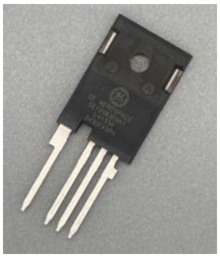
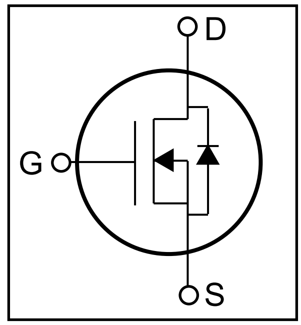
GE Aerospace

GE Aerospace **GE1208309A1**

1200V SiC MOSFET





V_{DSS} = 1200 V

$R_{DS(ON)}$ = 27 mΩ

$T_{J,max}$ = 200°C

MOSFET Static Characteristics @ T_J=25°C (unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_D	Continuous drain current	V_{GS}=20 V, T_C=25°C, T_J=200°C			83	A
		V_{GS}=20 V, T_C=100°C, T_J=200°C			63	
		V_{GS}=20 V, T_C=125°C, T_J=200°C			55	
$I_{D,pulse}$	Pulsed drain current [1)]	T_C=25°C, T_J=200°C			125	A
P_{tot}	Power dissipation	T_C=25°C			366	W
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS}=0 V, I_{DS}=13 µA	1200			V
I_{DSS}	Drain leakage current	V_{DS}=1200 V, V_{GS}=0 V, T_J=25°C			13	µA
		V_{DS}=1200 V, V_{GS}=0 V, T_J=200°C			133	
I_{GSS}	Gate-source leakage current	V_{GS}= -15/+23 V			100	nA
V_{GS}	Recommended gate-source voltage			20		V
$V_{GS,max}$	Maximum gate-source voltage	V_{DS}=0 V			-15/+23	
V_{TH}	Gate-source threshold voltage	V_{GS}=V_{DS}, I_{DS}=13 mA, T_J=25°C	2.0	2.8	4.0	
$R_{DS(ON)}$	Drain-source on-resistance	V_{GS}=20V, I_{DS}=20A, T_J=25°C		25.0	33.0	mΩ
		V_{GS}=20V, I_{DS}=55A, T_J=25°C		26.6	35.1	
		V_{GS}=20V, I_{DS}=55A, T_J=200°C		54.6	72.0	
$R_{GATE,ESR}$	Gate-source series resistance	V_{GS}=20 V_{DC}, 25mV_{AC}, 100kHz, D-S shorted		0.20		Ω
E_{AS}	Single pulse avalanche energy	I_D=22.4 A, L=10 mH		2.6		J
R_{thJC}	Thermal resistance, junction-case	Assumes TO247-4L packaged die		0.28	0.35	°C/W
T_J,T_{stg}	Bare chip/discrete max junction operating and storage temperature		-55		200	°C

MOSFET Dynamic Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
C_{ISS}	Input capacitance	V_{GS}=0 V, V_{DS}=500 V, f=100 kHz		3124		pF
C_{OSS}	Output capacitance			146		
C_{RSS}	Reverse transfer capacitance			9		
$t_{d(on)}$	Turn-on delay time	V_{DS}=600V, V_{GS}=0/20V, I_D=55A, $R_{G,ext}$=8.2Ω		14		ns
t_r	Rise time			16		
$t_{d(off)}$	Turn-off delay time			34		
t_f	Fall time			18		
E_{ON}	Turn-on energy	V_{DS}=600 V, V_{GS}=-5/+20 V, I_D=55A, $R_{G,ext}$=8.2 Ω, L_σ =50 nH, L_{LOAD}=1.6 mH		800		µJ
E_{OFF}	Turn-off energy			240		
E_{TOT}	Total switching energy			1040		
Q_G	Total gate charge [2)]	V_{GS}=-5 to 18 V, I_{DS}=60 A, V_{DS}=900 V		127		nC
Q_{GS}	Gate-source charge [2)]			50		
Q_{GD}	Gate-drain charge [2)]			36		

Diode Characteristics [3)]

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_{SD}	Pulsed body diode current	V_{GS}=0 V			125	A
V_{SD}	Diode forward voltage	V_{GS}=0 V, I_{SD}=55 A		4.0		V
t_{rr}	Reverse Recovery Time	I_{SD} = 55 A, V_R = 600 V, $R_{G(ext)}$=8.2 Ω		24		ns
Q_{rr}	Reverse Recovery Charge	I_{SD} = 55 A, V_R = 600 V, $R_{G(ext)}$=8.2 Ω, L_σ =50 nH, L_{LOAD}=1.6 mH, di/dt = 2600 A/µs		350		nC
I_{rrm}	Peak Reverse Current	I_{SD} = 55 A, V_R = 600 V, $R_{G(ext)}$=8.2 Ω, L_σ =50 nH, L_{LOAD}=1.6 mH, di/dt = 2600 A/µs		30		A

1) Pulse width limited by $T_{J,max}$.

