

N-Channel Silicon Carbide Power MOSFET

1200 V, 30A, 80 mΩ

Features

- High switching speed with a low gate charge
- Fast intrinsic diode with low reverse recovery
- Robust Avalanche Capability
- 100% Avalanche Tested
- Pb-free, Halogen Free, and RoHS Compliant

Benefits

- System efficiency improvement
- Higher frequency applicability
- Increased power density
- Reduced cooling effort

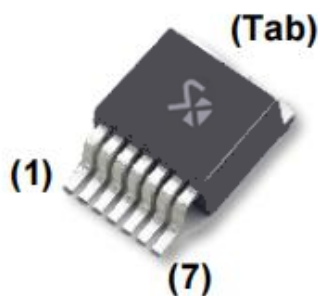
Applications

- Solar inverter
- EV charging station
- UPS
- Industrial power supply

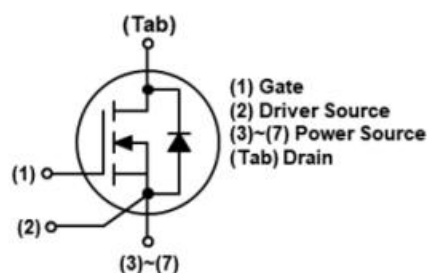
Absolute Maximum Ratings

$T_A=25^{\circ}\text{C}$, unless otherwise noted.

Parameter		Symbol	Value	Unit
Drain-source Voltage		V_{DS}	1200	V
Gate-source Voltage(DC)		V_{GS}	-10/+22	V
Recommended Operation Value		V_{GSop}	-5/+18	V
Drain Current-Continuous	$T_C=25^{\circ}\text{C}$	I_D	30	A
	$T_C=100^{\circ}\text{C}$		21	A
Drain Current	Pulsed(Note 1)	I_{DM}	80	A
Power Dissipation	$T_C=25^{\circ}\text{C}$	P_D	150	W
	Derate Above 25°C		1.0	W/ $^{\circ}\text{C}$
Operating Temperature		T_J	-55~175	$^{\circ}\text{C}$
Storage Temperature Range		T_{STG}	-55~175	$^{\circ}\text{C}$
Maximum Lead Temperature for Soldering, "1/8" from Case for 10 Seconds		T_L	260	$^{\circ}\text{C}$



TO-263-7L





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Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case, Max.	$R_{\theta JC}$	1.0	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient, Max.	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
SKSC120N080G1-ST7	120N080	TO-263-7L	Tube& Reel	500 units

Electrical Characteristics

$T_A=25^{\circ}\text{C}$, unless otherwise noted.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-source Breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =1mA	1200			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V		1	100	μA
		V _{DS} =1200V,V _{GS} =0V,T _J =175°C		5		μA
Gate-source leakage current	I _{GSS}	V _{GS} =+22V, V _{DS} =0V			+100	nA
		V _{GS} =-10V, V _{DS} =0V			-100	nA
On Characteristics						
Gate Threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =5.0mA (tested after V _{GS} = 22V, 1 ms pulse)	2.0	3.0	4.5	V
Static Drain to Source on resistance	R _{DS(on)}	V _{GS} = 18V, I _D = 15A		80	110	m Ω
		V _{GS} = 18V, I _D = 15A,T _J =175°C		128		
Transconductance	g _{fs}	V _{GS} = 20V, I _D = 15A		11.4		S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =800V,V _{GS} =0V, f=250kHz		800		pF
Output Capacitance	C _{Oss}			64		pF
Reverse Capacitance	C _{rss}			5		pF
Stored Energy in Output Capacitance	E _{Oss}	V _{DS} =0V to 800V,V _{GS} =0V		26		μJ
Energy Related Output Capacitance	C _{O(er)}			80		pF
Time Related Output Capacitance	C _{O(tr)}			142		pF
Total Gate Charge	Q _{g(tot)}	V _{DS} =800V,I _D =15A		50		nC
Gate to Source Charge	Q _{gs}	V _{GS} =-5V/18V		13		nC



