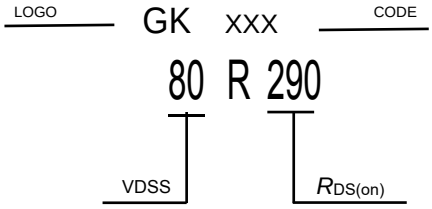
V_{DSS}	800 V
I_D	13 A
$R_{DS(ON)}$	290 mΩ

FEATURES

- High Speed Switching
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel
- Simple to Drive
- RoHS Compliant

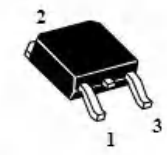
APPLICATION

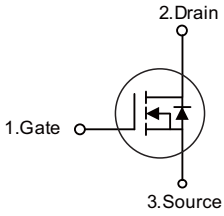
- Increased Power Density
- Faster Operating Frequency
- Reduction of Heat Sink Requirements
- Higher Efficiency
- Reduced EMI



APPLICATION

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters





ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit
V_{DS}	Drain-Source Voltage		800	V
I_D	Continuous Drain Current	V_{GS}=18V T_c=25°C T_c=100°C	13 9	A
I_{DM}	Peak Drain Current	Pulse width t_p limited by T_{jmax}	26	A
V_{GSmax}	Gate-Source Voltage, max. Transient Voltage	t_p≤0.5μs, D<0.001	-8/+22	V
V_{GSmax}	Gate-Source Voltage		-8/+22	V
V_{GSop}	Recommend Gate-Source Voltage		-4/+18	V
P_{tot}	Power Dissipation	T_c=25°C T_c=100°C	57 28	W
E_{AS}	Non-Repetitive Avalanche Switching Energy	V_{DD}=50V, L=1mH, I_D=12A	72	mJ
E_{AR}	Repetitive Avalanche Energy	V_{DD}=50V, L=500μH, I_D=14.5A	52.5	mJ
t_{SC}	Short-Circuit Withstand Time	V_{DD}=400V, V_{GS}=18V, $V_{DS,peak}$ < 800V	3.5	μs
T_j	Operating Junction Temperature		-40~175	°C
T_{stg}	Storage Temperature		-40~150	°C
T_{sold}	Soldering Temperature	1.6mm (0.063″) from case for 10s	260	°C

ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D=100μA, V_{GS}=0V	650			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V		1	10	μA
I_{GSS}	Gate-Source Leakage Current	V_{DS}=0V, V_{GS}=18V			250	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=1.33mA T_j=25°C T_j=175°C	2	3.1 2.2	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=15V, I_D=4.5A T_j=25°C T_j=175°C		400 360	550	mΩ
		V_{GS}=18V, I_D=4.5A T_j=25°C T_j=175°C		290 315	378	mΩ
g_{fs}	Forward Transconductance	V_{DS}=20V, I_D=4.5A		2.9		S

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{DS}=600V, f=1MHz, V_{GS}=0V		203		pF
C_{oss}	Output Capacitance			26		pF
C_{rss}	Reverse Transfer Capacitance			3.5		pF
E_{oss}	C_{oss} Stored Energy			4.2		μJ
$R_{G(int)}$	Internal Gate Resistance	f=1MHz		4.0		Ω
Q_g	Total Gate Charge	V_{DS}=400V, I_D=4.5A, V_{GS}=-4V/18V		11.2		nC
Q_{gs}	Gate to Source Charge			2		nC
Q_{gd}	Gate to Drain Charge			5.2		nC

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		2.63		°C/W

ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	V_{DD}=400V, I_D=4.5A, V_{GS}=-4V/18V, $R_{G(ext)}$=2.5Ω, L=200μH, T_j=25°C		3		ns
t_r	Rise Time			8		ns
$t_{d(off)}$	Turn-Off Delay Time			6		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy			24		μJ
E_{off}	Turn-Off Energy			5		μJ
$t_{d(on)}$	Turn-On Delay Time	V_{DD}=400V, I_D=4.5A, V_{GS}=-4V/18V, $R_{G(ext)}$=2.5Ω, L=200μH, T_j=175°C		3		ns
t_r	Rise Time			9		ns
$t_{d(off)}$	Turn-Off Delay Time			7		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy			23		μJ
E_{off}	Turn-Off Energy			4		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	V_{GS}=-4V, I_{SD}=2.5A T_j=25°C T_j=175°C V_{GS}=-4V, I_{SD}=4.5A T_j=25°C T_j=175°C		 4.0 3.6 4.7 4.2		V
I_S	Continuous Diode Forward Current	V_{GS}=-4V T_c=25°C T_c=100°C		 12 6		A

ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

Reverse Diode Characteristics (Continued)

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, I_{SD}=4.5A, V_R=400V, di/dt=1000A/μs, T_j=25°C		10		ns
Q_{rr}	Reverse Recovery Charge			56		nC
I_{rrm}	Peak Reverse Recovery Current			4		A
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, I_{SD}=4.5A, V_R=400V, di/dt=1080A/μs, T_j=175°C		12		ns
Q_{rr}	Reverse Recovery Charge			62		nC
I_{rrm}	Peak Reverse Recovery Current			5		A