2) Qgs and Qgd values were calculated using the two-curve extraction method shown in Fig. 12.

3) We recommend the use of body diode in synchronous rectification mode with repetitive conduction during switch commutation dead-time ≤ 1µs. Our long term (up to 13,000 hours) continuous switching test results show excellent reliability and forward voltage stability, indicating it is safe to use the body diode in this mode.

Figure 1. Output characteristics

$I_D=f(V_{DS},V_{GS})$; $T_j=25°C$

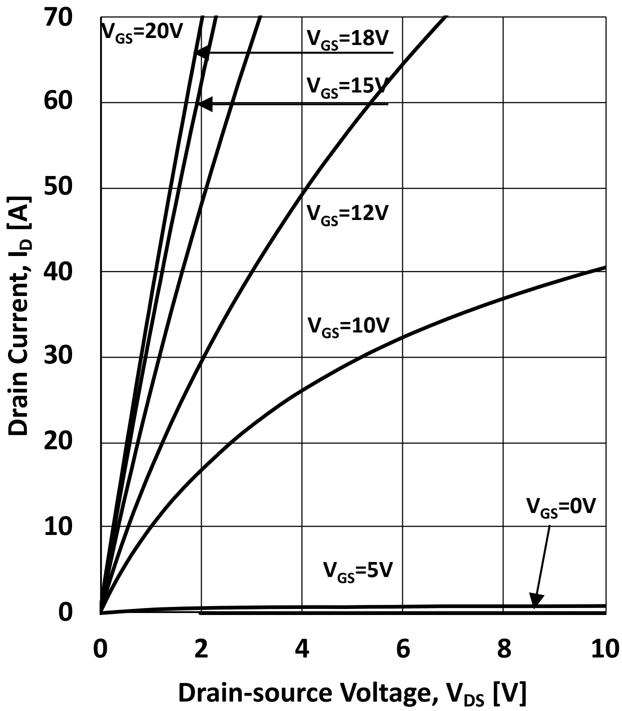