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Gate to Drain “Miller” Charge	Q _{gd}	Inductive load		17		nC
Internal Gate Resistance	R _G	f=1MHz, V _{AC} =30mV		4.0		Ω
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	V _{DS} =800V,I _D =15A V _{GS} =-5V/18V,R _G =2Ω, FWD:PCH120S10D1 Inductive load		12		nS
Turn-On Rise Time	t _r			10		nS
Turn-Off Delay Time	t _{d(off)}			24		nS
Turn-Off Fall Time	t _f			9		nS
Turn-on Switching Energy	E _{on}			71		μJ
Turn-off Switching Energy	E _{off}			41		μJ
Total Switching Energy	E _{tot}			112		μJ
Source-Drain Diode Characteristics						
Continuous Diode Forward Current	I _S				30	A
Pulsed Diode Forward Current	I _{SM}				80	A
Diode Forward Voltage	V _{SD}	V _{GS} =-5V, I _{SD} =15A		4.1		V
Reverse Recovery Time	t _{rr}	V _{DD} =800V, I _{SD} =15A,		12		ns
Reverse Recovery Charge	Q _{rr}	dI _F /dt=3000A/μs,Includes Q _{OSS}		121		nC

Typical Characteristics

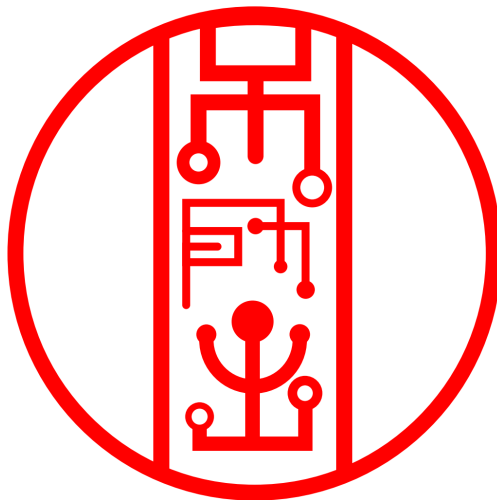


Figure 3. On-Region Characteristics $T_J = 175^\circ\text{C}$

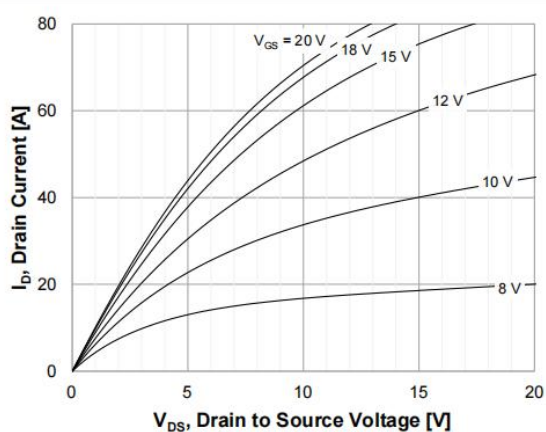


Figure 4. Normalized On-Resistance Characteristics vs. Temperature

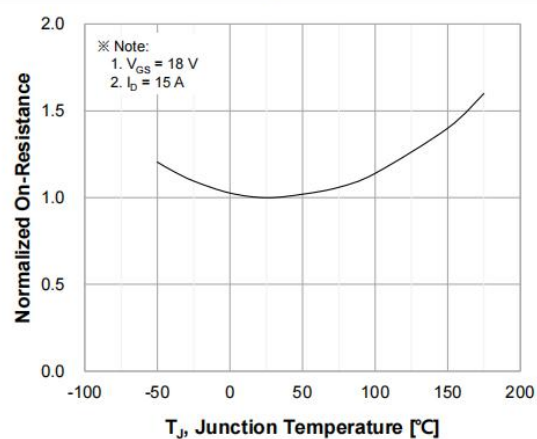


Figure 5. Transfer Characteristics

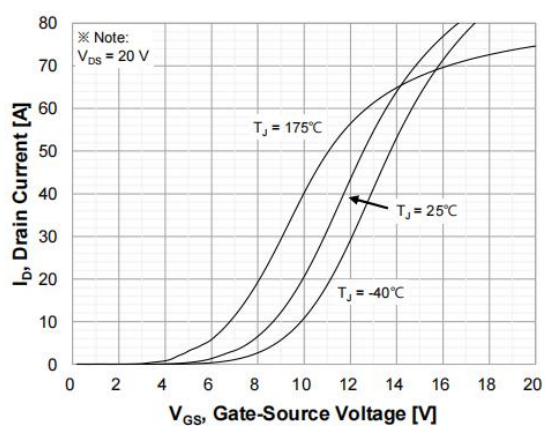
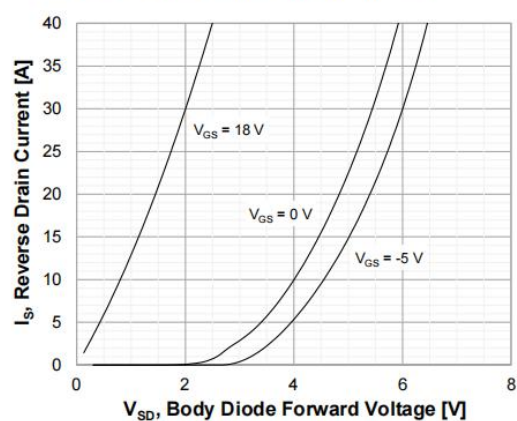


Figure 6. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = -40^\circ\text{C}$





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Figure 7. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 25^\circ\text{C}$

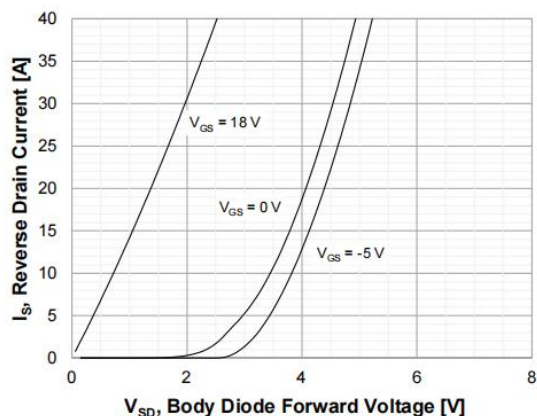


Figure 8. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 175^\circ\text{C}$