RATING AND CHARACTERISTIC CURVES

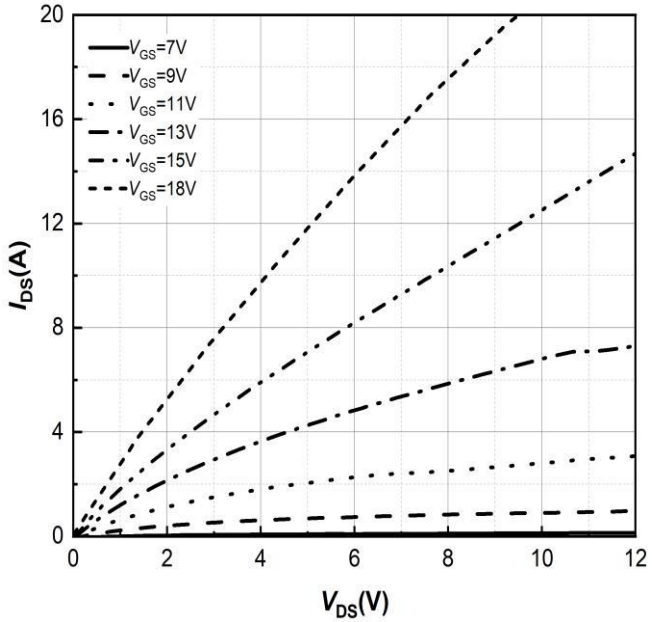


Figure 1. **Output Characteristics T_j=-40°C**

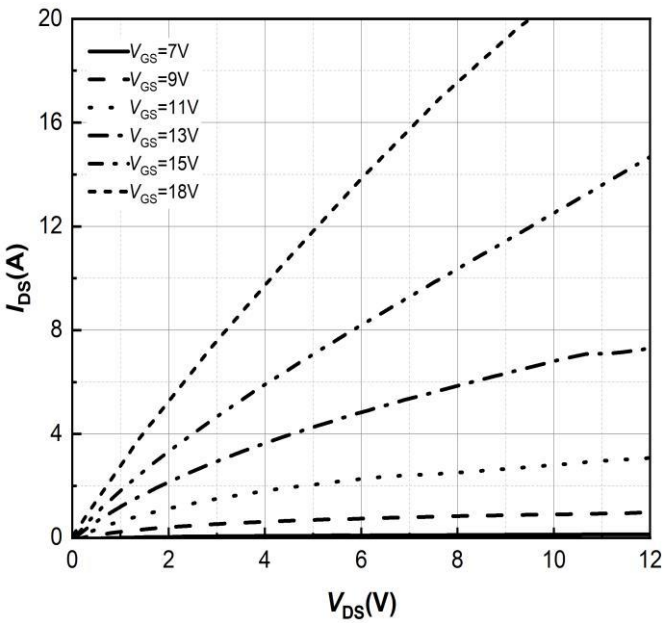


Figure 2. **Output Characteristics T_j=25°C**

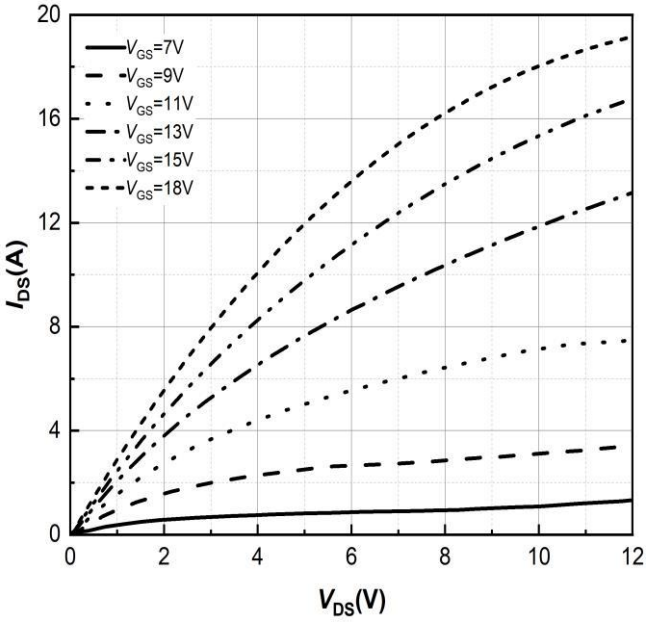


Figure 3. **Output Characteristics T_j=175°C**

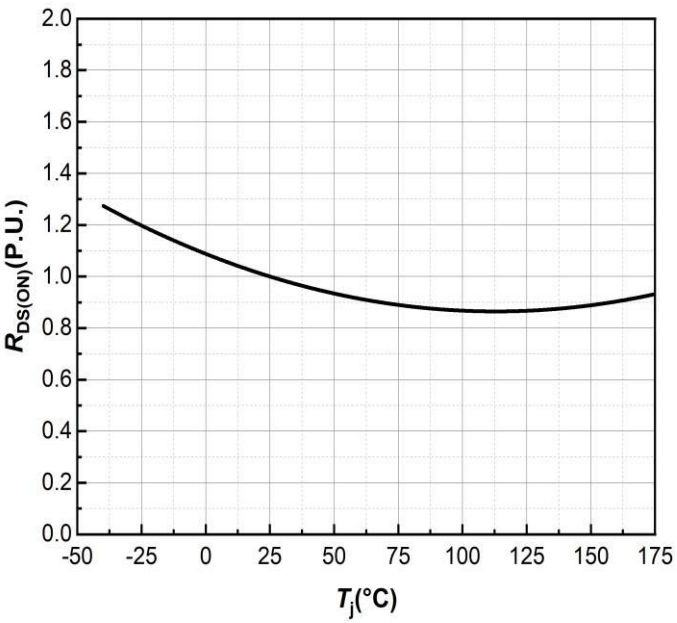


Figure 4. **Normalized On-Resistance vs. Temperature**

RATING AND CHARACTERISTIC CURVES

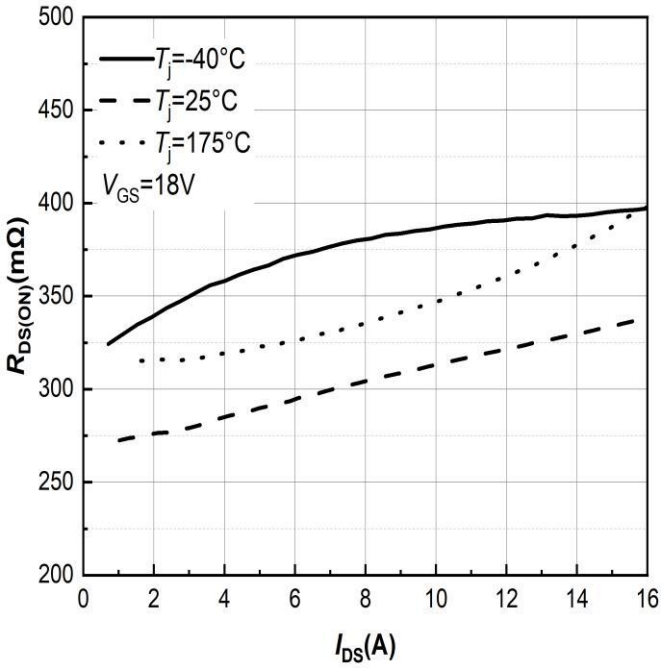


Figure 5. **On-Resistance vs. Drain Current For Various Temperatures**

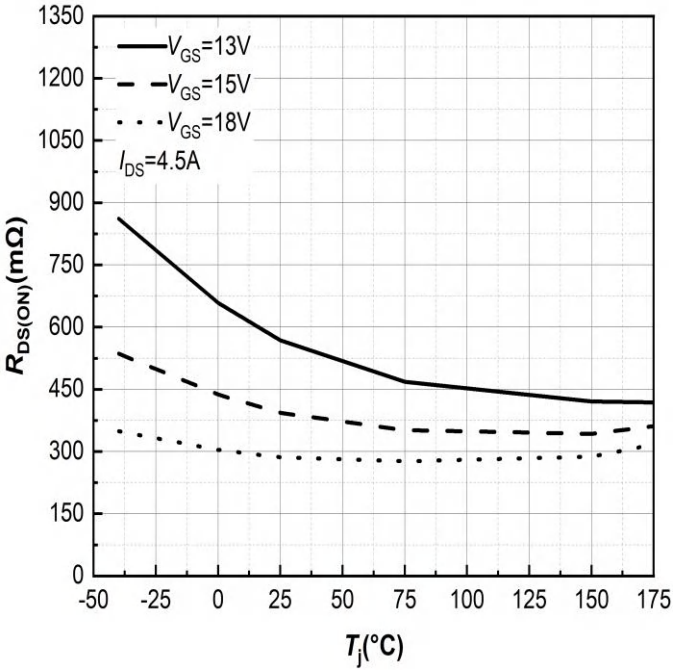