Figure 2. Output characteristics

$I_D=f(V_{DS},V_{GS})$; $T_j=200°C$

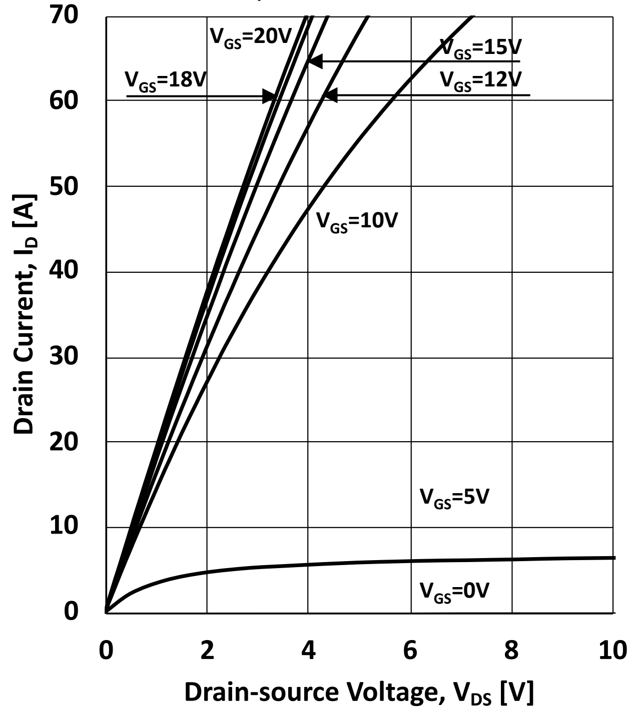


Figure 3. Threshold voltage

$V_t=f(T_j)$; $V_{DS}=V_{GS}$; $I_D=13$ mA

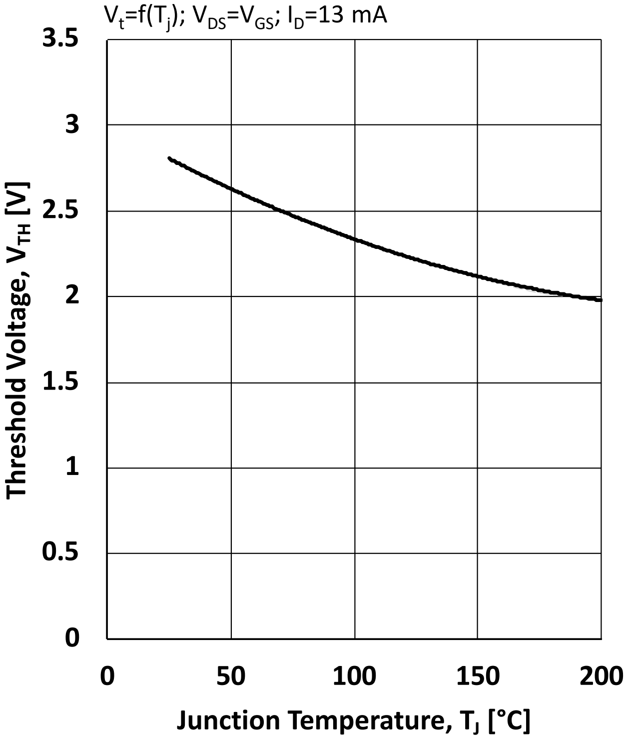


Figure 4. Drain-source on-state resistance

$R_{DS(on)}=f(T_j)$; $I_D=55$ A

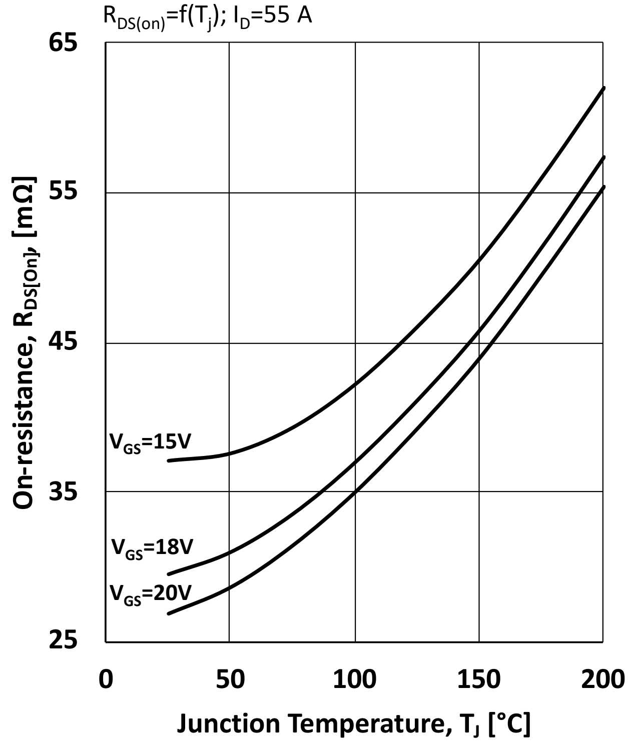


Figure 5. Drain-source on-state resistance

$R_{DS(on)}=f(I_D)$; $T_j=25°C$

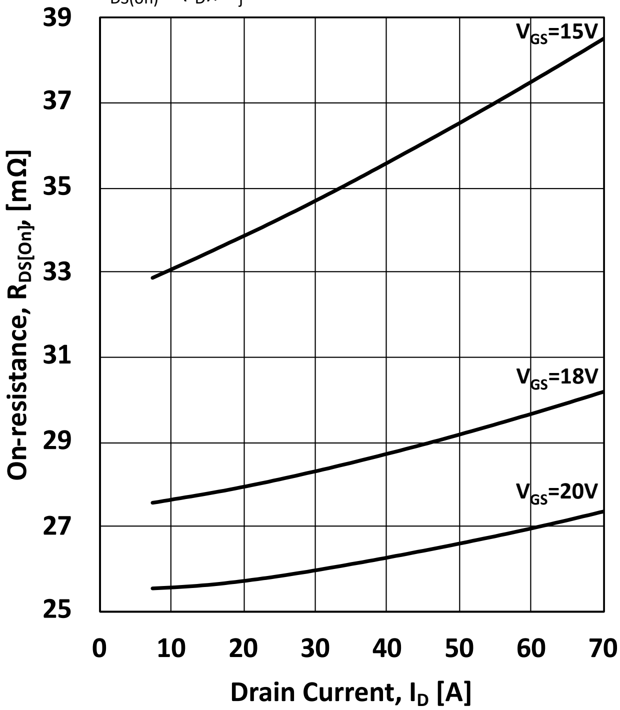


Figure 6. Drain-source on-state resistance