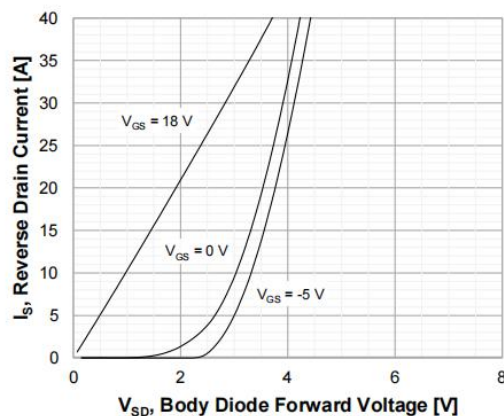


Figure 9. Threshold Voltage vs. Temperature

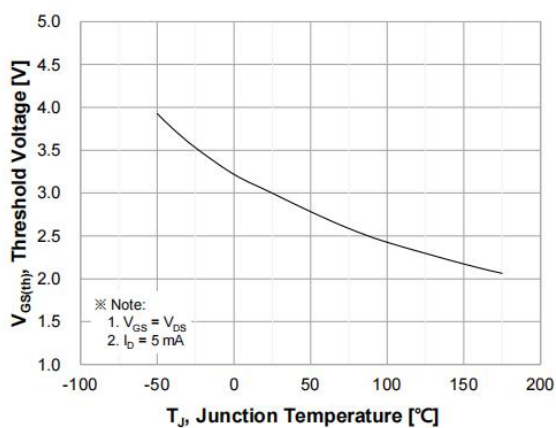


Figure 10. Gate Charge Characteristics

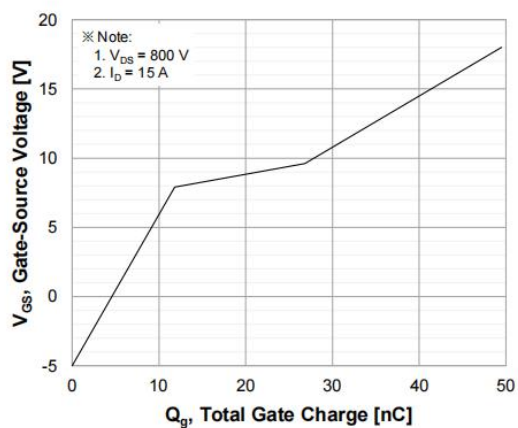


Figure 11. Stored Energy in Output Capacitance

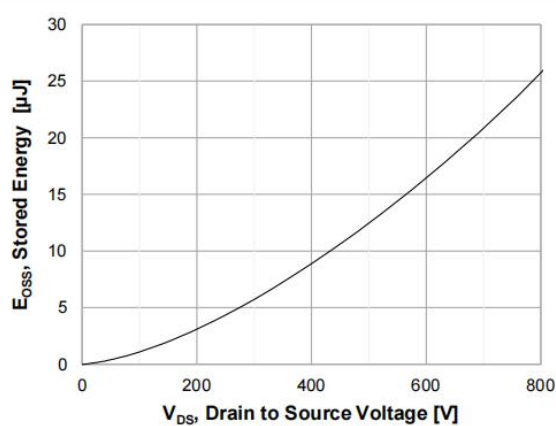
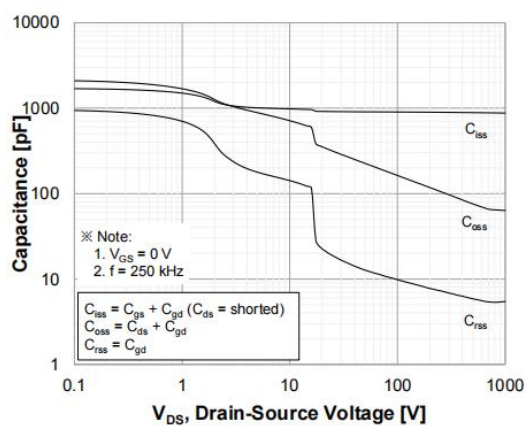