Figure 6. **On-Resistance vs. Temperature For Various Gate Voltage**

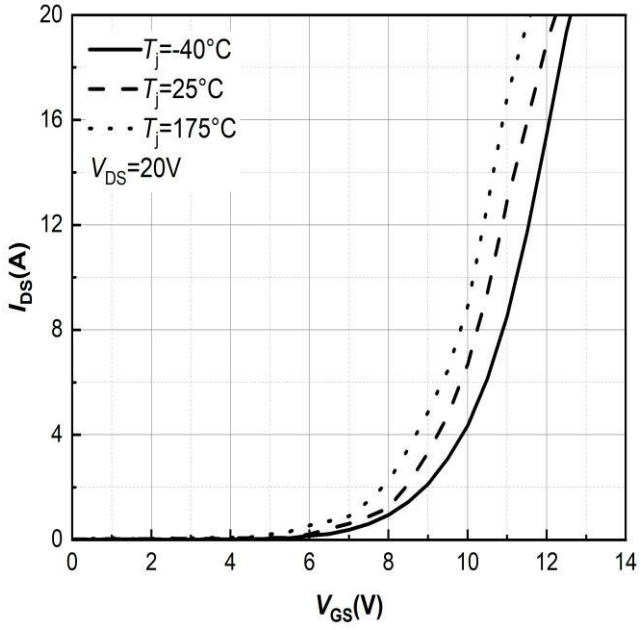


Figure 7. **Transfer Characteristic for Various Junction Temperatures**

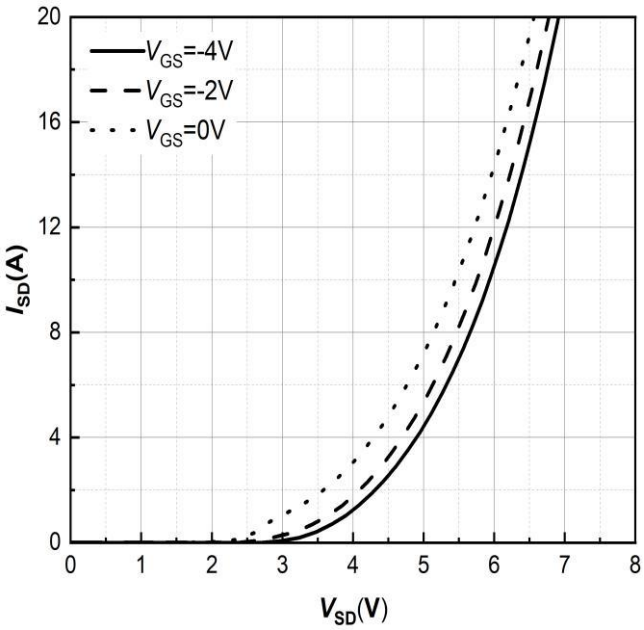


Figure 8. **Body Diode Characteristic T_j=-40°C**

RATING AND CHARACTERISTIC CURVES

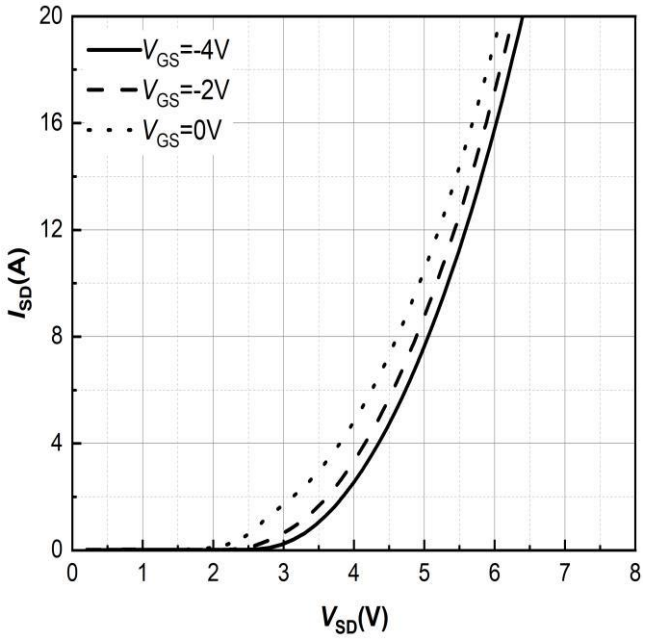


Figure 9. **Body Diode Characteristic T_j=25°C**

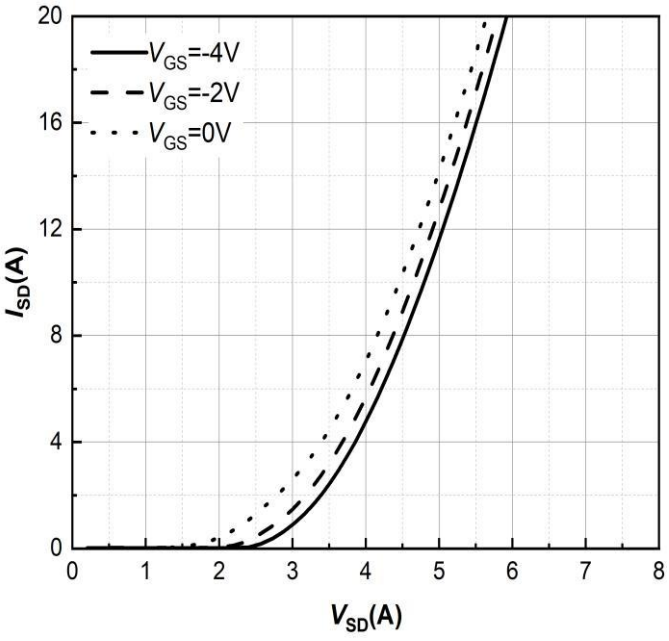


Figure 10. **Body Diode Characteristic T_j=175°C**

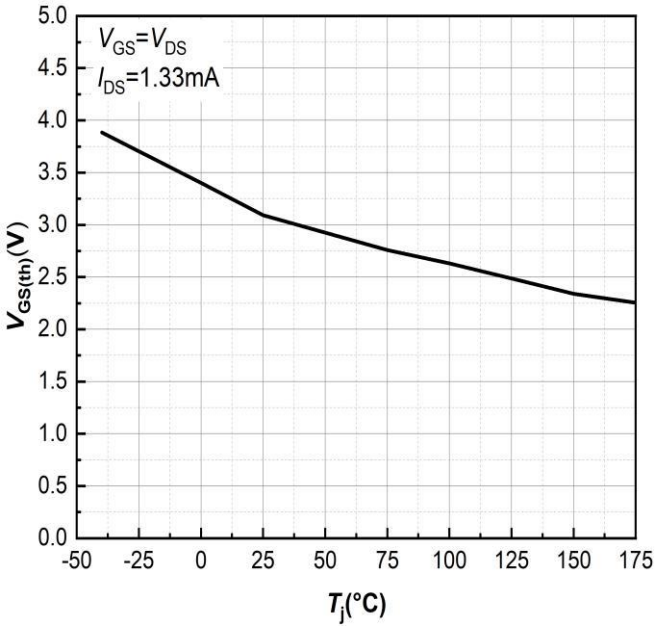


Figure 11. **Threshold Voltage vs. Temperature**