$R_{DS(on)}=f(T_j)$; $V_{GS}=20$ V

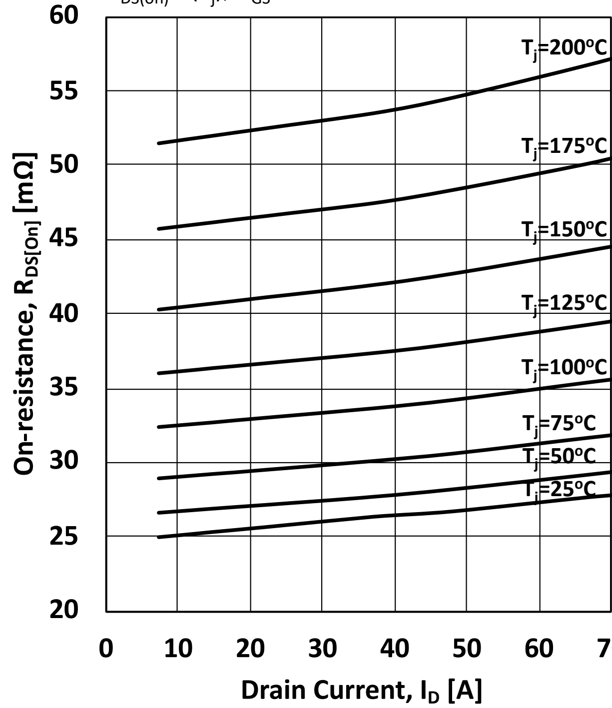


Figure 7. Third quadrant characteristics

$I_D=f(V_{DS},V_{GS})$; $T_j=25°C$

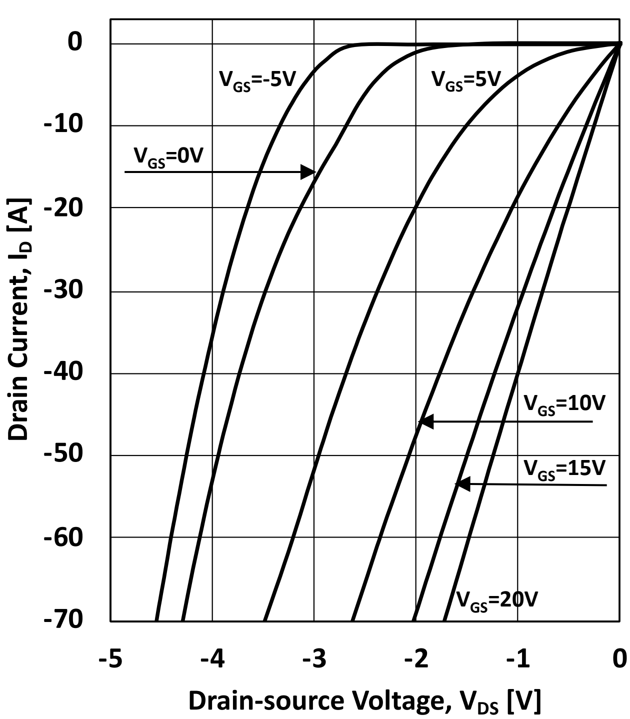


Figure 8. Third quadrant characteristics

$I_D=f(V_{DS},V_{GS})$; $T_j=200°C$

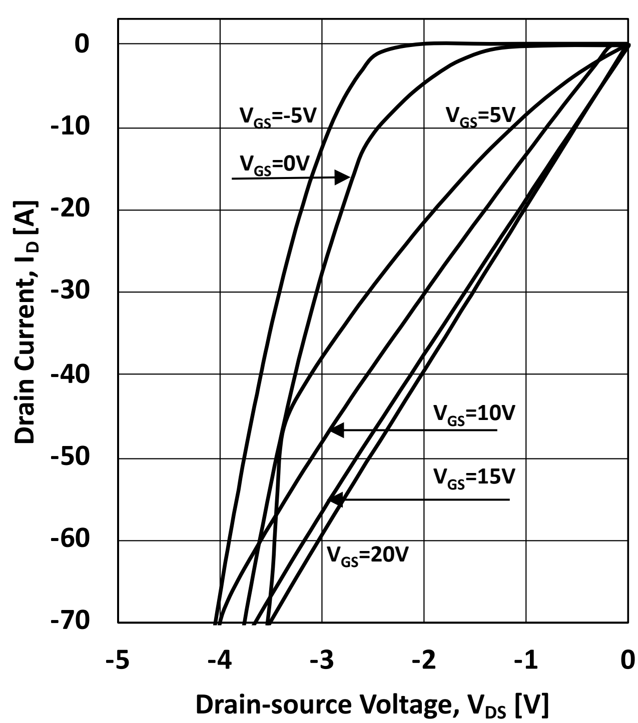


Figure 9. Capacitances
$C=f(V_{DS})$; f=100 kHz

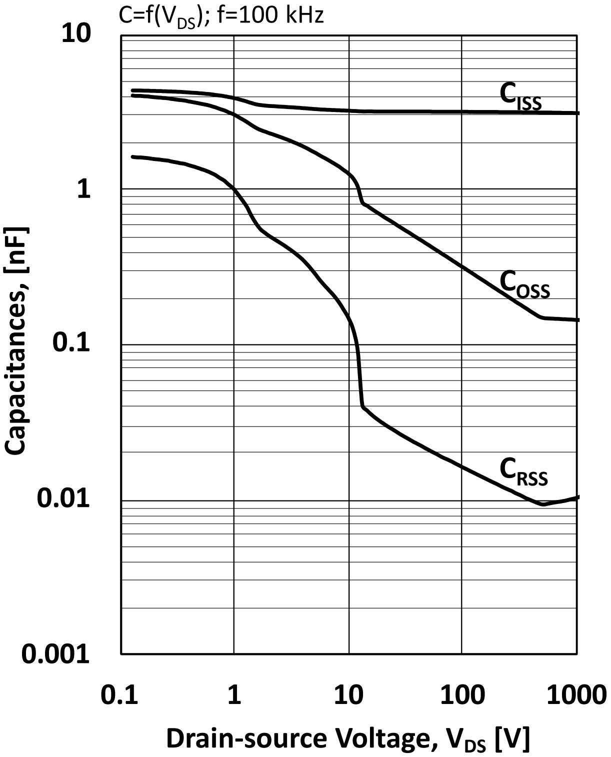


Figure 10. Inductive switching energies (see Fig. 17)
$E_{ON}=f(I_D)$; $E_{OFF}=f(I_D)$; $E_{TOT\_SW}=f(I_D)$