Figure 12. Capacitance Characteristics



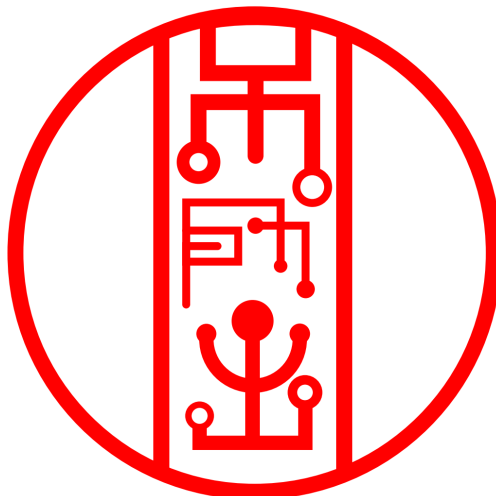


Figure 15. Typ. Switching Losses vs. Drain Current

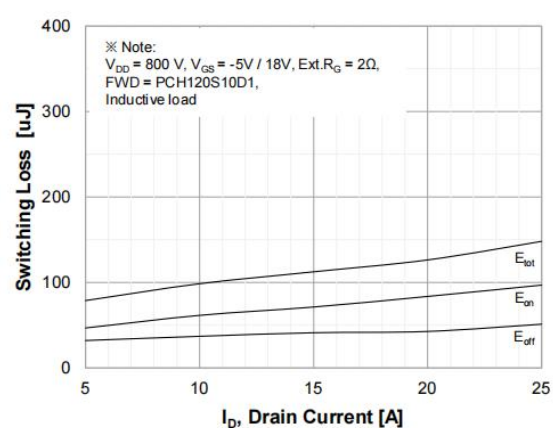


Figure 16. Typ. Switching Losses vs. Gate Resistance

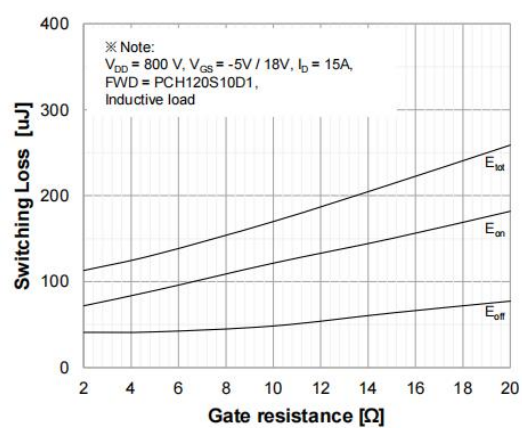


Figure 17. Typ. Switching Losses vs. Drain Current

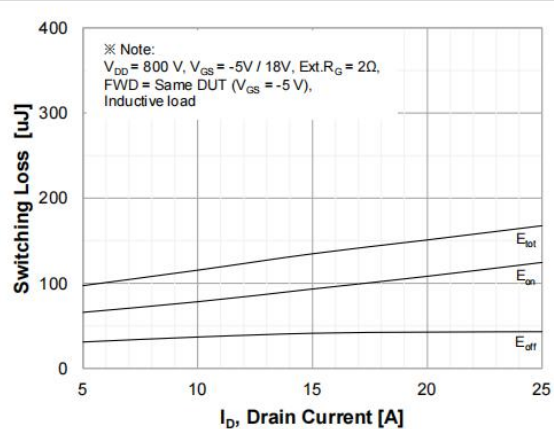
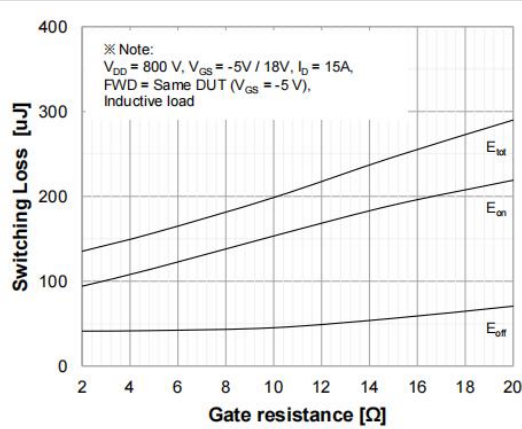


Figure 18. Typ. Switching Losses vs. Gate Resistance





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Figure 19. Maximum Safe Operating Area

