S C b (S C) MOSFET – E S C, 23 m , 650 V, M3S, TOLL

NTBL023N065M3S

Features

- −Source Voltage

		V_{GS}	−8/+22	V
Continuous Drain Current	T_C = 25°C	I_D	77	A
Power Dissipation		P_D	312	W
Continuous Drain Current	T_C = 100°C	I_D	54	A
Power Dissipation		P_D	156	W

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case (Note 3)	$R_{\theta JC}$	0.48	°C/W
Thermal Resistance, Junction−to−Ambient (Note 3)	$R_{\theta JA}$	43	°C/W

3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value	Unit
Operation Values of Gate−to−Source Voltage	V_{GSop}	−5...−3/+18	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA	650			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 1 mA, Referenced to 25°C		89		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650 V, T_J = 25°C			10	μA
		V_{DS} = 650 V, T_J = 175°C (Note 5)			500	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = −8/+22 V, V_{DS} = 0 V			±1	μA
ON CHARACTERISTICS						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 18 V, I_D = 20 A, T_J = 25°C		23	32.6	mΩ
		V_{GS} = 18 V, I_D = 20 A, T_J = 175°C		34		
		V_{GS} = 15 V, I_D = 20 A, T_J = 25°C		29		
		V_{GS} = 15 V, I_D = 20 A, T_J = 175°C		37		
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 10 mA	2		4	V
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 20 A		14		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 400 V (Note 5)		1950		pF
Output Capacitance	C_{OSS}			152		
Reverse Transfer Capacitance	C_{RSS}			13		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −3/18 V, V_{DD} = 400 V, I_D = 20 A (Note 5)		69		nC
Gate−to−Source Charge	Q_{GS}			19		
Gate−to−Drain Charge	Q_{GD}			18		
Gate−Resistance	R_G	f = 1 MHz		4.0		Ω
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −3/18 V, V_{DD} = 400 V, I_D = 20 A, R_G = 4.7 Ω, T_J = 25°C, (Notes 4, 5)		11		ns
Turn−Off Delay Time	$t_{d(OFF)}$			35		
Rise Time	t_r			15		
Fall Time	t_f			9.6		
Turn−On Switching Loss	E_{ON}			51		μJ
Turn−Off Switching Loss	E_{OFF}			29		
Total Switching Loss	E					

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −3/18 V, V_{DS} = 400 V, I_D = 20 A, R_G = 4.7 Ω, T_J = 175°C, (Notes 4, 5)		9.6		ns
Turn−Off Delay Time	$t_{d(OFF)}$			41		
Rise Time	t_r			14		
Fall Time	t_f			12		
Turn−On Switching Loss	E_{ON}			51		μJ
Turn−Off Switching Loss	E_{OFF}			45		
Total Switching Loss	E_{TOT}			96		
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = −3 V, I_{SD} = 20 A, T_J = 25°C		4.5	6.0	V
		V_{GS} = −3 V, I_{SD} = 20 A, T_J = 175°C		4.2		
Reverse Recovery Time	t_{RR}	V_{GS} = −3 V, I_S = 20 A, dI/dt = 1000 A/μs, V_{DS} = 400 V (Note 5)		19		ns
Charge Time	t_a			11		
Discharge Time	t_b			8		
Reverse Recovery Charge	Q_{RR}			97		nC
Reverse Recovery Energy	E_{REC}			8.7		μJ
Peak Reverse Recovery Current	I_{RRM}			11		A

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. E_{ON}/E_{OFF} result is with body diode.
5. Defined by design, not subject to production test.

TYPICAL CHARACTERISTICS

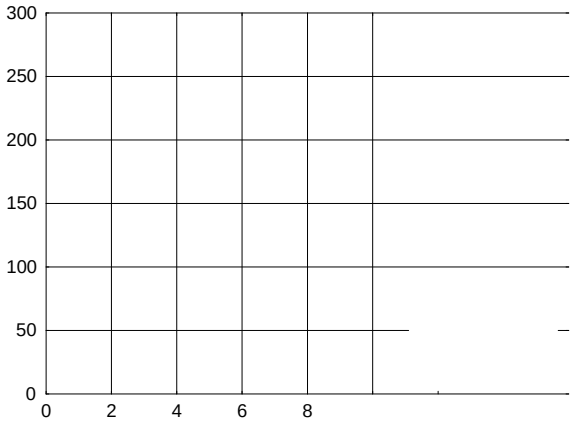


Figure 1. On−Region Characteristics

Figure 2. Output Characteristics

Figure 3. Transfer Characteristics

Figure 4. On−Resistance vs. Gate Voltage

Figure 5. On−Resistance vs. Drain Current

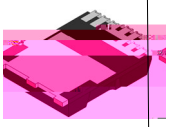
Figure 6. On−Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS

TYPICAL CHARACTERISTICS

Figure 19. Switching Loss vs. Gate Resistance

Figure 20. Thermal Response Characteristics



H−PSOF8L 9.90x10.38x2.30, 1.20P
CASE 100DC
ISSUE D

DATE 30 JUL 2024

D4 (2x)

LAND PATTERN
RECOMMENDATION

H/2

GENERIC
MARKING DIAGRAM*

XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.