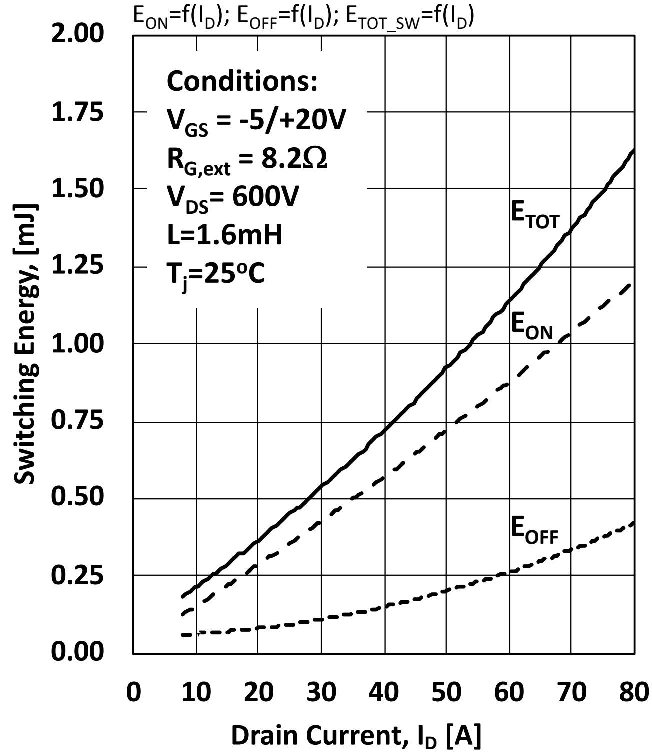


Figure 11. Typical unclamped inductive switching waveforms $I_D=f(t)$; $V_{DS}=f(t)$