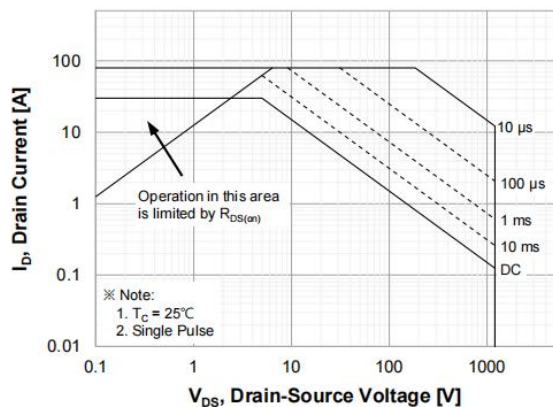


Figure 20. Transient Thermal Response Curve

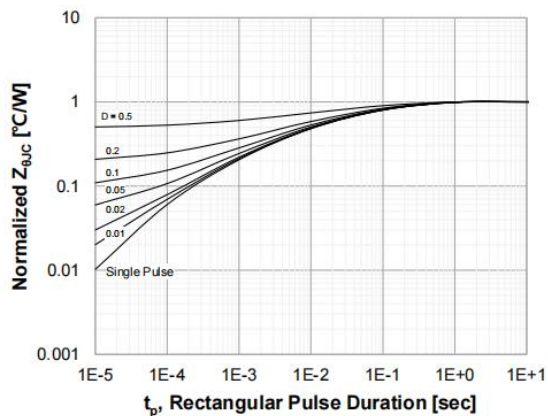


Figure 21. Inductive Load Switching Test Circuit and Waveforms

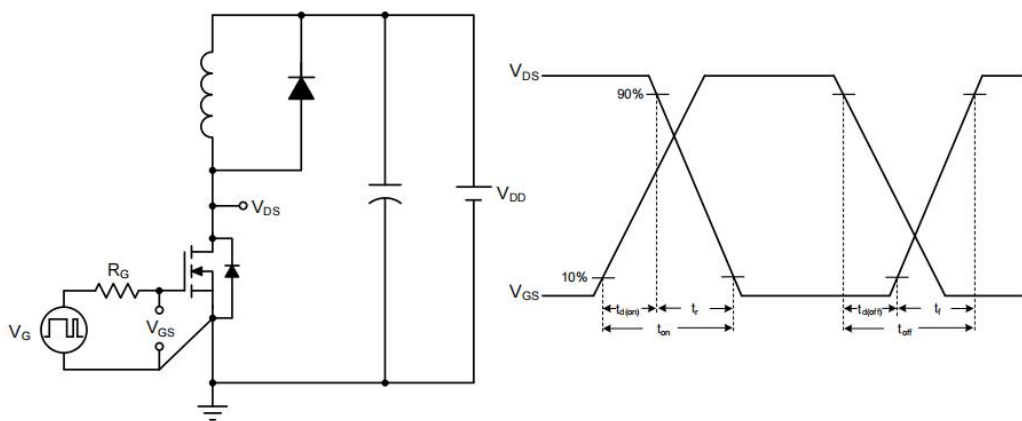
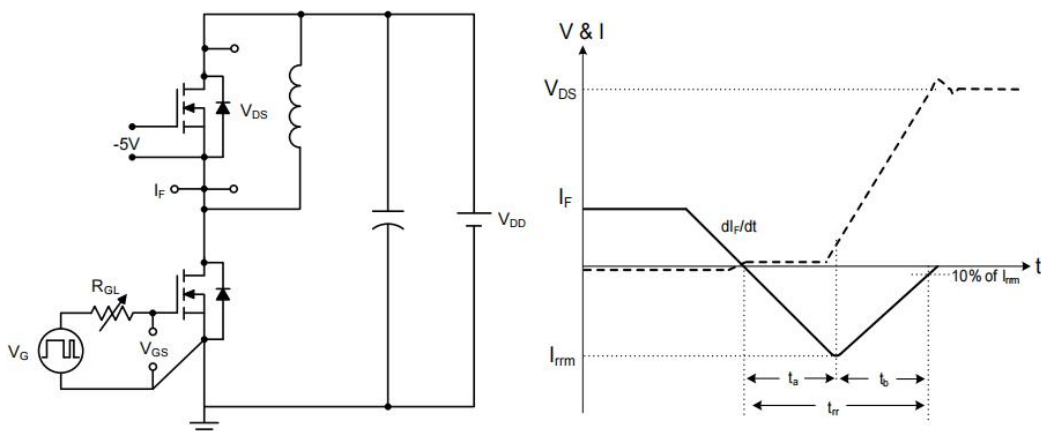