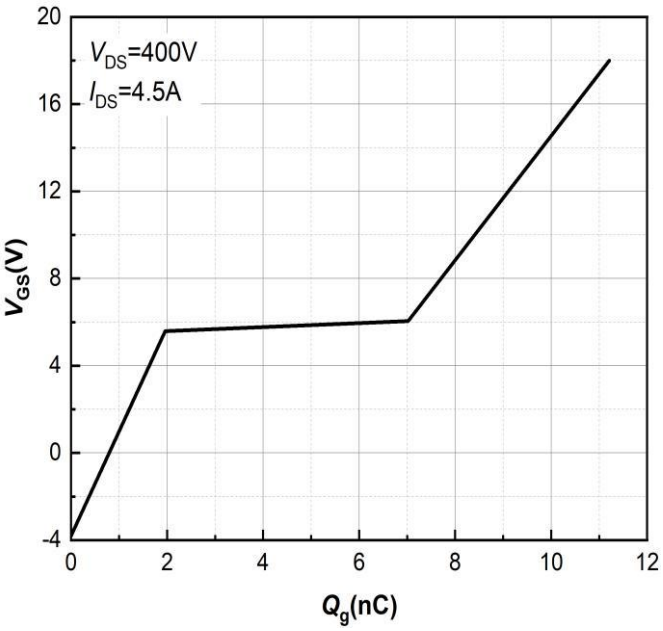


Figure 12. **Gate Charge Characteristics**

RATING AND CHARACTERISTIC CURVES

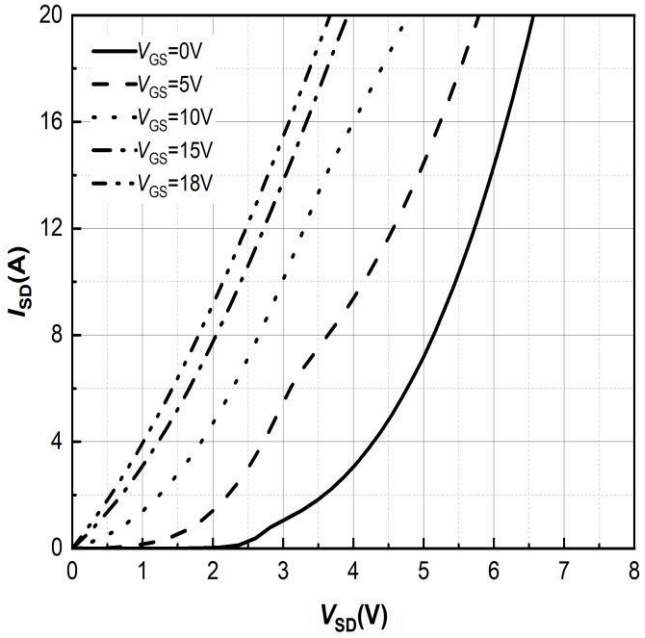


Figure 13. **3rd Quadrant Characteristic T_j=-40°C**

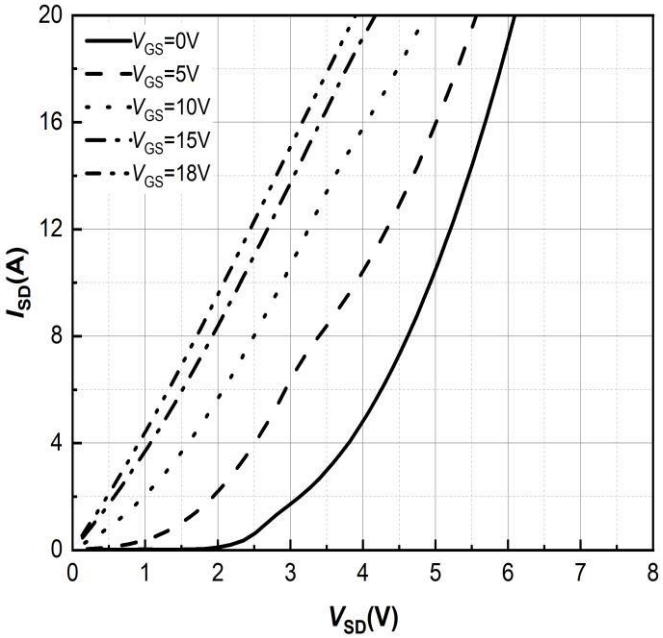


Figure 14. **3rd Quadrant Characteristic T_j=25°C**

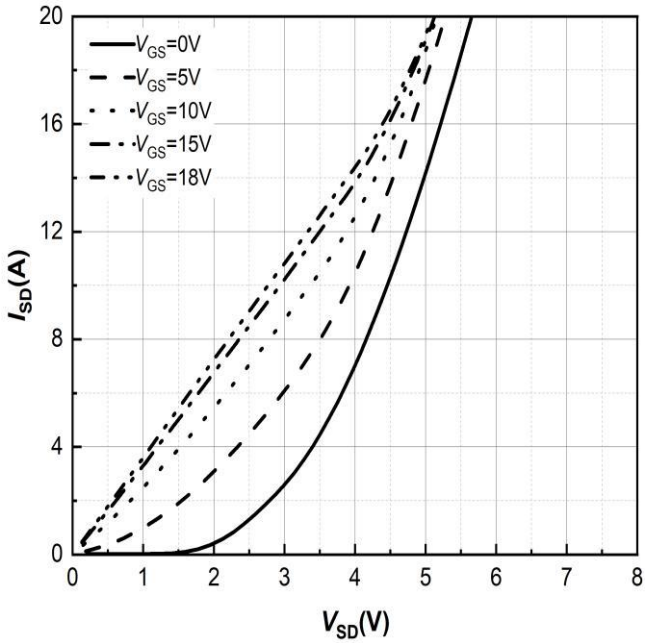


Figure 15. **3rd Quadrant Characteristic T_j=175°C**

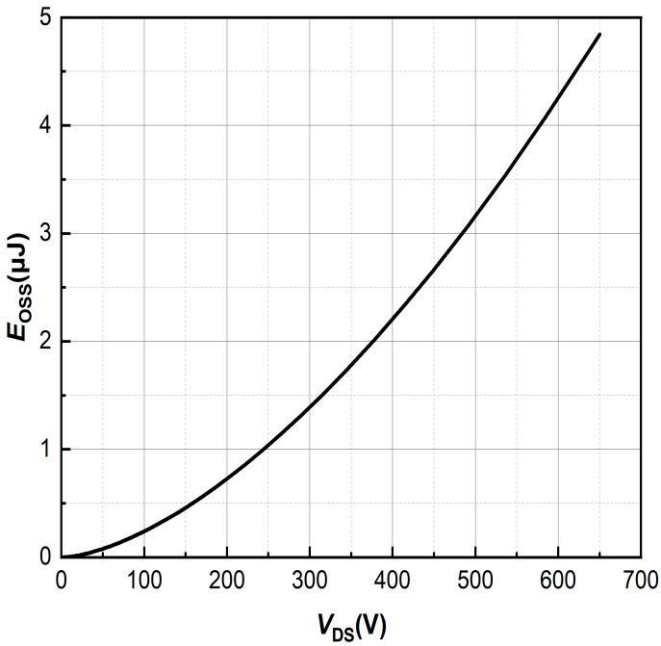


Figure 16. **Output Capacitor Stored Energy**

RATING AND CHARACTERISTIC CURVES

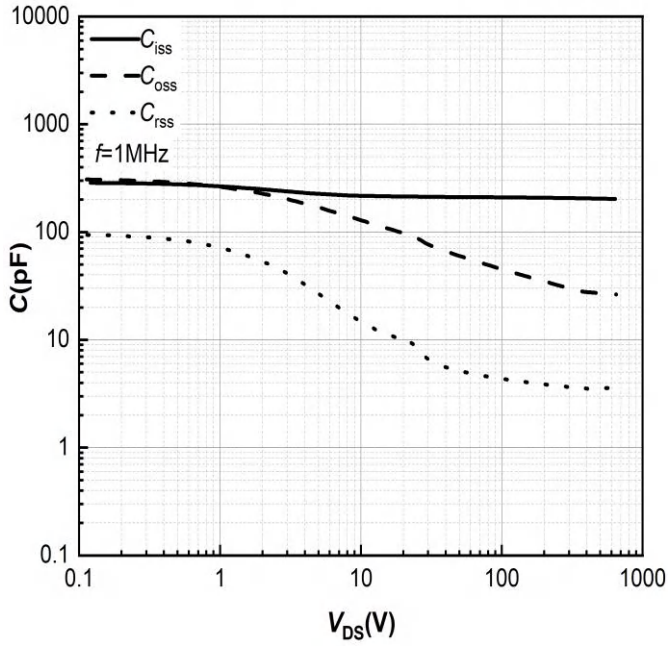


Figure 17. **Capacitances vs. Drain-Source**

