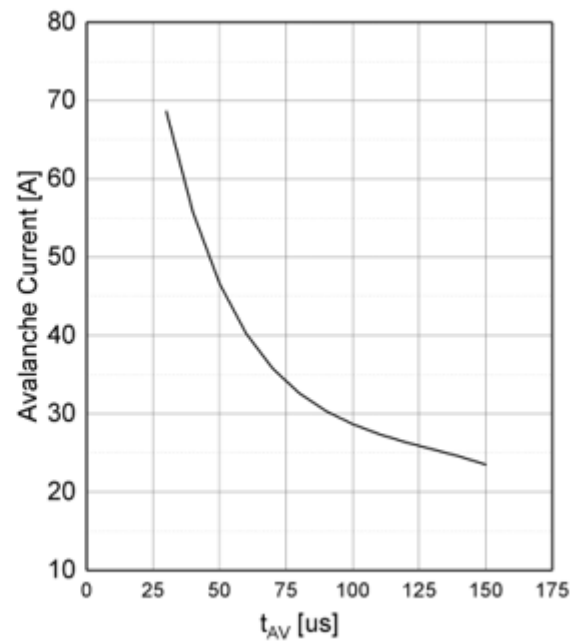
Switching Times

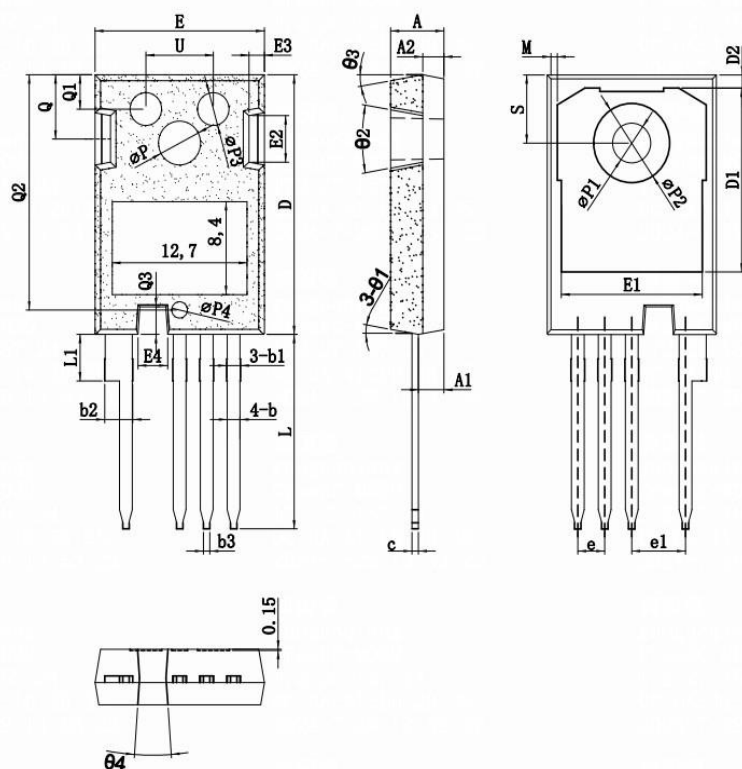
Switching Times=f($R_{G(ext)}$), $T_J=25^\circ\text{C}$
 $V_{DD}=800\text{V}$, $I_{DS}=40\text{A}$, $V_{GS}=-5\text{V}/+18\text{V}$, $L=150\mu\text{H}$



Single Avalanche Safe Operating Area

Avalanche Current=f(t_{AV}), $T_J=25^\circ\text{C}$, $V_{DD}=50\text{V}$





Package Outline

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°

Common Dimensions