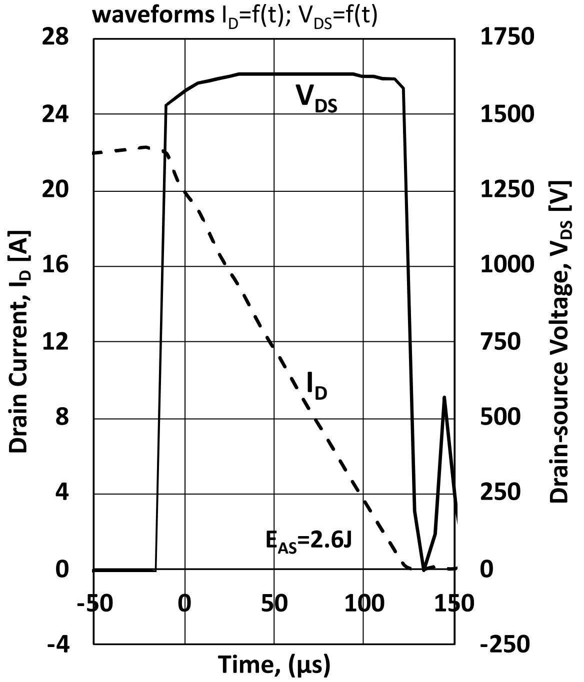


Figure 12. Gate charge
V_{GS}= (-5 … +18V); V_{DS}=900V; I_{DS}=30A; T_j=25°C

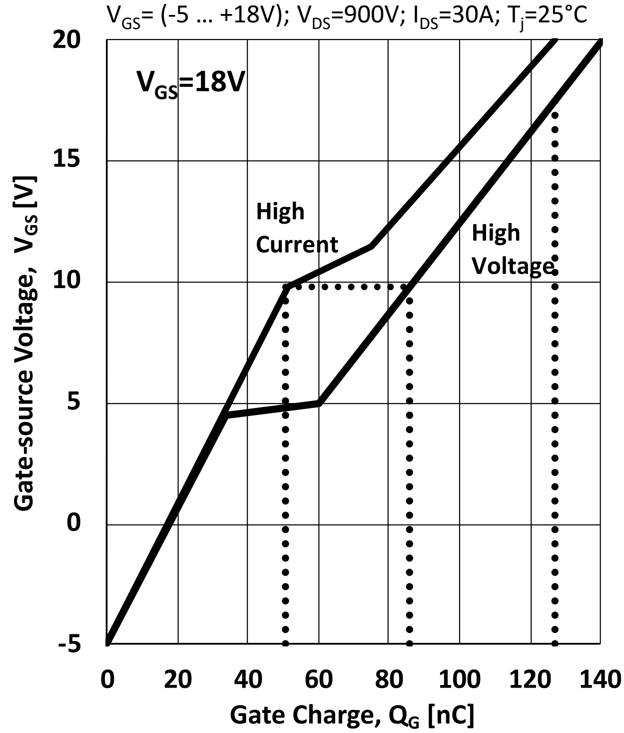


Figure 13. Transfer characteristic
I_D=f(V_{GS}); V_{DS}=10 V; T_j=25°C

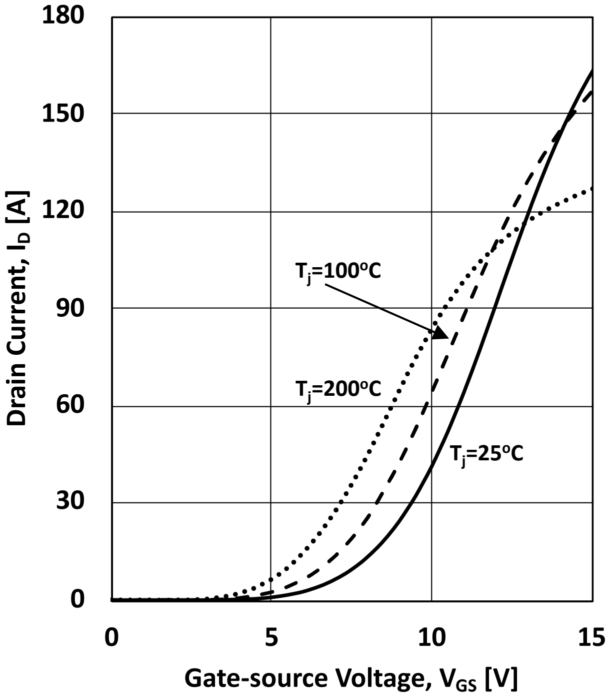


Figure 14. Power dissipation
P_{tot}=f(T_C)

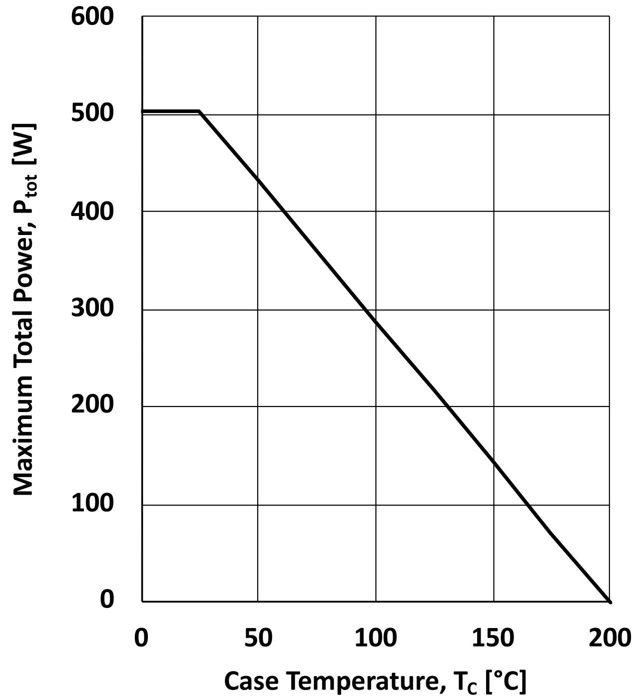


Figure 15. Transient thermal impedance
$Z_{th,JC}$=f(t_p, D); D= t_p/(period)

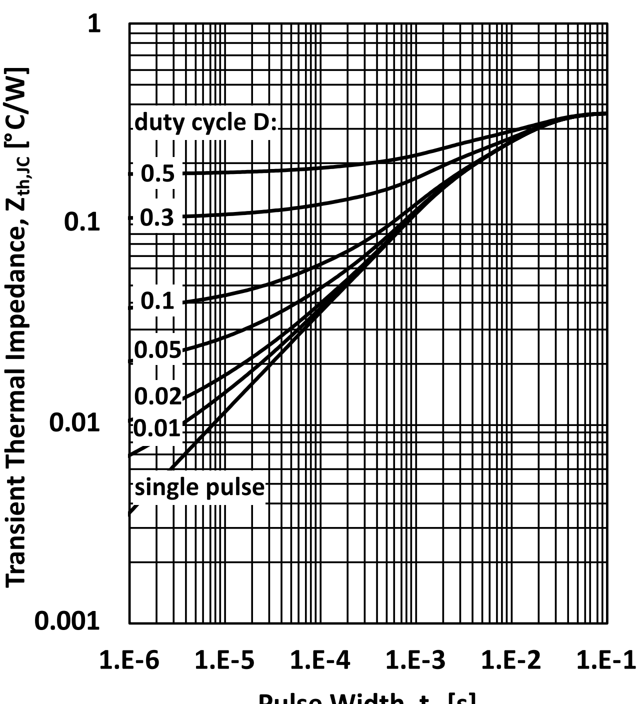


Figure 16. Safe operating area
I_D=f(V_{DS}, t_p); T_C=25°C; D=0 (single pulse)