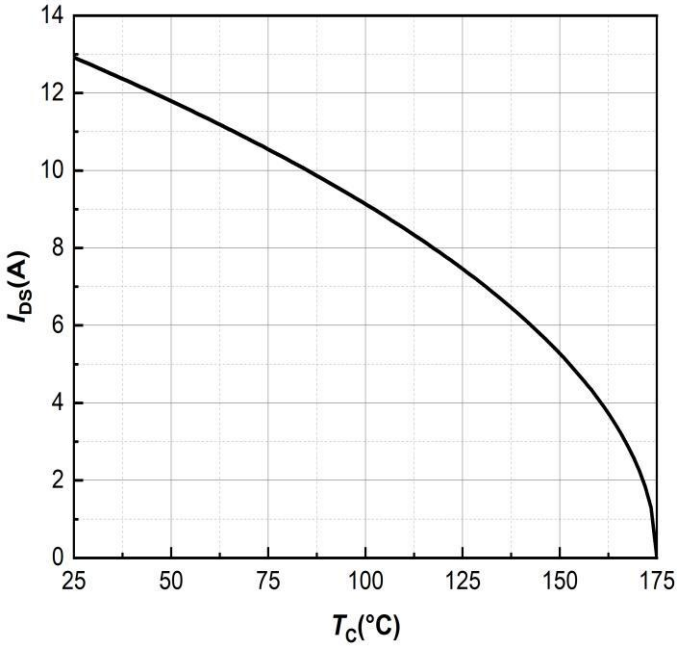


Figure 18. **Continuous Drain Current Derating vs. Case Temperature**

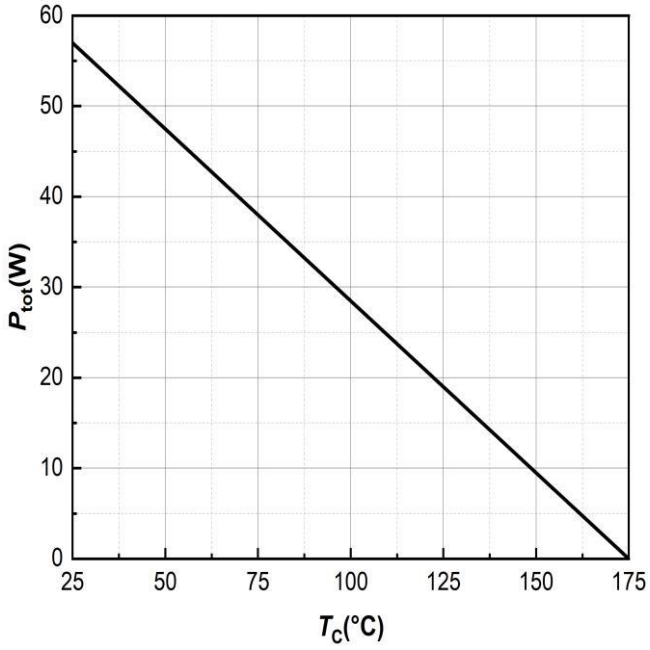


Figure 19. **Maximum Power Dissipation Derating vs. Case Temperature**

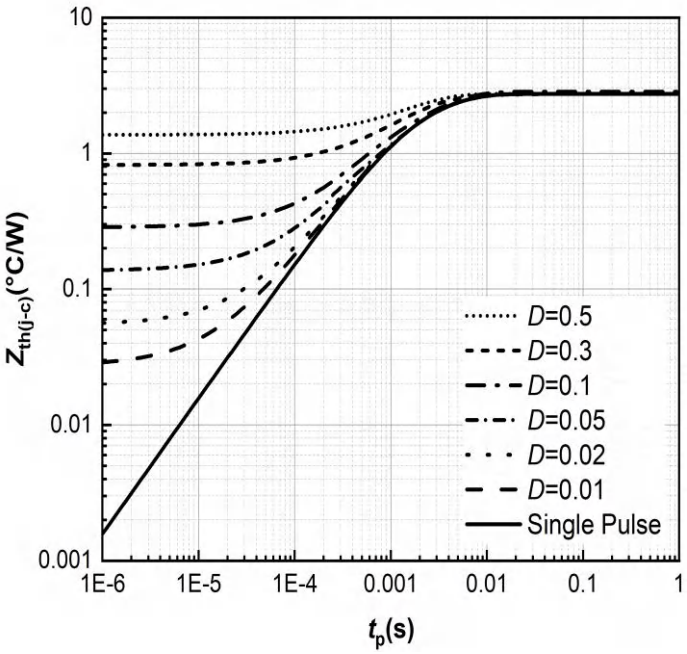


Figure 20. **Transient Thermal Impedance**

RATING AND CHARACTERISTIC CURVES

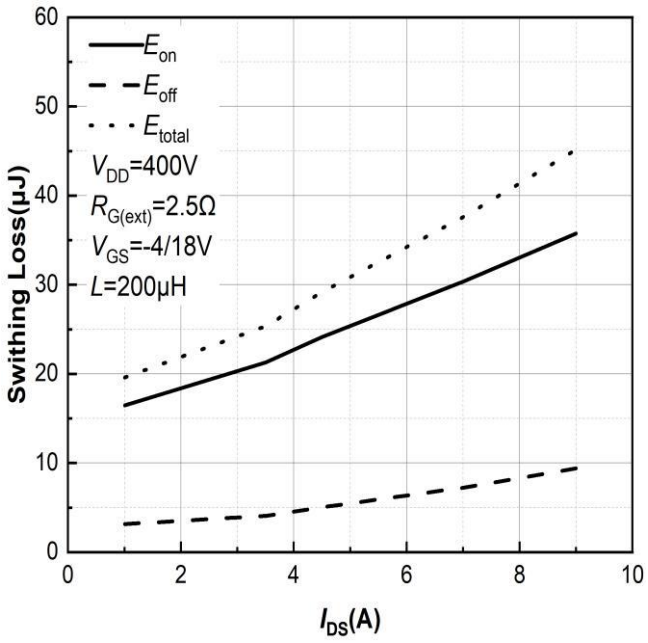


Figure 21. **Clamped Inductive Switching Energy vs. Drain Current T_j=25°C**

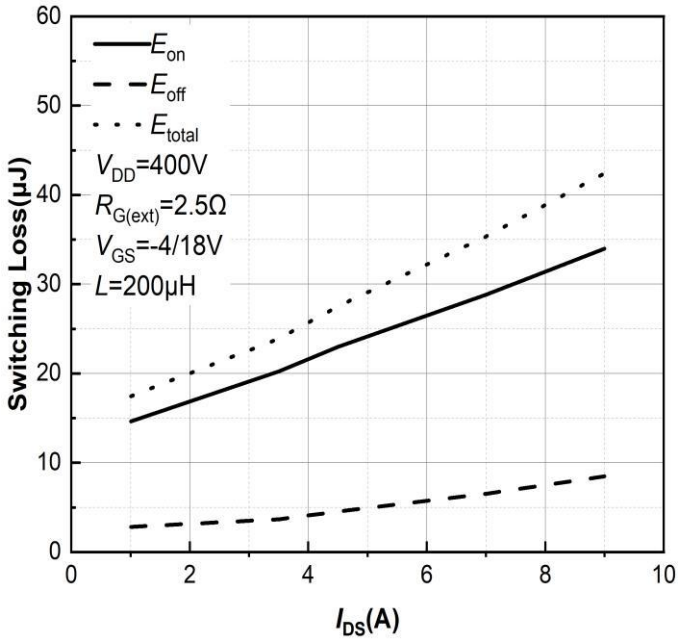


Figure 22. **Clamped Inductive Switching Energy vs. Drain Current T_j=175°C**