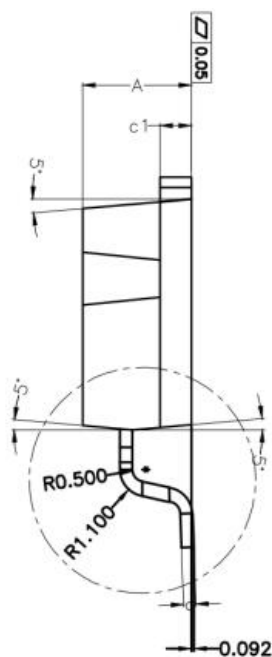
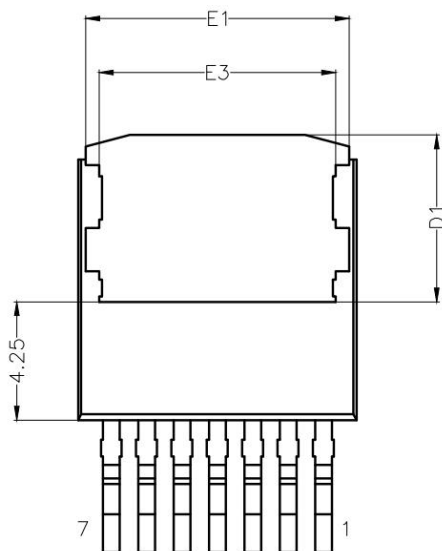
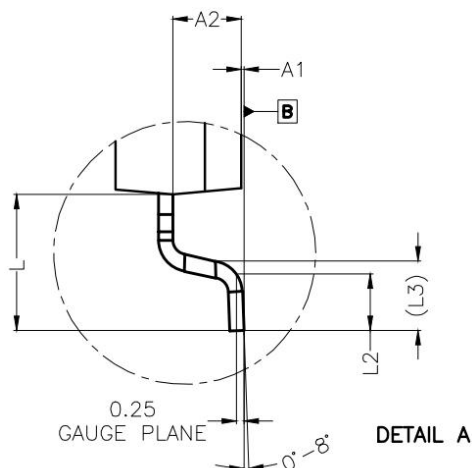
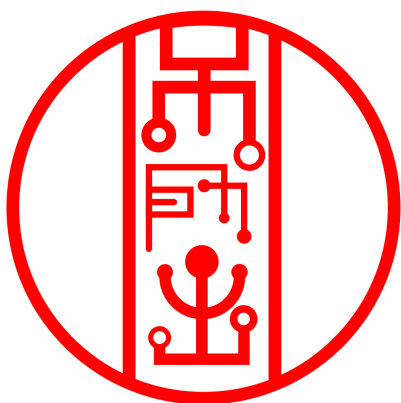
Figure 22. Peak Diode Recovery dv/dt Test Circuit and Waveforms



Package Information

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Dimensions in mm



SYMBOL	Common		
	DIMENSIONS MILLIMETER		
	MIN.	NOM.	MAX.
A	4.30	4.40	4.50
A1	0.00	0.10	0.20
A2	2.30	2.40	2.50
b	0.50	0.60	0.70
b1	0.00	0.08	0.15
c	0.40	0.50	0.60
c1	1.17	1.27	1.37
D	9.05	9.25	9.45
D1	5.90	6.00	6.10
E	9.80	10.00	10.20
E1	9.36	9.46	9.56
E2	0.00	0.15	0.30
E3	8.40	8.50	8.60
e	1.27		
H	15.00		
L	4.20	4.75	5.20
L1	0.70	1.00	1.30
L2	1.70	2.00	2.30
L3	2.70		
P	0.35	0.45	0.55
Q	4.02	4.12	4.22
R	2.03	2.13	2.23
S	1.40	1.50	1.60