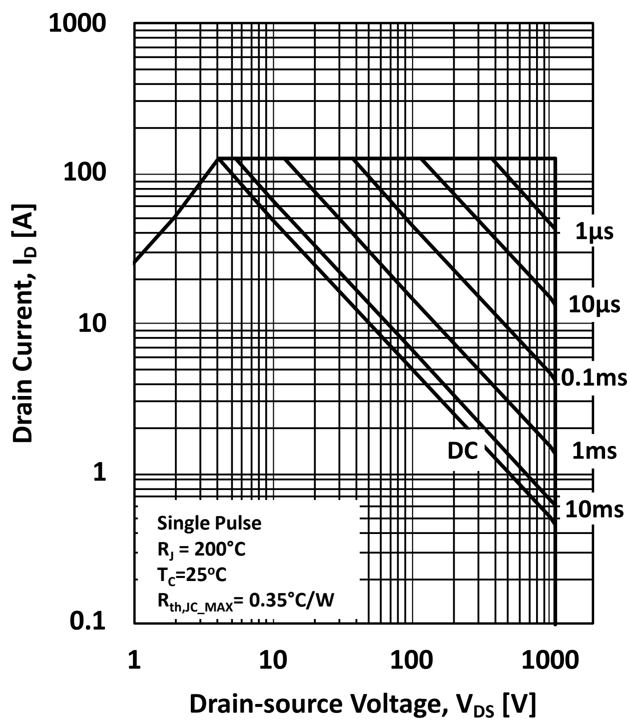


Figure 17. Clamped inductive switching test circuit

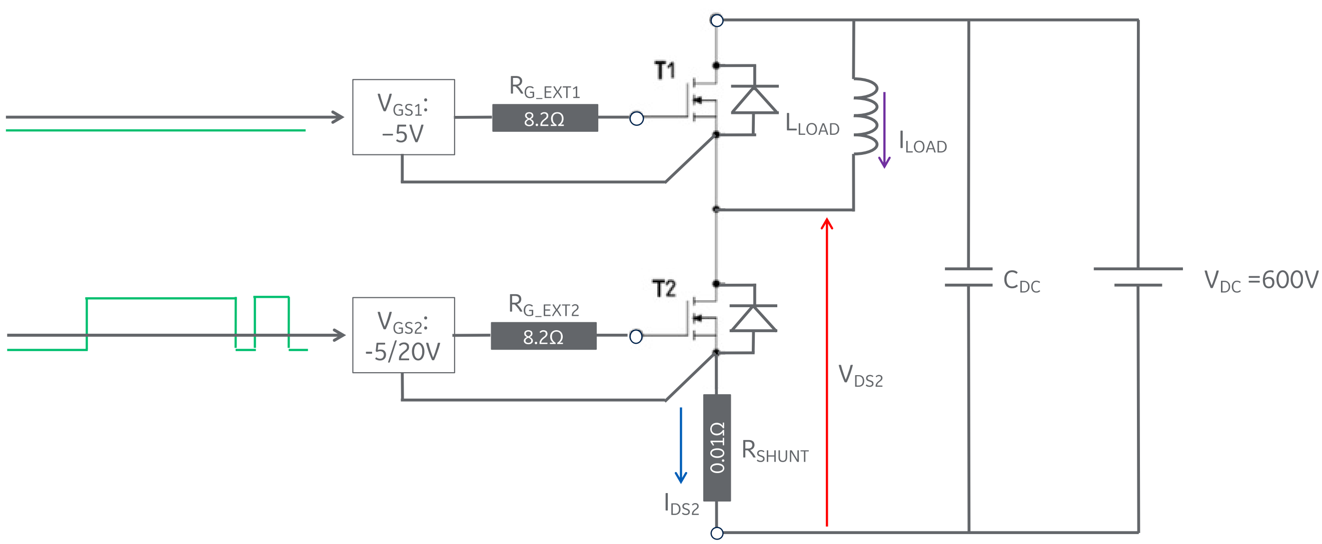


Figure 18. Switching waveforms for transition times

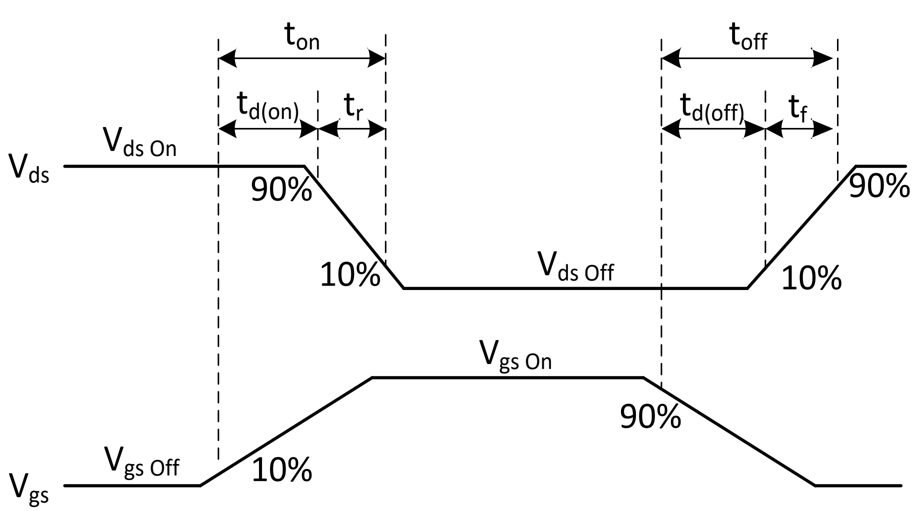
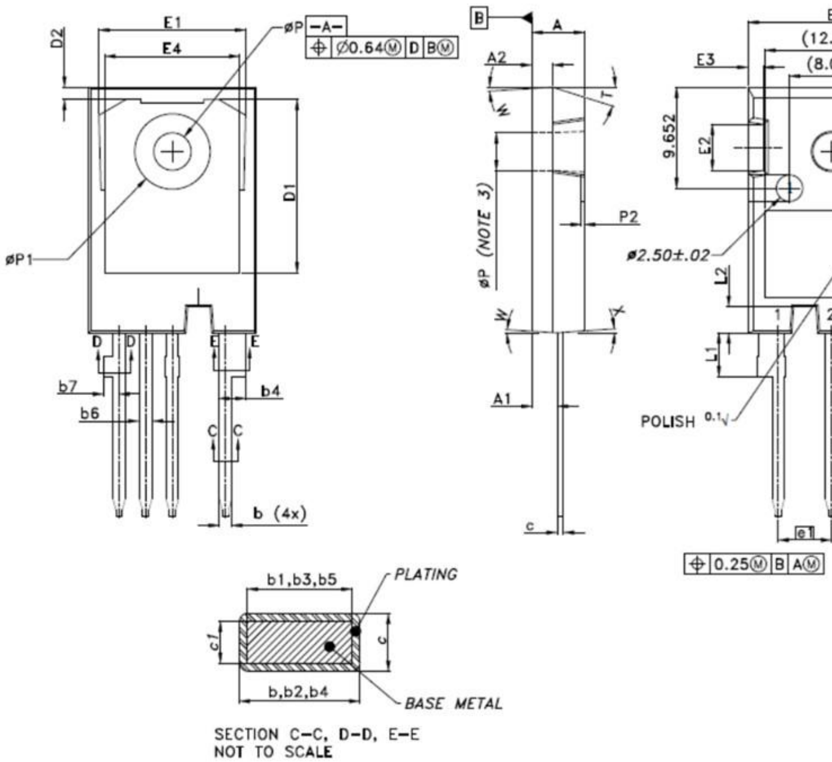


Figure 19. Part Dimensions (mm)



AREA	MIN	NOM	MAX
A	4.83	5.02	5.21
A1	2.29	2.415	2.54
A2	1.86	1.99	2.12
D	23.30	23.45	23.60
D1	15.85	16.55	17.25
D2	1.02	1.17	1.32
E	15.75	15.94	16.13
E1	13.89	14.02	14.15
E2	3.68	4.39	5.10
E3	1.00	1.45	1.90
E4	12.38	12.91	13.43
e		2.540 BSC	
e1		5.080 BSC	
L	17.31	17.57	17.82
L1	3.97	4.17	4.37
L2	2.35	2.50	2.65
b	1.07	–	1.33
b1	1.07	1.20	1.28
b2	2.39	–	2.64
b3	2.39	–	2.69
b4	2.39	–	2.94
b5	2.39	2.53	2.84
b6	1.07	–	1.60
b7	1.30	–	1.70
c	0.55	–	0.68
c1	0.55	0.60	0.65
øP	3.51	3.58	3.65
Q	5.49	5.75	6.00
S	6.04	*6.15*	6.30
øP1		7.18 REF	
T		17.5° REF	
W		3.5° REF	
X		4° REF	
P2	0.05	0.175	0.30

NOTES:

1. DIMENSIONS ARE IN MILLIMETERS
2. DIMENSION D & E DO NOT INLCUDE MOLD FLASH, MOLD FLASH SHALL NOT EXCEED 0.127 MM PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
3. øP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF *3.65mm.*
4. ADDED DIMENSION P2 TO SPECIFY EJECTION MARK DEPTH

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INFORMATION

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