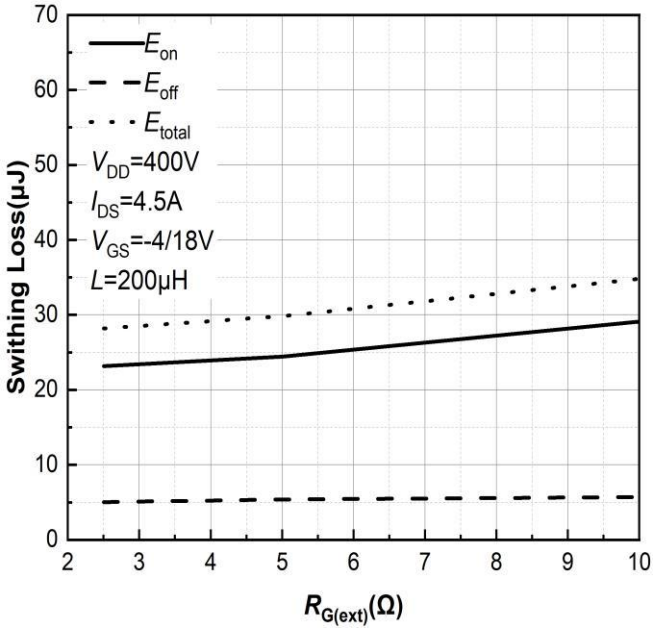


Figure 23. **Clamped Inductive Switching Energy vs. $R_{G(ext)}$ T_j=25°C**

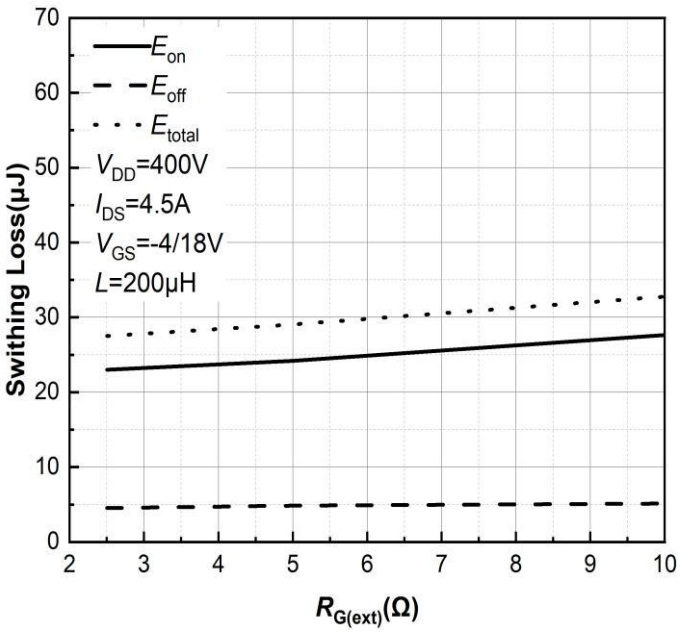


Figure 24. **Clamped Inductive Switching Energy vs. $R_{G(ext)}$ T_j=175°C**

RATING AND CHARACTERISTIC CURVES

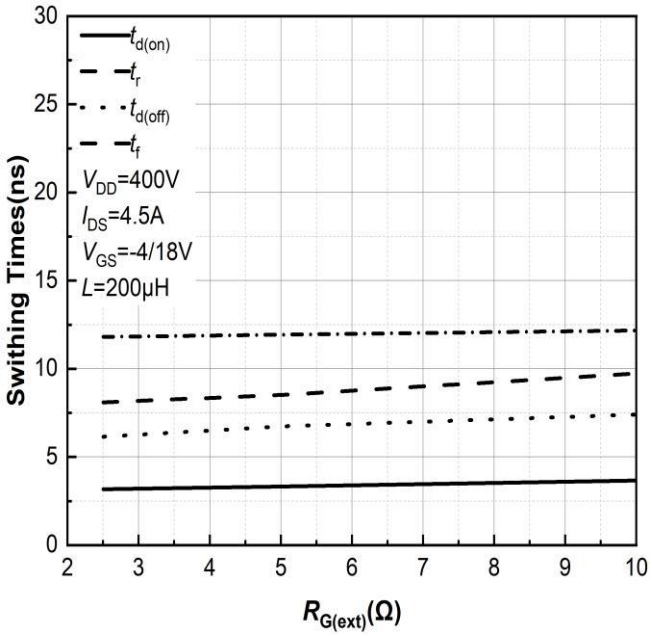


Figure 25. **Switching Times vs. $R_{G(ext)}$ T_j=25°C**

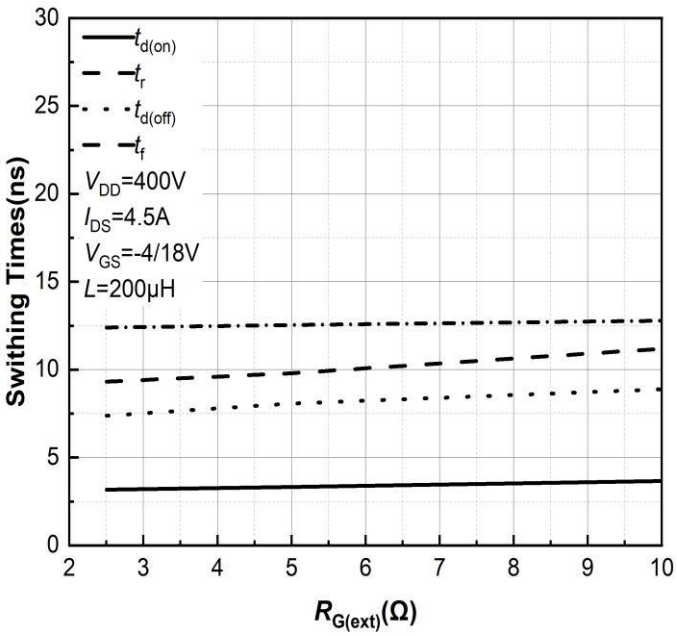


Figure 26. **Switching Times vs. $R_{G(ext)}$ T_j=175°C**

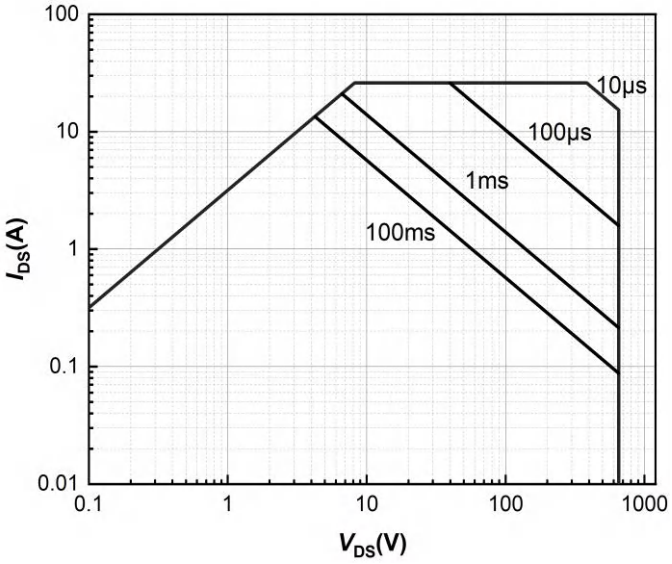
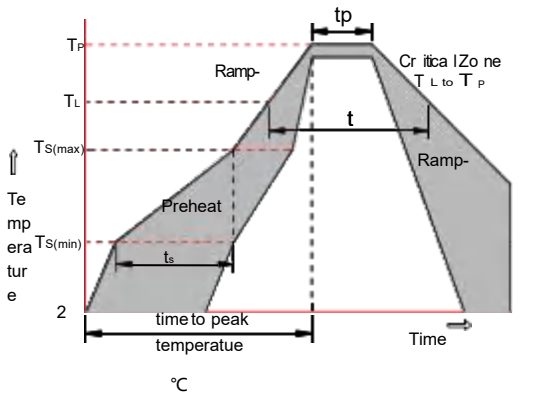


Figure 27. **Safe Operating Area**

Soldering parameters

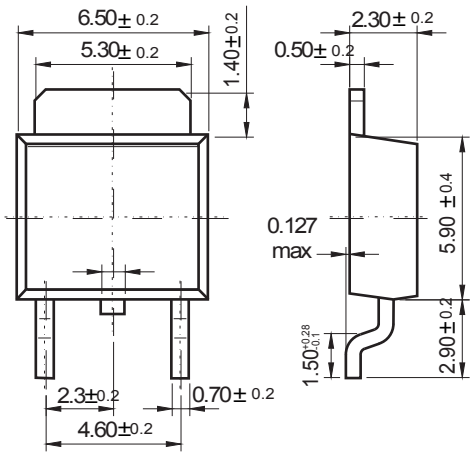
Reflow Condition		Pb-Free assembly (see as bellow)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150℃
	-Temperature Max($T_{s(max)}$)	+200℃
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3℃/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3℃/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217℃
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)℃
Time within 5℃ of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6℃/sec. Max
Time 25℃ to Peak Temp (T_P)		8 min. Max
Do not exceed		+260℃

FIG5: Reflow condition

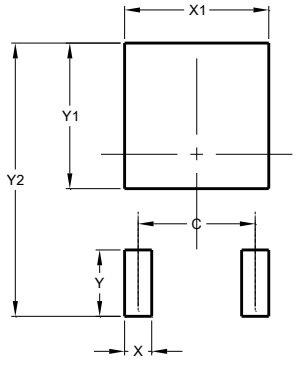


Package Dimensions & Suggested Pad Layout

TO-252



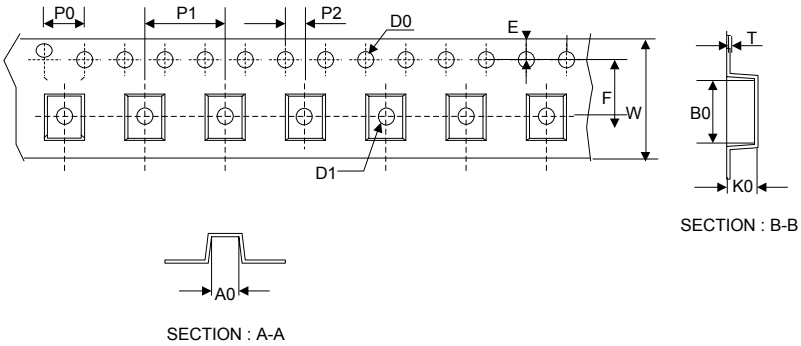
Dimensions in inches and (millimeters)



Dimensions	Value (in mm)
C	4.55
X	1.50
X1	5.80
Y	2.70
Y1	6.00
Y2	10.90

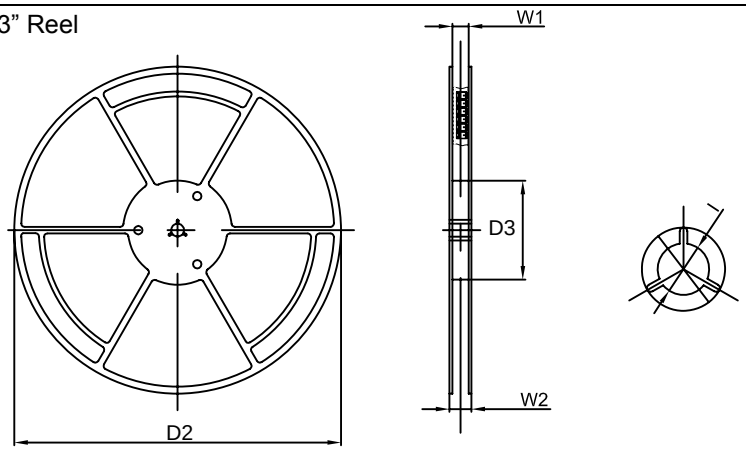
Tape & rell specification

Tape



Symbol	Dimension (mm)
P0	4.00±0.20
P1	8.00±0.20
P2	2.00±0.20
D0	1.55±0.15
D1	1.55±0.20
E	1.75±0.20
F	7.50±0.20
W	16.00±0.20
A0	7.10±0.20
B0	10.50±0.20
K0	2.70±0.20
T	0.30±0.10

13” Reel



D2	330.0±5.0
D3	100.0±4.0
W1	20.0±5.0
W2	25.0±5.0
I	13.0±2.0

Quantity: 2500PCS